

Carlino, Gerald; Drautzburg, Thorsten; Inman, Robert; Zarra, Nicholas

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Partisanship and Fiscal Policy in Federal Unions: Evidence from US States.

Gerald Carlino, Thorsten Drautzburg, Robert Inman, Nicholas Zarra*

February 23, 2020

Abstract

In federal countries, such as the U.S., the fiscal authority consists not of one, but many governments, with state governments accounting for a sizable share of expenditures. We analyze how state partisanship of politicians affects state fiscal policy and quantify the possible macroeconomic consequences for federal fiscal policy. First, using data from close elections, we find strong partisanship effects in the marginal propensity to spend federal transfers, the so-called fly-paper effect: Republican governors spend less. Second, this partisan difference has increased over time and is correlated with the political polarization of federal policymakers. Third, we calibrate a two-agent New Keynesian model of Republican and Democratic states in an open economy monetary union, calibrated to deliver defense spending multipliers as in the literature. Lowering back partisan differences to the less-polarized pre-Reagan era would increase the transfer multiplier by about 30 cents per dollar, and variation in governor's partisan composition similarly lead to variation in the multiplier of around 20 cents. Fourth, we provide direct support for the structural model's partisan predictions using local-projection methods.

Keywords: partisanship, flypaper effect, intergovernmental transfers, fiscal multiplier, monetary union, regression discontinuity.

JEL codes: C24, E62, F45, H72, H77.

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1 Introduction

How to divide fiscal policy between centralized and decentralized governments in fiscal unions is a classic questions in economics (Musgrave, 1959; Oates, 1968). The central government is typically considered best-placed to manage counter-cyclical fiscal policy, because it internalizes spillovers within the union. Decentralized governments, such as states, may be better placed, however, to ensure allocative efficiency. In the wake of the global financial crisis, the ability of the central government to stimulate members of the fiscal union directly through purchases has received renewed attention, both theoretically (Farhi and Werning, 2017) and empirically (Nakamura and Steinsson, 2014). An alternative way for the central government to stabilize the economy is to transfer resources to decentralized governments, which then engage in stimulus (Farhi and Werning, 2016). In the U.S., about 40% of the 2009 fiscal stimulus were such intergovernmental (IG) transfers, largely to state governments (Carlino and Inman, 2016). IG transfers can only provide effective stimulus, however, if states act as reliable agents of the central government and use the transfers to stimulate the economy.

Federal governments routinely transfer resources to state and local governments. In the U.S., state governors play a key role in the deciding how to spend these transfers. State and local governments are responsible for almost half of all government expenditures and more than half of all public investment, both in the U.S. and in the average federal economy (OECD/UCLG, 2016).¹ On average, federal IG transfers account for about half of the revenue of state and local governments. This share is only 22% in the U.S., but federal IG transfers have grown six times faster than GDP since 1947. They account for about 3% of GDP in recent years, more than federal government non-defense consumption and investment. About 90% of these transfers go to states governments. Thus, state level frictions, documented by Carlino and Inman (2016) and Leduc and Wilson (2017), can be important for the effects of these transfers. Within states, governors are the key actors for deciding the budget, due to line-item veto powers in most states (Holtz-Eakin, 1988; Bohn and Inman, 1996) and the institutional setting more broadly Kousser and Phillips (2012).

We provide evidence of a novel political friction: We show that Democratic governors spend more IG transfers than Republican governors. Specifically, we estimate differences in the marginal propensity to spend (MPS) narrowly elected Democratic and Republican governors. Our approach is similar to a Regression Discontinuity Design, which has been used to study partisanship in the U.S. before (Ferreira and Gyourko, 2009; Lee, 2008; Beland, 2015). However, we focus on differences in MPS (slopes), not on level differences in spending. We estimate an average MPS consistent with the so-called flypaper effect (surveyed in Hines and Thaler, 1995; Inman, 2009). Our novel finding is that the MPS of Republicans is significantly lower than that of Democrats: In response to a 1% increase in transfers, Republican governors raise expenditure growth by 0.25pp less than

¹40% of the world population live in federal countries; see <http://www.forumfed.org/countries/> for a list of federal governments and an estimate of their population share (accessed 1/30/2020). Eight of the 33 OECD countries are (quasi-)federal: Australia, Austria, Belgium, Canada, Germany, Mexico, Spain, Switzerland, and the U.S.

Democrats. Our results also indicate that Republicans have relatively lower taxes and interest payments. Consistent with the literature on the polarization of federal policy makers [McCarty et al. \(2016\)](#); [Azzimonti \(2018\)](#), we find that the partisan differences have been increasing with polarization.

In aggregate, our estimates imply large effects of state partisanship on federal IG multipliers. To compute aggregate effects, we need a macroeconomic model because our empirical estimates apply only to cross-sectional variation. We use a standard New Keynesian model consisting of two representative regions (states) in a monetary union, similar to [Nakamura and Steinsson \(2014\)](#) and [Auclert et al. \(2019\)](#). The model features a Keynesian demand side channel, to model policies such as changes in spending, as well as a neoclassical supply side channel, to cover policies such as changes in taxation. Our calibration disciplines the strength of these channels: The model matches the defense spending multiplier and the response of taxes that [Ramey \(2011\)](#) estimates. In the model, we compute the state-level and aggregate effects of an IG stimulus calibrated to the IG portion of the 2009 U.S. stimulus bill. Our estimated partisan MPS differences at the state level imply that the impact multiplier on federal transfers is 0.3 lower than it would have been in the pre-Reagan era, when partisan polarization was lower. For plausible values of the baseline MPS, the federal IG multiplier would exceed the defense spending multiplier with pre-Reagan era levels of partisan differences, but not with the partisan differences prevailing in the 2000s. We also show that the partisan differences matter more in the presence of a lower bound on interest rates.

Predictions of the model for economic activity are consistent with additional cross-sectional and time series regressions. Underlying is the key model mechanism: States with Democratic governors tend to see more expansionary demand-side policies than Republican states, while the opposite pattern holds for supply-side policies. At the state level, the model predicts that, with a delay, Republican states should see higher output and employment growth compared to Democratic states after increased IG. In contrast, Democratic states should see higher activity on impact. In state-level regressions using close elections, we indeed find evidence that, in the calendar year straddling the beginning of the fiscal year, the employment-to-population ratio falls in Republican states relative to Democratic states, following IG increases. In contrast, with a one-year lag, the opposite is true – consistent with model simulations. In aggregate, the model predicts that the multiplier on federal transfers should be lower the larger the share of Republican governors. This prediction is confirmed by local projection methods in a time series regression: The impact effect of IG surprises on GDP is more negative the larger the share of Republican governors.

Our paper fits in an established literature in macro-political economy and public finance. As [Alesina \(1988\)](#) discusses, there is a literature that analyzes coordination games with different policymakers running different economies at the same time. In our model, different policymakers run different state economies at the same time. However, we take the equilibrium of the political game as given, and aim to estimate the resulting partisan policy rules. Our positive analysis is thus similar to the cross-country work by [Hibbs \(1977\)](#) on political parties and the macroeconomy. Similar to how [Alesina and Sachs \(1988\)](#) find support for the “‘partisan view’ of monetary policy” (p. 79)

in their study of the aggregate U.S. economy, we find empirical support for partisan differences in state-level fiscal policy. This is in contrast to the negative result of [Ferreira and Gyourko \(2009\)](#) for U.S. cities, but is consistent with the more recent finding of partisan differences in pension funding under Democratic and Republican mayors ([Dippel, 2019](#)). For other countries, partisan differences between local policy-makers are also well established: see [Pettersson-Lidbom \(2008\)](#) for Swedish evidence and [Cervellati et al. \(2017\)](#) for Italy. Our focus is, however, not on partisan differences in spending levels, but in their propensity to spend out of transfers. While others have documented distributional effects of governors’ party affiliation ([Beland, 2015](#); [Hill and Jones, 2017](#)) in the U.S., we are, to the best of our knowledge, the first to document effects on the level of economic activity. In macroeconomics, heterogeneity in households’ propensity to consume has long been documented – see [Fagereng et al. \(2016\)](#) for a recent estimate, and [Kaplan et al. \(2018\)](#) for implied macroeconomic effects. Our paper documents MPS heterogeneity among states, and quantifies its macroeconomic effects.

We continue by describing the data and empirical specification in [Section 2](#), where we also argue that governors are the relevant actors in setting state budgets and that federal transfers are, indeed, fungible. [Section 3](#) presents the empirical results at the state level. There we examine expenditures, revenues, and interest payments on state debt. [Section 4](#) embeds the state level estimates in a model of a monetary union and computes our main counterfactuals. Finally, [Section 5](#) uses time series data to test the model prediction that transfer multipliers depend on the partisan affiliation of governors.

2 Empirical specification and data

We begin this section by providing evidence that governors are the relevant political actors when it comes to state budgets. Additionally, we provide evidence that intergovernmental transfers are, indeed, fungible. To complete our discussion of the institutional context, we describe the broad characteristics of state government budgets. We then develop our regression specification and discuss it in the context of the descriptive statistics of our main variables.

2.1 Institutional setting

Governors in most U.S. states are in a strong bargaining position when it comes to setting the state budget. The line-item veto, recognized by all but seven states, gives the governor particularly strong powers to check any significant deviations from her initial agenda; see [Holtz-Eakin \(1988\)](#) and [Bohn and Inman \(1996\)](#). And, while legislatures generally can afford not to pass new legislation, since the fallback is just the status quo, not passing a budget is politically costly for legislatures ([Kousser and Phillips, 2012](#)). Divided government and increasing partisanship between legislative parties make a coordinated legislative effort to undo the governor’s budget very difficult; see [McCarty et al. \(2016, chapter 8\)](#) and [Bohn and Inman \(1996\)](#) for evidence from state budgets. It is therefore

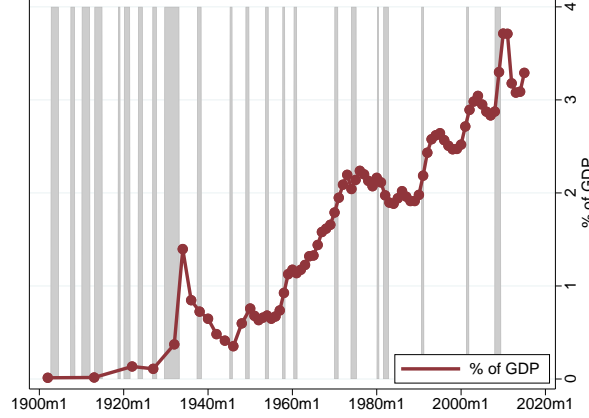
unsurprising that [Kousser and Phillips \(2012\)](#) conclude that “each dollar of ... changes proposed by the governor in January translates into roughly 70 cents in the final budget deal”.

Underlying our analysis is also the assumption that states have discretion in the use of federal IG transfers. This may not be obvious: with the exception of “general revenue sharing”, a program introduced by Nixon and axed by Reagan, IG transfers take the form of aid and grants. These funds are intended for specific types of spending. However, states do circumvent these rules. [Nicholson-Crotty \(2004\)](#) provides two illustrative examples. He describes that the U.S. Congress increased the level of states’ discretion in administering Medicaid funds in 1981. Following rapid cost increases, the General Accounting Office investigated and found that “the states were using their federal matching funds to supplant, rather than supplement, state-level funds. Investigators determined that ... states were able to use federal dollars for almost all care provided while spending little or none of their own money.” (p. 114) Similarly, for the Byrne Formula Grant Program, the largest category of funds in the area of criminal justice in the early 1990s, [Nicholson-Crotty \(2004\)](#) concludes that “there is essentially no monitoring of individual states by the Justice Department” (also p. 114). This is consistent with the survey in [Hines and Thaler \(1995\)](#), which finds that subnational governments spend as little 25 cents for each dollar received in intergovernmental transfers.²

Intergovernmental transfers have risen sharply in the U.S., as Figure 1 shows. While the first ongoing federal cash grant to states dates back to 1879 ([Congressional Research Service, 2019](#)), IG transfers to states still accounted for as little as 0.01% of GDP in 1902. The modern system of transfers took off during the Great Depression, with transfers peaking at 1.4% of GDP in 1934, before dropping back to 0.36% of GDP after WWII. From 1946 to 2010, however, transfers grew ten times faster than GDP, peaking in the Great Recession at 3.7% of GDP, before declining modestly to 3.1% of GDP in 2014 and ticking up slightly with the Medicaid expansion in 2015. While part of the increase in transfers in the big downturns automatic, since the unemployment insurance is state-run and partly funded through federal grants, the 2009 stimulus bill included large discretionary transfers to U.S. states ([Carlino and Inman, 2014](#)).

Figure 2 gives an overview of state finances and the importance of IG transfers at the state level. Panel (a) provides a breakdown of general revenue, averaged across all states from 1983 to 2014. Federal transfers are the second most important source of state general revenue, accounting for 29% of the total. Among IG revenue, about half are grants for welfare programs (not shown). The main revenue source of states are taxes, accounting for 51%. General charges and miscellaneous revenue accounts for most of the remainder. Panel (b) breaks down the tax revenue into its components. Almost half of the tax revenue is due to sales taxes and almost 30% of taxes come from individual income taxes. The remaining 22% are split roughly evenly into other taxes, license revenue, and corporate income taxes. Last, panel (c) breaks down expenditures. 54% of total expenditures go towards operating expenses and others. States spend one quarter of expenditures on transfers to municipalities and 13% are transfers to households. The remaining 8% are capital outlays. In what

²The lack of enforcement and resulting fungibility of intergovernmental transfers is not unique to the U.S. For example, [Ivanova et al. \(2017\)](#) warns of risks of fund diversion for EU funded projects in member states.



Source: U.S. Census for grant data, [Ramey and Zubairy \(2014\)](#) for historical GDP data, and authors' calculations. Gray shaded areas indicate NBER recession dates.

Figure 1: U.S. federal intergovernmental transfers to states since 1902

follows, we set out our framework for relating expenditure growth to IG revenue growth.

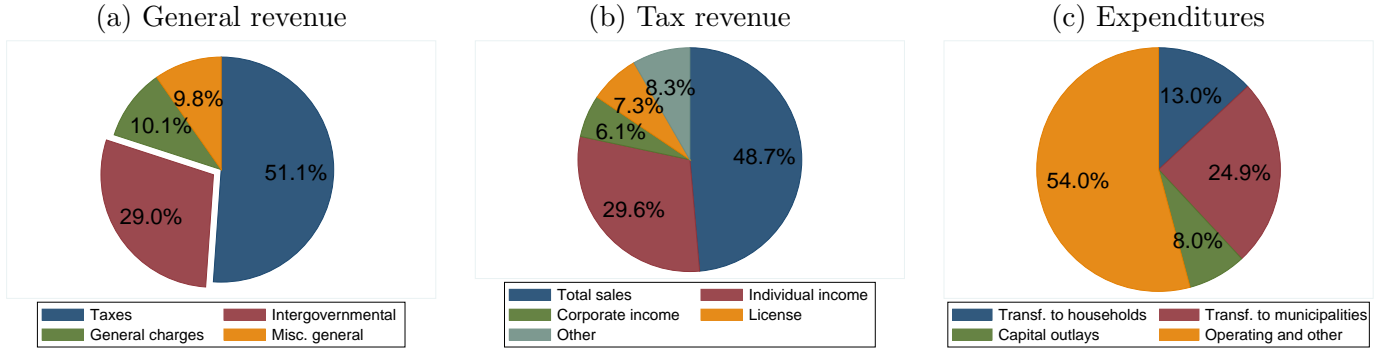


Figure 2: State budgets: Average shares from 1983–2014

2.2 Empirical strategy

Our focus is on recovering the average MPS γ_p for Democratic and Republican governors ($p \in \{D, R\}$) out of intergovernmental transfers IG . Naively, one could simply regress per capita expenditures $E_{s,t}$ on per capita transfers $IG_{s,t}$ and a constant, separately for Republican and Democratic governors. For some error term $\epsilon_{s,t}$, this corresponds to the following regression:

$$E_{s,t} = \mu_p + \gamma_p IG_{s,t} + \epsilon_{s,t}, \quad p \in \{D, R\}. \quad (2.1)$$

In practice, the challenge in running such a regression is to distinguish policymakers' preferences from those of the electorate and socio-economic conditions in the state. While, as [Besley and Case \(2003\)](#) point out, much variation can be accounted for by fine enough fixed effects or possibly control variables, omitted variables are hard to fully control for. For example, IG inflows could

promote a big-government attitude among the electorate, which, in turn, could be associated with voting for Democratic governors and spending more. We might then falsely identify a higher MPS for Democrats, simply because Democratic governors tend to be selected when transfers and expenditures are high.

An obvious approach to control for unobservables is to condition on close elections. Intuitively, we can run separate OLS regressions of expenditure $E_{s,t}$ on IG transfers $IG_{s,t}$ for Democratic and Republican governors, i.e., for $p \in \{D, R\}$. In each case, we get that:

$$\hat{\gamma}_p \xrightarrow{p} \gamma_p + \frac{\text{Cov}_p[IG, \epsilon_E]}{\text{Var}_p[IG]}$$

In general, γ_p is biased, as omitted variables may cause a non-zero covariance between transfer growth and expenditure growth residuals. Our strategy is to difference this bias out:

$$\hat{\gamma}_\Delta \equiv \hat{\gamma}_R - \hat{\gamma}_D = \gamma_R - \gamma_D + \frac{\widehat{\text{Cov}}_R[IG, \epsilon_E]}{\widehat{\text{Var}}_R[IG]} - \frac{\widehat{\text{Cov}}_D[IG, \epsilon_E]}{\widehat{\text{Var}}_D[IG]}$$

For the full sample, this strategy need not work as the bias may be different for Democrats than for Republicans. For close elections, it may, however, be justified to assume that the distribution of IG transfers and expenditure residuals is the same for governors of either party. In that case, the bias cancels out and we have identified the causal difference in MPS.

A further complication arises for a subset of IG transfers. For several IG programs, the federal government pays transfers as a function of expenditures, particularly in welfare programs. A simple way to model this issue is to represent IG as the sum of an exogenous component $X_{s,t}$ and a multiple θ of state expenditures: $IG_{s,t} = X_{s,t} + \theta E_{s,t}$, where expenditure follows (2.1) and thus differs by party. We show in Appendix A.2, that, when the variance ω_p of the exogenous spending component is equal for both parties, then the (asymptotic) difference between propensities to spend is:

$$\begin{aligned} \hat{\gamma}_{R,OLS} - \hat{\gamma}_{D,OLS} &\xrightarrow{p} \gamma_R - \gamma_D + \theta \frac{\omega^2}{\text{Var}[X] + \theta^2 \omega^2} (1 - \gamma_R \theta) - (1 - \gamma_D \theta) \\ &= (\gamma_R - \gamma_D) \frac{\text{Var}[X]}{\text{Var}[X] + \theta^2 \omega^2} \end{aligned}$$

This difference between propensities to spend is proportional to the object of interest $\gamma_R - \gamma_D$, but biased down. The factor of proportionality approaches unity as the role of matching declines to zero, either because IG is largely exogenous ($\text{Var}[\omega\epsilon]/\text{Var}[X] \rightarrow 0$) or because $\theta \searrow 0$. As a consequence, we exclude welfare spending, so that the remaining matching rate θ is low and non-welfare IG is dominated by exogenous factors. We also use the difference in estimates based on overall IG transfers and non-welfare IG transfers to verify the downward bias with $\theta > 0$.

Last, when taking the model to the data we work with log differences and fixed effects. Expenditures and IG revenue have grown secularly in the U.S. and by estimating our model in log-differences, we can render the model stationary. Allowing for additional state fixed effects, or even finer fixed

effects, also allows for state-specific trends by controlling for differences in average growth rates. In practice, we also found that states behave differently in response to increased in IG transfers and cuts to transfers, so that we allow for slopes to differ. This gives us, finally, our empirical specification:

$$\begin{aligned}\Delta E_{s,t} = & (\gamma_{0,+} + \gamma_{r,+} \times Rep_{s,t-1}) \Delta \ln IG_{s,t}^+ + (\gamma_{0,-} + \gamma_{r,-} \times Rep_{s,t-1}) \Delta \ln IG_{s,t}^- \\ & + (\mu_0 + \mu_r \times Rep_{s,t-1}) + \text{fixed effects} + \epsilon_{s,t},\end{aligned}\tag{2.2}$$

where s denotes states and t denotes years. $\Delta E_{s,t}$ is (log) expenditures in our main results. In extensions, we replace $\Delta E_{s,t}$ with revenue or other outcomes. $Rep_{s,t-1}$ is a dummy for Republican governors at the time the budget was passed. Here, $\Delta \ln IG_{s,t}^+ \equiv \max\{0, \Delta \ln IG_{s,t}\}$ and $\Delta \ln IG_{s,t}^- \equiv \min\{0, \Delta \ln IG_{s,t}\}$. $\epsilon_{s,t}$ is the error term, which we allow to be correlated across states and time. For inference, we therefore cluster standard errors by state and year, using the `reghdfe` package (Correia, 2016). Fixed effects always include either state or party by state fixed effects as well as either year, census region by year, or party by year fixed effects. In what follows, we focus on the estimates of $\gamma_{r,+}$ and $\gamma_{r,-}$, that is, on how the pass-through elasticity changes when the governor is Republican rather than a Democrat.

In our baseline specifications, we allow for a Texan Republican to differ from one in California – and for Democrats to act, on average, differently during years of the Obama presidency than under the Trump presidency. Formally, we use party×state and party×year fixed effects. This captures concerns that southern Democrats or New England Republicans are, on average, different from their average party colleague. In addition, it would control for the possibility that a president of one party may strategically direct IG transfers more so to states run by fellow Democrats or Republicans – or that Republicans decline transfers offered by a Democratic president (or vice versa).³ In robustness checks, we also use the more customary state and year fixed effects as in Besley and Case (2003), or state and census region×year fixed effects, which capture economic spillovers. Overall, we view our fixed effects as isolating the within-state variation in political outcomes and the between-state variation in intergovernmental transfers and business cycles.

Our baseline specification is relatively richly specified, given the double split by IG growth and party. However, to bring our results closer to the standard RDD literature, we also verify that our results are not driven by the margin of victory (MOV). We thus interact all variables with the MOV. This yields a modified estimating equation, similar to Caetano et al. (2017):

$$\begin{aligned}\Delta E_{s,t} = & (\gamma_{0,+} + \gamma_{r,+} \times Rep_{s,t-1}) \Delta \ln IG_{s,t}^+ + (\gamma_{0,-} + \gamma_{r,-} \times Rep_{s,t-1}) \Delta \ln IG_{s,t}^- \\ & + (\gamma_{0,+,m} + \gamma_{r,+,m} \times Rep_{s,t-1}) \Delta \ln IG_{s,t}^+ \times MOV_{s,t-1} \\ & + (\gamma_{0,-,m} + \gamma_{r,-,m} \times Rep_{s,t-1}) \Delta \ln IG_{s,t}^- \times MOV_{s,t-1} \\ & + (\beta_{0,m} + \beta_{r,m} \times Rep_{s,t-1}) MOV_{s,t-1} \\ & + (\mu_0 + \mu_r \times Rep_{s,t-1}) + \text{fixed effects} + \epsilon_{s,t}.\end{aligned}\tag{2.3}$$

³This was the case in the recent Medicaid expansion.

Here, the MOV is lagged to line up with the governor in charge during the budget process. To implement this specification, we choose a margin of victory cutoff via cross-validation. Specifically, we estimate (2.3) first leaving one state out at a time, and then one year out at a time. We then compute the root-mean-squared-error (RMSE) for the left out observations. We repeat this process for MOV cutoffs on a one percentage point grid, and choose the cutoff that minimizes the RMSE averaged across leaving out state and leaving out years.

For ease of interpretation, it is useful to map γ_p from an elasticity to a dollar coefficient. To do that, we may simply use the average ratio of expenditures to IG transfers. This ratio, however, also varies between states. Therefore, we also provide results with $\frac{E_{s,t-5}}{IG_{s,t-5}} \Delta E_{s,t}$ as the regressand. This is similar to regressing the (real, per capita) dollar change in expenditures on the (real, per capita) dollar change in transfers, but we have found it to be more robust.

2.3 Data sources and definitions

We construct a panel data set encompassing fiscal and political outcomes in U.S. States from 1963 to 2014, supplemented with select macroeconomic indicators. Appendix B provides variable definitions and additional details.

Political data. We assemble a political database including state legislature partisan affiliation, governor party and marginal victory, and state presidential vote. The state legislature data comes from Klarner (2015). Klarner assembles this open source data set from primary sources. This database also includes a variety of budget power variables assembled by Klarner’s study of legal fiscal rules. Using text recognition software, we assembled a database of gubernatorial outcomes from the Council of State Government’s Book of States, which provides margin of victory and party affiliation from 1933 to date. Since the vote share can lead to ambiguous outcomes when other parties won the most vote, we manually check the election results whenever third parties are shown as having the most votes. In addition, we check all governors elected within a 5pp. margin of victory (MOV). We also collect non-electoral gubernatorial change outcomes from the National Governors Association.⁴ Finally, we take state-level presidential voting records from the University of California Santa Barbara’s American Presidency Project. Our final data set spans 1963 to 2008 with full fiscal and political data. Note most states switch governors during our sample period. For example, even states that produce landslide victories in some elections, such as California or Texas, had marginally elected governors from both parties.

Fiscal variable definitions. We collect comprehensive data on revenues and expenditures for all states from the U.S. Census Bureau’s State and Local Government Finance historical database for 1958 to 2006 by fiscal year. For both expenditures and revenues, the State and Local Government Finance database provides detailed accounts for both the end use and source of financing, including

⁴In years with a change in governor party, we assign the governor’s political party to the party during the budget process in the first quarter of the previous calendar year. Unless otherwise noted, we drop state-years with independent governors – a rare occurrence, as Figure B.2 shows.

purpose of intergovernmental transfers as well as type of spending. The more recent data comes from the Census' Annual Surveys of State and Local Government Finances.⁵

Our fiscal variables definitions follow [U.S. Census Bureau \(2006\)](#). Our measure of government expenditures is called "Total Expenditure". The Census defines it as "includ[ing] all amounts of money paid out by a government during its fiscal year [...] other than for retirement of debt, purchase of investment securities, extension of loans, and agency or private trust transactions." ([U.S. Census Bureau, 2006](#), p. 5-1.) This measure is the sum of current operating expenditures, total capital outlays, total spending on assistance and subsidies, total insurance trust benefits, total interest on debt, and total intergovernmental expenditures.

We use "General Revenue" net of federal intergovernmental transfers as the main measure of revenue for our analysis. General Revenue is defined by the Census as "compris[ing] all revenue except that classified as liquor store, utility, or insurance trust revenue." ([U.S. Census Bureau, 2006](#), p. 4-3) General revenue is the sum of tax revenue, intergovernmental revenue, current charges, and miscellaneous charges. While the Census provides an alternative and larger measure called "Total Revenue" that also includes social insurance trust revenue, the Census requires unrealized gains or losses to be booked in the fiscal year that they occur, which skews the data during recessions.

To measure the constraints on fiscal policy, we also use "total debt" from the census data set. The weakness of this measure is that it is based on the face value of outstanding debt, rather than its market value. However, by focusing on the change in total debt we should limit the importance of the composition problem of debt. We also focus on debt with a maturity of at least one year which accounts for almost all debt. Our results are, however, robust to using all debt outstanding. The Census discourages using alternative measures, such as the past surplus.⁶

Economic activity. We also data on state GDP, employment, and population data from the U.S. Bureau of Economic Analysis's Regional Economic Accounts by calendar year. To merge the dataset, we line up fiscal years with the calendar years straddling the end of the previous fiscal year and the beginning of the current fiscal year, to best reflect states' contemporaneous information. Fiscal years begin in the calendar year before with the state budget allocation being set in advance for all U.S. states, despite difference in the timing of fiscal years for four states. We assign the political status of the state to be that in the first quarter of the calendar year preceding the fiscal year as it is in the middle of the budget process.

Macroeconomic data. We use the aggregate annual GDP deflator to deflate all quantities to real dollar values in our state level data set. In addition, we collect quarterly data on grants-in-aid to both state and local governments, and on federal, and state and local government expenditures as well as consumption and investment expenditures, as well as aggregate GDP.

⁵We do not use the preliminary estimate for 2015 because we found that preliminary estimates can be off substantially in 2007 and 2008, when the historical and contemporaneous sources overlap.

⁶"[...] the Census Bureau statistics on government finance cannot be used as financial statements, or to measure a government's fiscal condition. For instance, the difference between a government's total revenue and total expenditure cannot be construed to be a 'surplus' or 'deficit.'" See [U.S. Census Bureau \(2006\)](#), p. 3-13.)

2.4 Sample selection

We organize our analysis according to the predominant state fiscal year definition and begin our estimation sample in the (state) fiscal year of 1983. This fiscal year is the first fiscal year that states knew the Reagan policies: Reagan assumed office in 1981 and the first new federal fiscal year in his presidency begins in September 1981. Fiscal years begin in July in most states, whereas the federal fiscal year begins in September. States could react to the 1981 federal budget during their budget deliberations for FY 1983 that take place in the first half of 1982. In our analysis, we relate the expenses in a given fiscal year to the political majorities in the previous fiscal year because of the implementation lag. Some of our results are depend on excluding the pre-Reagan years, and we analyze this time-dependence explicitly below.

We drop states that have large sovereign wealth funds financed through severance taxes. States with sovereign wealth funds behave closer to the permanent income hypothesis, contrary to the political dimension of the flypaper “anomaly” (Hines and Thaler, 1995) that we are interested in. In the literature (e.g., Conley and Dupor, 2013), it is common to remove the four smallest U.S. states, which include three of the most oil dependent states, or to control for oil prices. Instead, we focus on states that have sovereign wealth funds with explicit requirements on revenues and expenditures. For example, the Alaska Constitution mandates that at least 25% of oil revenue is deposited in its wealth fund. Such fiscal rules and the potential to use these funds to smooth expenditures or taxes may create problems for our model. We thus drop the states starting in the the year that they instituted their wealth fund: Wyoming (since 1975), Alaska (1976), and North Dakota (2009).⁷

When using our parsimonious baseline specification, we use MOV cutoffs up to 5pp, with 4pp as our baseline. A 4pp MOV corresponds to a 52.0% Democratic vote share with the remaining 48.0% going to the Republican candidate, if no votes were cast for independent candidates. Only half as many voters (plus one) have to switch to reverse the election outcome. Figure B.1 in the Appendix shows the corresponding number of marginally elected governors by year for our baseline cutoff of a 4pp. MOV. All years have marginally elected governors from both parties, with a minimum of three marginally elected governors in 2009 and a maximum of 13 in 2003 and 2004. As discussed above, when using the specification with MOV interactions, we choose the cutoffs via cross-validation and find a cutoff of 10pp when using fixed effects and of 6.5pp without fixed effects,

2.5 Descriptive statistics

Before we begin our analyze, we discuss the descriptive statistics provided in Table 1. Besides giving context to our regressions, it allows us to consider our assumptions that states with narrowly elected governors are similar. Intuitively, we are assuming that, conditional on close elections, the unobserved state characteristics, as well as the (observed) IG revenue are identically distributed on both sides of the cutoff. If these or other observables are very differently distributed for closely

⁷They are the only states to receive 20% of their revenue from severance taxes. Our main results are robust to including these states.

elected Republicans than for closely elected Democrats, this would cast doubt on the assumption that unobservables are about the same.

Specifically, Table 1 provides information on all states during the Reagan era, the sample of states with elections decided within a ± 4 pp margin, and the close election sample split by governor’s party. In addition, it provides t -statistics that evaluate the assumption of equal sample means for closely elected governors – without any fixed effects, with state and year fixed effects, and with state and census region \times year fixed effects. Note that our preferred fixed effects, which are party \times year, state fixed effects, eliminate any mean differences between party. The table is organized in two parts. The top part covers variables entering our regression analysis, while the bottom part provides additional state characteristics.

Our main takeaway from the table is that, the differences in the growth rates of expenditures, various revenue components, and IG growth and its components are small and statistically insignificant. Expenditure growth averages 2.6% (real, per capita) in our sample, and is only marginally higher under Democrats than Republicans: 2.7% vs. 2.5%. This difference is not statistically significant, with t -statistics of -0.3 without fixed effects and -1.4 or 1.6 with fixed effects. The differences between all other growth rates tend to have small absolute t -statistics. In particular, IG growth excluding welfare averaged 2.9% in our close election sample, and 2.8% under Democrats vs. 3.0% under Republicans. Depending on fixed effects, the difference has t -statistics of 0.1, -0.6, and 0.8. For IG increases, again excluding welfare, the sample means are identical at 5.3%, and the t -statistics range from -0.4 to 1.0.

Table 1: Sample means of main variables for various samples.

	Main sample	Main sample with close elections			Dem=Rep t -stat		
					Fixed effects?		
Expenditure growth	2.6	2.6	2.7	2.5	-0.3	-1.4	1.6
Net general rev gr	2.2	2.8	3.1	2.6	-1.1	-0.9	0.3
Income sales tax rev gr	2.1	2.7	2.9	2.5	-0.6	-0.5	1.1
Tax rev growth	2.0	2.6	2.8	2.5	-0.5	-0.5	0.9
IG growth	3.3	3.3	3.1	3.4	0.3	-0.6	-0.2
IG increases	5.0	4.6	4.6	4.6	0.0	-0.5	-0.4
IG decreases	-1.6	-1.3	-1.5	-1.2	1.0	-0.4	0.2
IG growth excl welfare	2.2	2.9	2.8	3.0	0.1	-0.6	0.8
IG incr excl welfare	4.9	5.3	5.3	5.3	-0.0	-0.4	1.0
IG decr excl welfare	-2.8	-2.4	-2.5	-2.3	0.2	-0.5	0.6
Prior exp growth	2.9	2.0	2.5	1.7	-0.9	-0.4	2.5
Prior IG growth	3.3	3.5	3.9	3.3	-0.3	-0.0	0.5
Prior IG growth excl welfare	2.7	2.0	3.5	0.8	-0.8	-0.3	1.8
Republican incumbent share:	48.0	47.7	50.4	45.6	-0.4	-2.5	0.7
Dem share in legislature	55.9	56.9	54.3	58.5	0.9	4.4	0.4
Observations	1508.0	269.0	113.0	156.0	1.2	.	.

Shares and ratios in percent. All growth rates are real per capita. t -statistics based on standard errors clustered by state and year after removing state and year fixed effects. The 4pp. MOV includes three observations that drop out with these fixed effects.

For other state characteristics, the sample also appears largely balanced. Without taking out fixed effects, growth rates in the year prior to the term of the closely elected governor have t -statistics between -0.3 and -0.9 . There are slightly more Republican incumbents when Democratic governors are in power, but the t -statistic is only -0.4 . Republican governors tend to be in power when the share of Democratic legislatures is slightly higher (58.5% compared to 54.3% under Democrats), and are slightly overrepresented in our sample (156 vs 113 state-years), but the t -statistics are small with 0.9 and 1.2. With fixed effects, some t -statistics become significant, but without a consistent pattern for the different sets of fixed effects. Nevertheless, we double-check our results by augmenting our parsimonious regression with interaction terms for the state characteristics in question.⁸

3 Partisan policies post-Reagan

We now turn to the results of estimating equation (2.2), beginning with the expenditure side of the budget, before then turning to revenues and debt payments.

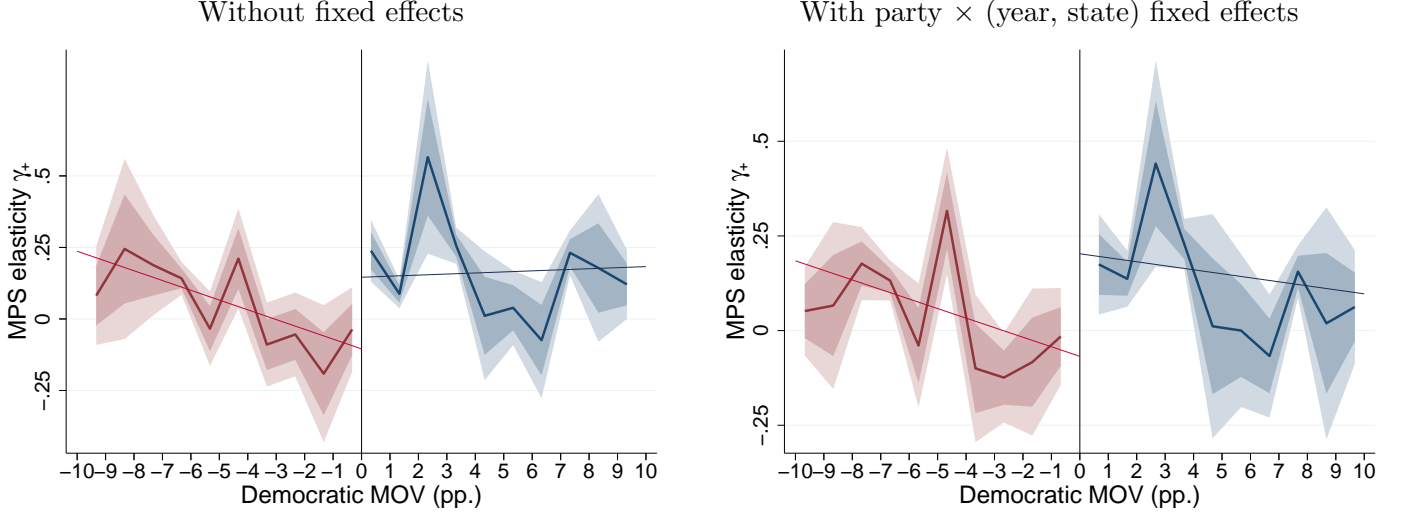
3.1 Expenditure side

Graphical analysis. We begin our analysis by showing how the propensity to spend out of transfer increases varies by margin of victory – see Figure 3. The left panel in the figure estimates reports coefficient estimates for estimating γ_+ in equation (2.2) separately for each one percentage point bin, but without fixed effects. The right panel also removes fixed effects. We plot the coefficients along with ± 1 and ± 1.65 standard errors. Both panels clearly show that the MPS jumps when the MOV turns positive. Focusing on panel (a) first, Republicans have a marginal propensity to spend slightly below zero near the cutoff, whereas Democrats have a marginal propensity to spend near 0.25. Fitting linear regressions to the binned elasticity estimates yields a Republican intercept of -0.11 , and a Democratic intercept of 0.15 . The 0.26 difference in the MPS elasticity estimates has a causal interpretation, given our identifying assumptions. It implies that if a Democratic governor receives 1pp higher IG growth, her expenditure growth is 0.26 pp. higher than if she were a Republican governor. With fixed effects, in panel (b), the picture changes only slightly: The MPS of marginally elected Republicans is -0.06 , whereas that of Democrats is 0.20 . The difference is, again, 0.26 .⁹

Figure 4 shows the results for transfer cuts. Here, we find that the MPS tends to be somewhat higher under Republican governors than under Democrats. Taken at face value, this suggests that Republican governors cut their expenditure more than Democrats would for the same cut of IG

⁸That is, we estimate versions of regression 2.3 with other state characteristics replacing the MOV one at a time. The only noteworthy results are for the Democratic share in the legislature, which seems to be a channel through which the partisan differences operate.

⁹Note that the $+2$ pp to $+3$ pp. bin contains an influential observations: Ann Richards, a Democratic governor of Texas in the early 1990s. We have removed, however, the former Democratic governor of West Virginia, Bob Wise. Without both of them, the elasticity would also be around 0.3 also in the $+3$ pp bin. Adding Bob Wise, the elasticity is $+0.94$ (no FE) and $+0.86$ (with FE).



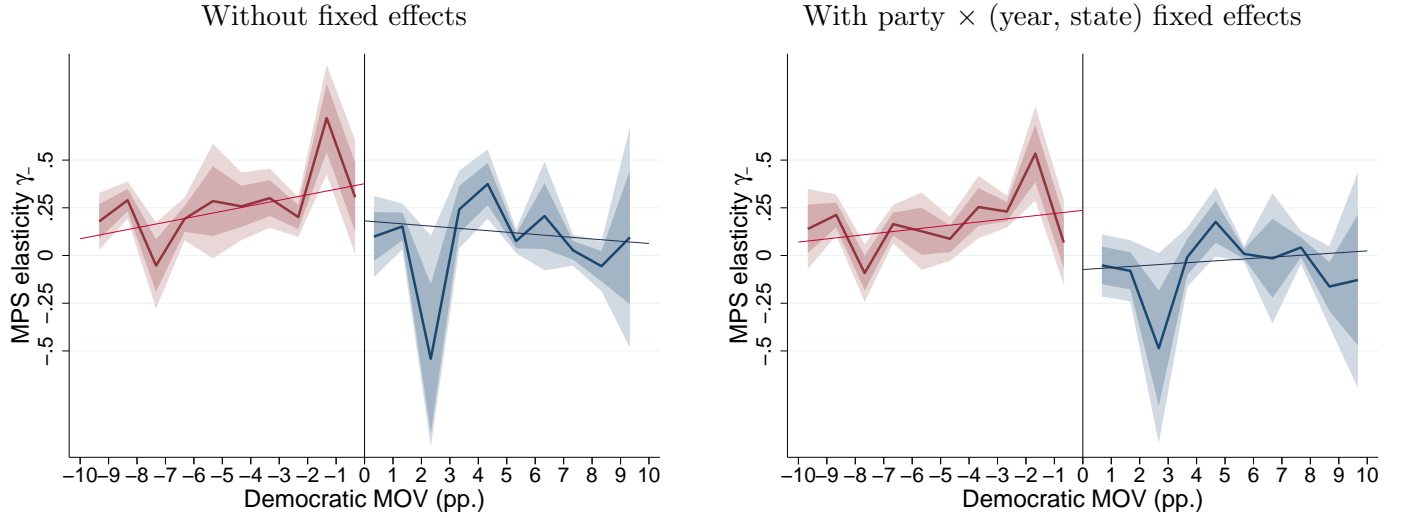
The plots show the estimated marginal propensity to spend (MPS) elasticity along with $\pm 1(\pm 1.65)\text{s.e.}$ clustered by year and state for each 1pp MOV bin. The standard errors are computed pointwise by estimating (2.2) with $\text{party} \times \text{year}$ and $\text{party} \times \text{state}$ fixed effects (or without any fixed effects) and the slope coefficients and intercepts are interacted with dummies for each MOV bin. We drop the term of Bob Wise (D, WV, 2001-2005). Overlaid are linear regressions weighted by the inverse squared s.e.

Figure 3: Illustrating our regression discontinuity in slopes: Republican Governors pass less of IG increases on to spending.

transfers. The differences are, however, less robust to the inclusion of fixed effect than the results for expenditure growth. One reason might be because we have 50% more observations with transfer increases. However, we focus our analysis on the results for transfer increases.

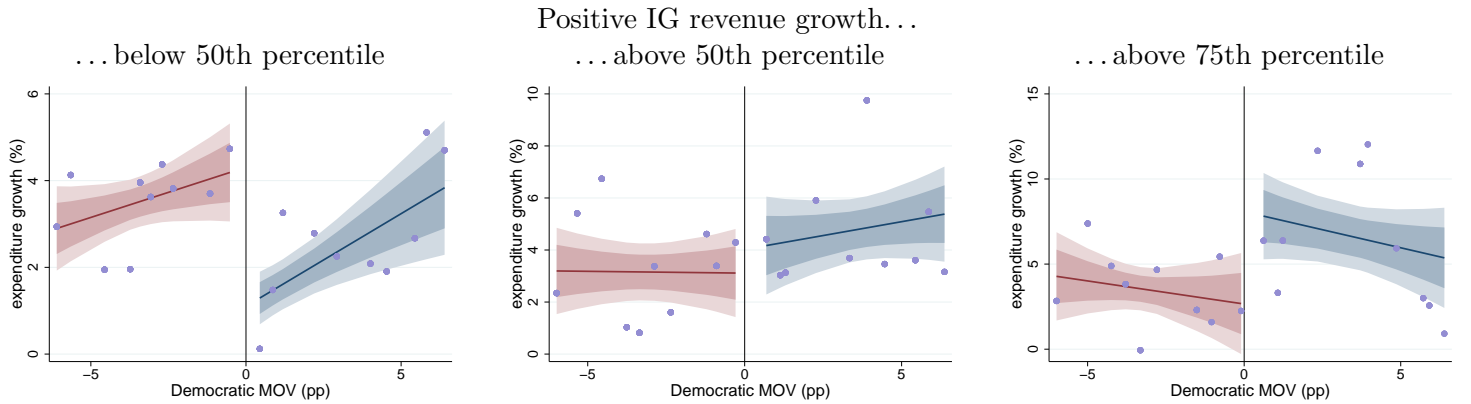
While we focus on the interpretation of our results for partisan differences in the MPS, one can also visualize them differently using plots more familiar from the RDD literature. Rather than computing slopes and looking for a difference in slopes around the cutoffs, we can discretize the support for IG growth and run an RDD separately for subsamples that condition on high or low IG growth. Figure 5 shows such more traditional plots. We estimated the plots within a MOV of $\pm 6.5\text{pp.}$, based on cross-validation of equation (2.3) without fixed effects.¹⁰ Comparing the left panel – which conditions on below median, but positive IG growth – with the middle panel – which conditions on above median IG growth – shows that Democratic spending at the cutoff rises from an estimated 1.5% to 4%, whereas Republican spending at the dropoff falls from 4% to slightly less than 4% as we condition on above median IG growth. Conditional on IG growth in the top 75th percentile, shown in the right panel, shows Democratic around 8% at the cutoff, compared to Republican IG growth below 4%. The fact that Republican spending is, if anything, decreasing in IG growth, while Democratic spending is increasing underlies our estimate of MPS differences.

¹⁰The results with fixed effects are similar: See Figure C.12 in the Appendix.



The plots show the estimated marginal propensity to spend (MPS) elasticity along with $\pm 1(\pm 1.65)$ s.e. clustered by year and state for each 1pp MOV bin. The standard errors are computed pointwise by estimating (2.2) with party×year and party×state fixed effects (or without any fixed effects) and all slope coefficients and intercepts interacted with dummies for each MOV bin. Overlaid are linear regressions weighted by the inverse squared s.e.

Figure 4: Illustrating our regression discontinuity in slopes: Republican Governors pass more of IG decreases on to spending cuts.



± 1 (± 1.65) standard errors, based on coefficient standard errors clustered by year and state. No fixed effects. All observations receive equal weights within the shown MOV range.

Figure 5: Expenditure growth binned RDD plot by IG transfer growth, : Democratic governors increase expenditure more as IG transfers rise, while Republican spending is largely invariant.

Regression estimates. Next, we consider our regression estimates of partisan differences in MPS. Table 2 shows the main regression results. Columns (1) through (4) use the specification with linear MOV controls from (2.3) for 10pp. MOV, which we determined through cross-validation. The columns differ in the underlying fixed effects, which are party specific state and year fixed effects, state and year fixed effects, state and region by year fixed effects, or none. Column (5) uses all elections with cubic MOV controls and party specific fixed effects. The results are close to those from the graphical analysis: For IG increases, the Democratic baseline MPS estimate is an elasticity between 0.169 and 0.20. Under Republican governors, the MPS elasticity is estimated to be 0.196 to 0.287 lower. Given the fixed effects, the differences are not driven by strategic funding of governors of a certain party, common macro policies, or omitted region-specific economic forces.

The estimated partisan differences are economically and statistically significant. The t -statistics are all above 2. The economic significance is easiest seen by converting the MPS elasticity to dollar terms. To do so, multiply the elasticity difference by the average ratio of expenditure to non-welfare IG. For the elasticity difference of 0.22 corresponds to an MPS that is 1.96 dollars (0.22×8.89) lower for each dollar received. While only the partisan difference has a causal interpretation, the estimates are consistent with Republicans responding having a MPS near zero, since the estimated elasticity difference is in the same order as the Democratic baseline MPS elasticity. In the case of transfer cuts, we also estimate large, statistically significant partisan differences. Republican governors have a MPS elasticity that is between 0.183 and 0.343 higher than that of Democrats: Republicans cut expenditures relative more than Democrats do, following cuts in IG transfers.

The empirical model is consistent with the existing literature on the flypaper effect. Assuming equal shares of Democratic and Republican governors, the average MPS elasticity is $0.181 - \frac{1}{2}0.266 = 0.048$. This yields an average dollar MPS of 0.43 (0.048×8.9) – well within the range of estimates surveyed by Hines and Thaler (1995), which ranges from 0.25 to 1.04. The model also fits reasonably well: With fixed effects, the within-model R^2 varies between 0.08 and 0.18, with 0.10 for our baseline specification in column (1).

Our results are driven by closely elected governors. Partisan differences are smaller among governors elected with a wide margin. To show this, columns (6) to (8) show the results MOV cutoffs below 5pp to 3pp, compared to results based on a MOV above 5pp in column (9). Here, the estimates use the parsimonious specification (2.2), which omits MOV terms. With close elections, the differences in MPS elasticity between -0.233 and -0.271 are similar to those estimated using MOV terms and a higher cutoff. Excluding close elections, in column (9), we do not find evidence once we exclude close elections. Besides selection, a possible reason for the attenuation of partisan differences away from the cutoff could be that politicians try to score points with their ideological base when states are competitive. Otherwise they may increase the rents of holding office by spending more, independent of their partisan affiliation.

One possible issue with transforming our MPS elasticities to a dollar-per-dollar MPS is that the ratio of expenditures to IG varies widely across states. Among the 41 states in our baseline sample in column (4) of Table 2, the 25th percentile is 7.5 while the 75th percentile is 10.0. To provide

Table 2: Partisan determinants of total expenditure growth by state governments: 1983 to 2014.

MOV cutoff	with MOV terms					without MOV terms			
	(1) ≤ 10 pp.	(2) ≤ 10 pp.	(3) ≤ 10 pp.	(4) ≤ 10 pp.	(5) ≤ 100 pp.	(6) ≤ 5 pp.	(7) ≤ 4 pp.	(8) ≤ 3 pp.	(9) > 5 pp.
IG incr.	0.181*** (4.16)	0.169** (2.66)	0.189*** (2.84)	0.200** (2.43)	0.174** (2.37)	0.195*** (5.90)	0.194*** (5.37)	0.109 (1.29)	0.096*** (4.25)
IG decr.	-0.018 (-0.26)	-0.046 (-0.81)	-0.081 (-1.25)	0.168** (2.53)	0.078 (1.07)	-0.020 (-0.27)	-0.034 (-0.56)	-0.021 (-0.21)	0.014 (0.71)
Rep x IG incr.	-0.266*** (-3.49)	-0.236** (-2.45)	-0.220* (-2.03)	-0.287** (-2.74)	-0.196** (-2.27)	-0.233*** (-3.40)	-0.271*** (-3.88)	-0.243** (-2.38)	0.001 (0.03)
Rep x IG decr.	0.337*** (3.33)	0.343*** (5.53)	0.313*** (3.58)	0.230*** (2.82)	0.183* (1.71)	0.264** (2.69)	0.266*** (3.58)	0.241 (1.39)	0.082*** (2.84)
Republican Gov.	0.000 (0.00)	0.016* (1.91)	0.018** (2.35)	0.024*** (4.20)					
Expenditure/IG-rev.	8.90	8.90	8.89	8.90	8.83	9.01	9.04	8.92	8.80
R-squared	0.54	0.46	0.56	0.18	0.42	0.65	0.69	0.71	0.43
R-sq, within	0.10	0.11	0.11	0.18	0.08	0.13	0.12	0.06	0.05
Observations	634	636	634	636	1497	313	259	169	1187
States	47	47	47	47	48	43	41	32	48
Years	32	32	32	32	32	32	32	32	32
State FE	By party	Yes	Yes	No	By party	By party	By party	By party	By party
Year FE	By party	Yes	By region	No	By party	By party	By party	By party	By party
MOV controls	Linear	Linear	Linear	Linear	Cubic	No	No	No	No

Estimated following equation (2.3), except when marked as without MOV controls. Without MOV controls, regressions are based on (2.2). t -statistics based on standard errors clustered by state and year. p -values based on t -distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$. To compute a dollar-to-dollar pass-through, multiply the elasticity by the Expenditure/IG revenue ratio.

direct dollar estimates that still take this heterogeneity into account, we scale expenditure growth by a five-year lag of the same ratio within the state prior to estimation. This gives us a weighted dollar MPS estimate, that may be a more reliable average effect for our sample. This then allows us to compare the MPS out of IG transfers exclusive of welfare with overall IG transfers.

Using scaled expenditure growth, we find that dollar pass-through differences are, indeed larger when we exclude welfare IG from our estimates. Table 3 reports the estimated dollar-for-dollar MPS. Columns (1) through (5) are the expenditure-weighted counterparts to the same columns in Table 2, which use a wider cutoff and MOV controls. Column (6) report results for IG excluding welfare. While the first six columns are for IG excluding welfare, columns (7) and (9) report estimates for overall IG for comparison. For non-welfare IG, the dollar partisan differences are large and robust across specifications: between 1.32 and 2.14 following IG increases, when we exclude welfare. Compared to the elasticity estimates, however, the effects are less precisely estimated and sometimes have marginally insignificant. While we focus our attention on the partisan difference, it is worth noting that the level estimates are reasonable in light of the literature. Consider column (1). First, note that the effect sizes are slightly smaller than the converted elasticity based on the same column in Table 2: The partisan difference here is -1.92, whereas the converted elasticity difference is -2.37. Second, assuming equal shares of Republican and Democratic governors, yields a an average MPS of 0.39 ($1.351 - \frac{1}{2}1.919$). This estimate is slightly below that based on elasticities and also lines up with the literature (Hines and Thaler, 1995).

Table 3: Partisan determinants of total expenditure growth by state governments for non-welfare IG and overall IG: 1983 to 2014. Expenditure growth scaled to yield dollar interpretation.

	IG excluding welfare					Overall IG			
	(1) $\leq 10pp.$	(2) $\leq 10pp.$	(3) $\leq 10pp.$	(4) $\leq 10pp.$	(5) $\leq 100pp.$	(6) $\leq 4pp.$	(7) $\leq 10pp.$	(8) $\leq 100pp.$	(9) $\leq 4pp.$
IG incr.	1.351*** (2.84)	1.260* (2.00)	1.411** (2.17)	1.469* (1.82)	1.354* (1.96)	1.678*** (5.19)	1.068** (2.47)	1.095*** (3.03)	1.285*** (6.06)
IG decr.	0.271 (0.36)	-0.322 (-0.51)	-0.641 (-0.92)	1.595** (2.42)	0.694 (0.91)	-0.047 (-0.09)	0.220 (0.72)	0.523** (2.35)	0.262 (0.41)
Rep x IG incr.	-1.919** (-2.47)	-1.661* (-1.73)	-1.510 (-1.47)	-1.905* (-1.84)	-1.318 (-1.59)	-2.142*** (-3.49)	-0.697 (-1.18)	-0.850* (-1.77)	-1.446*** (-2.90)
Rep x IG decr.	2.996** (2.38)	3.541*** (3.95)	3.020*** (3.25)	2.202** (2.08)	2.228* (1.97)	2.186*** (3.45)	2.480*** (3.09)	1.845** (2.64)	2.310*** (2.87)
Republican Gov.	0.000 (0.00)	0.167** (2.19)	0.173** (2.37)	0.213*** (3.61)			0.000 (0.00)		
R-squared	0.53	0.46	0.56	0.19	0.42	0.67	0.55	0.47	0.71
R-sq, within	0.10	0.11	0.11	0.19	0.09	0.12	0.17	0.17	0.19
Observations	634	636	634	636	1497	259	634	1497	259
States	47	47	47	47	48	41	47	48	41
Years	32	32	32	32	32	32	32	32	32
State FE	By party	Yes	Yes	No	By party	By party	By party	By party	By party
Year FE	By party	Yes	By region	No	By party	By party	By party	By party	By party
MOV controls	Linear	Linear	Linear	Linear	Cubic	No	Linear	Cubic	No

Estimated following equation (2.3), except when marked as without MOV controls. Without MOV controls, regressions are based on (2.2). t -statistics based on standard errors clustered by state and year. p -values based on t -distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$. To compute a dollar-to-dollar pass-through, multiply the elasticity by the Expenditure/IG revenue ratio.

The pattern for overall IG and non-welfare IG is consistent with our argument about identification. For the same specification and sample, we find that the partisan difference drops with overall IG: In our baseline specification (columns (1) vs. (7)) the difference drop from -1.919 to -0.697. In the full sample with a third order MOV polynomial, the partisan difference drops from -1.318 to -0.850. Without MOV controls, in the 4pp MOV sample, the partisan difference also drops. This is consistent with our identifying argument that matching grants, which dominate welfare IG, bias partisan difference down. It thus gives us confidence, that our estimate of partisan differences is, if any matching remains, biased down and would thus conservative.

Polarization and time-variation. Have there always been partisan differences in governors' MPS? To answer this question, we now expand our sample period to cover the period prior to Reagan, beginning in 1968. Previewing our results, we find that partisan differences have widened over time in line with measures of the polarization of federal policymakers.

A large literature (e.g., Azzimonti (2018) and McCarty et al. (2016)) has measured the increase in political polarization in the U.S. We connect this increase in polarization at the federal level to increased partisan differences in fiscal policies. Specifically, we use the empirical specification with double and triple interaction from (2.3) and replace the MOV with one of three indicators of polarization. Alternatively, we also allow for up to quadruple interactions with both MOV and a polarization indicator. Our three measures of partisanship are: The mean ideological difference in

the House and Senate, taken from [McCarty et al. \(2016\)](#), and the news-based partisan conflict index from [Azzimonti \(2018\)](#), smoothed by averaging over two years. We standardize all three measures, so that the coefficient correspond to the effect of a one standard deviation increase in polarization. We estimate the results with weighted expenditure growth to obtain dollar MPS estimates.¹¹

Table 4: Dollar pass-through estimates and historical partisan conflict: 4pp. MOV, 1968 to 2014.

	Polarization control								
	None	News-based historical partisan conflict					House	Senate	
MOV cutoff	(1) 100pp	(2) 100pp	(3) 100pp	(4) 100pp	(5) 10pp	(6) 4pp	(7) 4pp	(8) 4pp	
Pos IG growth	0.965*** (5.44)	1.006*** (5.82)	1.268*** (5.38)	1.449*** (3.27)	1.344*** (2.92)	1.319*** (2.96)	1.228*** (3.03)	1.351*** (3.32)	
Neg IG growth	0.224* (1.83)	0.216* (1.68)	0.195 (1.24)	0.071 (0.14)	-0.030 (-0.06)	0.006 (0.01)	-0.108 (-0.15)	-0.056 (-0.08)	
Rep gov x Pos IG growth	-0.269 (-1.67)	-0.283 (-1.65)	-0.527 (-1.57)	-1.208* (-1.84)	-1.305* (-1.93)	-1.342** (-2.19)	-1.329** (-2.19)	-1.529** (-2.52)	
Rep gov x Neg IG growth	0.801*** (4.67)	0.748*** (3.88)	0.810*** (3.76)	1.486** (2.53)	1.460** (2.02)	0.737 (0.94)	1.119 (1.41)	1.101 (1.40)	
Control x Pos IG growth		0.419* (1.86)	0.681** (2.24)	1.325*** (3.30)	1.295*** (4.12)	1.217*** (5.17)	0.440 (1.23)	0.768*** (3.05)	
Control x Neg IG growth		0.000 (0.00)	-0.093 (-0.43)	-0.097 (-0.20)	-0.182 (-0.47)	-0.478 (-0.95)	-0.383 (-0.65)	-0.395 (-0.71)	
Rep gov x Control x Pos IG growth		-0.703** (-2.24)	-1.104** (-2.43)	-2.038*** (-3.14)	-1.996*** (-3.30)	-1.998*** (-5.54)	-1.017* (-1.95)	-1.346*** (-3.47)	
Rep gov x Control x Neg IG growth		0.295* (1.85)	0.580* (1.95)	1.090 (1.37)	1.043 (1.59)	1.450** (2.12)	1.302* (1.76)	1.192 (1.65)	
R-squared	0.43	0.43	0.43	0.44	0.52	0.65	0.64	0.64	
R-sq, within	0.06	0.06	0.07	0.08	0.10	0.11	0.08	0.08	
Observations	2226	2226	2226	2226	961	390	390	390	
States	50	50	50	50	50	47	47	47	
Years	47	47	47	47	47	47	47	47	
MOV controls	No	No	Linear	Cubic	Linear	No	No	No	

Estimated following equation 2.2, equation 2.3 with the polarization indicator instead of MOV, and with extra interactions of the polarization indicator and MOV. Party by year and party by state fixed effects. The LHS is scaled with the lagged non-welfare IG to expenditure ratio in each state to yield dollar estimates. t -statistics based on standard errors clustered by state and year. p -values based on t -distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$.

We find that partisan differences have risen along with increased polarization. Table 4 shows these estimates for an extended sampler period, from 1968 to 2014. Here, we always use party×year and party×state fixed effects, for different cutoffs and with and without MOV controls. We use weighted IG growth so that the coefficients are in terms of a level MPS. Consider, column (1) first. It shows the full-sample regression without any correction for close elections. Unsurprisingly, the partisan difference is only -0.269, about one eighth of our Reagan-era estimate that controls for close elections. If we add the smoothed and average measure of partisanship based on [Azzimonti \(2018\)](#), however, we find economically and statistically significant interaction term (column (2)): A one standard deviation increase in polarization is associated with an increased partisan difference of \$0.703 per dollar received. Since polarization has been 1.42 standard deviations higher in the

¹¹The results are robust to estimating elasticities.

2000s than in the five years preceding the Reagan era, this corresponds to an increase in partisan differences between MPS of about \$1.0 dollars per dollar received (0.702×1.42).¹²

Controlling for close elections points to a larger effect of polarization: In column (3), where we control for linear effects of the MOV and its interactions in the full sample, the partisan difference rises in magnitude from -0.702 to -1.104. Controlling for cubic MOV terms brings the effect of a one standard deviation increase in polarization on partisan MPS difference to -2.038 (column (4)). This effect is very similar in the 10pp MOV sample with only linear MOV terms and interactions, and in the parsimonious model without any MOV terms but with a 4pp MOV cutoff (columns (5) and (6)). Using measures of polarization based on U.S. House or U.S. Senate roll-call votes also implies that partisan differences have risen significantly with polarization (columns (7) and (8)).

Going forward, we use estimates from Table 4 to inform counterfactuals in our macroeconomic model. It may be inappropriate, however, to use the estimates based on the difference between marginally elected governors to inform counterfactuals: Less than one fifth of governors is typically elected marginally. Extrapolating from the partisan MPS difference of closely elected governors may thus overstate the MPS differences between the average Democratic and the average Republican governor. To address this, we present estimates with and without linear controls for MOV interactions. Intuitively, without the additional interaction, we are attributing more of the unobserved heterogeneity to the governors (column (2)), while when we remove the MOV terms (column (3) or (4)), we may have purged the governor estimates of effects due to, for example, the preferences of the electorate. Interestingly, when we follow Angrist and Rokkanen (2015) to get away from the cutoff, we find effects of polarization that right in the middle of those with and without linear MOV controls. To do so, we use additional controls for the electorate’s preference and state characteristics. We thus use these bounds in our simulation. There, we focus on the effects of a surprise increase in federal transfers change, and how that changes if one were to reduce partisan differences in MPS to levels implied by the lower pre-Reagan era polarization.

Other revenue sources. To validate our estimates, we have also analyzed other revenue sources. Specifically, we have looked at the MPS out of severance tax revenue increases. Severance tax revenue is largely driven by changing oil prices and may therefore be considered another source of exogenous variation. To do so, we focus on states with severance tax revenue accounting for at least 1% of overall revenue five years ago and use data on all elections. These estimates are in Table 5.¹³

We also find that Republican governors spend less of the increase in severance tax revenue compared to Democratic governors. When severance tax revenue increases by 1pp of overall revenue, expenditure growth is -0.288pp lower under a Republican governor than under a Democratic

¹²At the same time, the baseline (Democratic) MPS, which is identified only under stronger assumptions, increased by only 0.4 times the increase in partisan differences. Since the partisan difference is almost twice as high, this result implies that the MPS varies only little with polarization, when averaged across Democrats and Republicans and they govern similar numbers of states.

¹³In the appendix, we also analyze expenditure growth stimulus in the aftermath of the recession (2009-2012) relative to the preceding 4-year period. The regression also shows the same qualitative partisan difference (Table C.11).

governor, according to our estimate in column (1) of Table 5. This estimate is robust to state fixed effects and state by party fixed effects, but becomes weaker and insignificant once we control for year fixed effects. Intuitively, oil prices are a common yearly factor, which generates much of the identifying variation here. If we instrument for severance tax growth with oil prices, we find larger effect sizes.

Extensions In several extensions, we investigate the role of institutional details, timing, the role of politics, and the interaction with economic factors. Accounting for institutional detail such as restricting the sample to states with line-item-veto strengthens our results (Table C.6). Our results also carry through when we restrict our sample to states with line-item veto with a party change in the governor’s mansion, and when dropping election years (Table C.8). Our results hold for multi-year expenditure and IG increases (Table C.10). When taking the party control of the legislature into account, it emerges that the role of Republican governors is partly to thwart the Democratic legislatures (Table C.9). Interactions with economic variables, such as the revenue share of IG or past population growth, are largely insignificant and do not affect our baseline results (Table C.5).

We also analyze the expenditure by end use, for those categories which we could match across the two vintages of the government budget data, comprising about two thirds of total expenditure. The results suggest that the different propensities to spend apply to a large range of end uses, with the exception of infrastructure spending. Specifically, we find marginal propensities to spend that are significantly lower for Republicans than Democrats in Public Welfare (account for 20.4% of expenditures), Natural Resource Management, Park and Recreation, and Libraries (2.4%), and Housing and Community Development (0.7%). For total education spending (31.2%), the difference is negative, but the t -stat is just -1.02. For Highways (8.0%), the difference is insignificant. For Sanitation (0.4%), Republican governors spend significantly more out of IG transfers. Republicans also spend significantly less for the remainder, which comprises 34.0% of expenditures. See Table C.12.

3.2 Revenue and debt

Since Republican governors have a lower MPS out of federal transfers, some other components of their state budgets need to adjust. While the Census cautions that the budget identity does not hold exactly in our data set, we provide evidence of relatively lower taxes under Republican governors than under Democratic governors during periods of IG inflows. For debt, which is not well-measured in our data, we also have results that suggest a reduction either in debt levels or interest rates. However, the estimates are noisier than our results for expenditures. This may be because, unlike expenditures, neither tax revenue nor our preferred measure of debt (interest payments on debt) are direct choice variables for the government. We therefore also consider data on changes in statutory tax rates, which supports the analysis in our baseline dataset.

We begin by analyzing tax revenue growth. Overall, we find evidence of relatively lower taxes under Republican governors following IG increases. Table 6 shows the detailed results for income

Table 5: Partisan difference in the response to severance tax revenue changes: states with at least 1% severance tax revenue, 1983 to 2014.

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	IV (1)	IV (2)
Δ severance tax rev (t-1)	0.630*** (4.30)	0.633*** (4.44)	0.651*** (4.39)	0.618*** (3.60)	1.699** (2.48)	1.735** (2.30)
Rep x Δ sever. tax rev (t-1)	-0.288*** (-2.86)	-0.252*** (-3.24)	-0.277*** (-4.33)	-0.188 (-1.12)	-1.927*** (-3.06)	-1.953*** (-2.93)
Republican Gov.	-0.004 (-1.06)	-0.006 (-0.98)	0.000 (.)	-0.003 (-0.73)	-0.005 (-0.95)	0.000 (.)
R-squared	0.05	0.09	0.11	0.24	-0.06	-0.05
R-sq. within	0.05	0.06	0.06	0.06	-0.10	-0.10
Observations	369	367	363	369	367	363
States	21	19	19	21	19	19
Years	32	32	32	32	32	32
Fixed effects	No	State	Party x State	Year	State	Party x State

Sample of all states with at least 1% of revenue generated by severances taxes five year ago. Standard errors clustered by state and year.

and sales tax revenue growth in columns (1) through (4). Here, we also estimate dollar coefficients directly, by scaling the LHS variable with the 5-year lag of the tax revenue divided by non-Welfare IG revenue. Our baseline estimate, shown in column (2), implies that for each dollar increase in intergovernmental transfers, the tax revenue falls by 72 cents under a Republican governor, compared to a Democratic governor. With party-specific fixed effects, the point estimate is fairly robust across specifications, ranging between -0.716 and -0.880, depending on the specification. But the results are statistically significant only in the full sample with cubic MOV controls and in the 4pp MOV sample without MOV.

For plausibly magnitudes of fiscal multipliers, these results indicate reductions in effective tax rates under Republican governors compared to Democratic governors. While small relative declines in Republican tax revenues could be the result of their relatively lower spending in the presence of fiscal multipliers, this is implausible for reasonable parameter values. For example, according to column(1) in Table 3, Republican governors spend spending \$1.92 less per dollar received, and according to column (2) in Table 6, this is associated with \$0.72 less in revenue. With a unit multiplier and a combined state tax rate of 10% on GDP, only \$0.19 of tax revenue could be explained by such effects. Thus, our results point to lower effective tax rates to explain at least part of the lower Republican tax revenue.

Table 6: Partisan determinants of tax revenue growth and changes in future interest on debt by state governments: 1983 to 2014. Dollar estimates

	Income and sales tax revenue				Future interest payments			
	(1) $\leq 10\text{pp.}$	(3) $\leq 10\text{pp.}$	(5) $\leq 100\text{pp.}$	(4) $\leq 4\text{pp.}$	(5) $\leq 10\text{pp.}$	(6) $\leq 10\text{pp.}$	(7) $\leq 100\text{pp.}$	(8) $\leq 4\text{pp.}$
IG incr.	0.147 (0.39)	0.058 (0.13)	0.427 (1.04)	0.518*** (3.01)	55.987 (1.18)	70.475* (1.84)	-12.799 (-0.41)	99.186** (2.56)
IG decr.	-1.061*** (-2.93)	-1.035* (-1.84)	-1.121** (-2.45)	-0.363 (-0.81)	-10.725 (-0.13)	51.839 (0.75)	64.894 (1.52)	-112.492** (-2.16)
Rep x IG incr.	-0.716 (-1.45)	-0.325 (-0.60)	-0.923* (-1.77)	-0.880*** (-3.07)	-63.503 (-1.02)	-120.526** (-2.30)	-14.332 (-0.27)	-141.322** (-2.10)
Rep x IG decr.	1.645*** (3.24)	1.517** (2.16)	1.603*** (2.92)	0.794 (1.34)	53.893 (0.56)	33.245 (0.39)	-41.378 (-0.62)	169.804** (2.21)
Republican Gov.	0.000 (0.00)	0.053 (0.79)			0.000 (0.00)	11.414** (2.20)		
R-squared	0.56	0.56	0.43	0.70	0.31	0.32	0.18	0.54
R-sq. within	0.03	0.02	0.02	0.04	0.02	0.02	0.01	0.06
Observations	634	634	1497	259	634	634	1497	259
States	47	47	48	41	47	47	48	41
Years	32	32	32	32	32	32	32	32
State FE	By party	Yes	By party	By party	By party	Yes	By party	By party
Year FE	By party	By region	By party	By party	By party	By region	By party	By party
MOV controls	Linear	Linear	Cubic	No	Linear	Linear	Cubic	No

Estimated following equation (2.3), except when marked as without MOV controls. Without MOV controls, regressions are based on (2.2). t -statistics based on standard errors clustered by state and year. p -values based on t -distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$. To compute a dollar-to-dollar pass-through, multiply the elasticity by the Expenditure/IG revenue ratio.

To get directly at a policy instrument chosen by state, we now turn to statutory tax rates. Specifically, we use maximum marginal income tax rates from the NBER TAXSIM database. Table 7 shows the corresponding regression results. In levels, shown in the first four columns, the evidence is suggestive only: The results are only significant for the specifications in columns (2) and (3). The results with MOV controls point towards a reduction, but the results are insignificant in our baseline specification. However, there are only few changes in statutory tax rates. We thus analyze also only tax rate changes. To deal with the sparser data, we use a model with fewer fixed effects to avoid overfitting. The results, shown in columns (5) through (7), suggest that Republican governors have smaller increases (or larger decreases) in statutory tax rates than Democratic governors. In column (5), we include linear MOV controls, but no fixed effects – and thus use the intermediate MOV cutoff of 6.5pp, which we calibrated for the expenditure growth model without fixed effects. In particular, the estimate with MOV terms in column (5) suggests that a 1pp. increase in IG growth is associated with a 0.06pp cut in states’ maximum marginal income tax rate. The effects in the full sample with party by state fixed effects and cubic MOV in column (6) are very similar. In the most parsimonious specification in column (7), we find effects with a t -statistic of only 1.4. The effect still indicate that a 1pp. increase in IG growth is associated with a 0.03pp cut in tax rates.

Last, we turn to possible debt changes, where we find that Republicans but also improve the debt position of their state compared to Democrats. Our preferred measure of debt are states’ interest payments on debt, since all other debt measures in this dataset are at face value only, rather than at market values. Columns (5) through (8) in Table 6 shows results for debt payments

Table 7: Partisan determinants of statutory income tax rates: 1983 to 2014.

	Current state marginal tax rate				Changes in marginal tax rate		
	(1) ≤ 10 pp.	(2) ≤ 10 pp.	(3) ≤ 100 pp.	(4) ≤ 4 pp.	(5) ≤ 6.5 pp.	(6) ≤ 100 pp.	(7) ≤ 4 pp.
IG incr.	-1.470 (-0.96)	0.187 (0.19)	1.003 (1.18)	0.031 (0.05)	3.472** (2.27)	4.274*** (3.44)	1.413 (1.20)
IG decr.	-1.631 (-0.51)	-4.119 (-1.60)	-3.639 (-1.30)	-1.316 (-0.64)	-7.431** (-2.72)	-6.904 (-1.65)	-6.345** (-2.28)
Rep x IG incr.	-0.860 (-0.34)	-4.237* (-1.82)	-3.421* (-1.86)	0.586 (0.36)	-5.779* (-1.71)	-5.202** (-2.04)	-2.517 (-1.41)
Rep x IG decr.	0.514 (0.10)	3.346 (1.02)	4.132 (1.06)	-1.147 (-0.24)	9.009** (2.14)	6.354 (1.14)	5.120 (1.57)
Republican Gov.	0.000 (0.00)	-0.818** (-2.17)			0.439 (0.98)	0.000 (0.00)	0.276 (0.99)
R-squared	0.92	0.93	0.91	0.96	0.06	0.27	0.06
R-sq, within	0.03	0.07	0.03	0.01	0.06	0.05	0.06
Observations	634	634	1497	259	139	414	88
States	47	47	48	41	36	41	31
Years	32	32	32	32	32	32	32
State FE	By party	Yes	By party	By party	No	By party	No
Year FE	By party	By region	By party	By party	No	No	No
MOV controls	Linear	Linear	Cubic	No	Linear	Cubic	No

All regressions include state and year fixed effects. t -statistics based on standard errors clustered by state and year.

in the next fiscal year, in real per capita. Only two specifications yield statistically significant results. Our parsimonious specification in column (8) implies that a one percent increase in IG revenue is associated with a reduction of debt payments by 1.41\$ per capita. The reductions could come from withdrawing outstanding debt, or rolling it over at lower interest rates.

4 Partisan states in a macroeconomic model

To assess the aggregate effects of the partisan policy rules, we build a macroeconomic business cycle model that features two representative states in a monetary union, endowed with the estimated preferences of Democratic governors and Republican governors, respectively. We use the model to evaluate the effects of a fiscal stimulus through IG transfers, as a function of the partisan difference in the MPS.

The economy is a New Keynesian model of states (regions) within a monetary union, similar to Nakamura and Steinsson (2014) and Auclert et al. (2019).¹⁴ Given its New Keynesian nature, gives a role both to demand-side and supply side policies: Firms in the model set prices in monopolistic

¹⁴Our model is similar to the TANK³ model of Auclert et al. (2019), there are two regions with two types of households in each region who consume two different types of goods, but with added fiscal detail to make the model suitable for the question at hand. Given our focus, we abstract from an explicit model of borrowing constraints and tradable vs nontradable sectors. Compared to Nakamura and Steinsson (2014), our model adds constrained households, as well as state governments, intergovernmental transfers, and a role for productive government spending.

competition subject to nominal rigidities, and a subset of households lives hand-to-mouth. These features give rise to an aggregate demand channel for policy. Capital accumulation, endogenous labor supply, and distortionary taxes, however, imply a potentially important role for supply side policies. We discipline the relative strength of these channels by calibrating the model to match federal government consumption multiplier estimated in [Ramey \(2011\)](#). We calibrate our fiscal experiment to the IG portion of the 2009 U.S. stimulus bill.

4.1 Environment

There are two states, inhabited by a unit measure of households and intermediate firms. The home state is of size n , while the foreign state is of size $1 - n$. The states trade with each other, but households and capital are immobile across states. Each state has its own government, and there is a federal fiscal authority as well as a monetary authority. Except for policy-makers preferences and possibly their size, the home (HS) and foreign (F) state are symmetric. We thus focus our discussion on the home state. As needed, we denote variables pertaining to the foreign state using an asterisk. Appendix [D](#) provides a full set of derivations and model equations.

Households The unit measure of households in each state is divided into constrained and unconstrained households. Unconstrained households have access to complete markets and accumulate private capital and government debt. A fraction $1 - \mu$ of households is barred from borrowing and saving and consumes their income every period. Households have identical utility over consumption, leisure, and state government services of the following form:

$$\tilde{u}(C_t, N_t) = \ln C_t - \kappa_N^i \frac{N_t^{1+1/\epsilon_N}}{1 + 1/\epsilon_N},$$

where C is an aggregate consumption good, N is labor supply, and ϵ_N is the Frisch elasticity of labor supply, which is common across households. κ_N^i governs the preference for leisure, and we allow it to differ by type of household ($i \in \{c, u\}$ for constrained and unconstrained).

Households pay proportional federal and state labor income taxes τ_t^f and τ_t^{st} on their labor income and receive lump-sum transfers and profit income. Only unconstrained households can hold nominal bonds B_t or capital K_t . Households can adjust capital services by varying the rate of utilization u_t , which incurs a resource cost. This yields the following budget constraint for unconstrained agents:

$$P_t(C_t^u + I_t^u + \kappa(u_t)K_{t-1}^u) + K_{t-1}^u\delta + B_t^u \leq (1 - \tau_t)W_tN_t^u + r_t^k u_t K_{t-1}^u + B_{t-1}^u R_{t-1}^n + Tr_t + Pr_t$$

Unconstrained agents can also trade a complete set of Arrow-Debreu securities, which are in zero net supply and omitted for simplicity. The budget constraint is similar for constrained households, but with $B_t^i = K_t^i = 0$ and without Arrow-Debreu securities.

Capital accumulation is subject to quadratic adjustment costs in the rate of investment. Capital depreciates at rate δ .

$$K_t \leq (1 - \delta(u_t))K_{t-1} + \left(1 - \frac{\kappa_I}{2} \left(\frac{I_t}{I_{t-1}} - 1\right)^2\right) I_t$$

Households consumption and investment demand is characterized by nested CES preferences over varieties produced at home and abroad. These preferences attach a weight ϕ_H ($1 - \phi_H \equiv \phi_F$) to home (foreign) goods, and an elasticity of substitution η between home and foreign goods and an elasticity of substitution of θ between different varieties within a state. Consequently, demand for bundles of home and foreign goods is given:

$$C_t^S + I_t^S = \phi_S(C_t + I_t) \left(\frac{P_{S,t}}{P_t}\right)^{-\eta}, \quad S \in \{H, F\}.$$

Here, $P_{S,t}$ is the optimal price index for the bundle purchased from state S , $P_{S,t} = (\int p_{S,t}(i)^{1-\theta} di)^{\frac{1}{1-\theta}}$. P_t is the aggregate price index, $P_t = (\phi_H P_H^{1-\eta} + (1 - \phi_H) P_F^{1-\eta})^{\frac{1}{1-\eta}}$. Demand for varieties within each bundle has the same structure, but with elasticity θ over the relative price $\frac{p_{S,t}(i)}{P_{S,t}}$.

Firms. There is also a unit measure of intermediate goods producers in each region, which produce their variety using a Cobb-Douglas aggregate of effective (utilization-adjusted) capital and labor:

$$y_{h,t}(z) = \bar{A}_t (K_t^e)^\alpha N_t(z)^{1-\alpha}.$$

While firms perceive cost shares of capital and labor of α and $1 - \alpha$, respectively, \bar{A}_t depends on public infrastructure that is subject to a congestion externality as in [Barro and Sala-I-Martin \(1992\)](#) and [Drautzburg and Uhlig \(2015\)](#), so that the equilibrium shares of public infrastructure, private capital, and labor are $\zeta, (1 - \zeta)\alpha$ and $(1 - \zeta)(1 - \alpha)$. Firms face iso-elastic demand with elasticity θ and set price in monopolistic competition subject to a Calvo-friction. With probability ξ , the firm cannot reoptimize in a given quarter and its prices rise at the rate of trend inflation $\bar{\Pi}$. Absent these frictions, firms would set a constant markup $\frac{\theta}{\theta-1}$ over marginal cost.

State governments States adjust transfers, government consumption and investment, and labor income tax rates in response to changes in intergovernmental transfers. The home and foreign state governments are symmetric, except in the pass-through coefficient for IG transfers which is generally different in the home region, where it is ψ_{IG} and in the foreign, where it is ψ_{IG}^* .

Guided by the composition of state budgets, we assume that states spend a fraction ϕ_{tr} on transfers $tr_{st,t}$. The remainder is spent on government consumption and investment $G_{st,t}$, of which a fraction $1 - \phi_K$ goes towards public services, which may affect the households' flow utility.

$$tr_{st,t} = \psi_{IG} \phi_{tr} \left(\frac{IG_t}{P_t} - \bar{IG}\right) + \bar{tr}_{st}$$

$$G_{st,t} = \psi_{IG}(1 - \phi_{tr}) \left(\frac{IG_t}{P_t} - \bar{IG} \right) + G_{st,t}^x$$

$$G_{st,t}^x = (1 - \rho_{st,g}) \bar{G}^{st} + \rho_{st,g} G_{st,t-1}^x + \omega_{st,g} \epsilon_{st,t}^x$$

States invest the remainder of $G_{st,t}$ in infrastructure:

$$K_{st,t} = (1 - \delta_G) K_{st,t-1} + \phi G_{st,t}. \quad (4.1)$$

State purchases $G_{st,t}$ are the same CES aggregate of home and foreign bundles as private consumption and investment.

To guarantee stable debt, we assume that states adjust distortionary taxes. As we discuss below, there is reduced form evidence that states smooth tax rates, and gradually adjust labor income tax rates in response to their debt burden and level of net expenditure. Our baseline tax rule therefore takes the following form:

$$\tau_{st,t} = \rho_\tau \tau_{st,t-1} + (1 - \rho_\tau) (\bar{\tau}_{st} + \psi_{st,b} (R_{t-1}^n - 1) B_{t-1}^{st} - (\bar{R}^n - 1) \frac{\bar{b}^{st}}{\bar{\Pi}} P_t) \\ + \psi_{st,E} (P_t G_t^{st} - P_t \bar{G}_t^{st} + P_t (tr_{st,t} - \bar{tr}_{st}) - (IG_t - P_t \bar{IG})) \quad (4.2)$$

Federal government. The federal government levies lump-sum and distortionary taxes to finance federal government consumption $G_{f,t}$ and to provide intergovernmental transfers to states. Real government consumption $G_{f,t}$ and equalized across states in per capita terms. Nominal per capita transfers are equal to IG_t in each region and follow an exogenous AR(1) process with persistence ρ_{IG} . Federal labor income taxes finance $1 - \gamma^f$ of government consumption and IG transfers every period (out of steady state), and the government issues constant lump-sum transfers (or taxes). Out of steady state, the federal government finances the remaining fraction γ^f of expenditures via nominal debt issuance.

Monetary authority. The monetary authority reacts to aggregate inflation and output when setting interest rates. Specifically, it follows a standard Taylor rule, as in [Galí \(2008\)](#):

$$R_t^n = (\bar{\Pi}/\beta)^{\rho_r} \left(\left(\frac{\bar{\Pi}_t}{\bar{\Pi}} \right)^{\psi_{r\pi}} \left(\frac{\bar{Y}_t}{\bar{Y}} \right)^{\psi_{ry}} \right)^{1-\rho_r}, \quad (4.3)$$

where aggregate inflation and output are simply weighted measures of regional consumer price inflation and output ($\bar{\Pi}_t \equiv n\Pi_t + (1 - n)\Pi_t^*$ and $\bar{Y}_t \equiv nY_t + (1 - n)Y_t^*$).

Equilibrium and solution. We solve for a standard symmetric, competitive equilibrium with each type of firm and household within each region behaving optimally, taking as given the stochastic processes for policy and the fiscal and monetary policy rules. To approximate the solution, we

linearize the economy and solve for the equilibrium law of motion and decision rules using Dynare (Adjemian et al., 2011).

4.2 Calibration

Since our goal is to evaluate the effectiveness of fiscal policies, we calibrate our model so that it current estimates of aggregate (defense) spending multipliers, which we take to be 0.8 for surprise spending increases, following Ramey (2011). Otherwise, parameters are similar to the calibrated values in the closely related currency union models of Nakamura and Steinsson (2014) and Auclert et al. (2019), as well as in the estimates of Leeper et al. (2017).

Type distribution, preferences, and technology. To match the defense spending multiply, our model requires strong Keynesian features. We thus calibrate a high degree of nominal rigidities and a large fraction of high MPC agents, similar to Auclert et al. (2019). Specifically, we pick a persistence of nominal prices of $\xi = 0.85$ and choose a fraction of constrained agents of $1 - \mu = 0.4$. Auclert et al. (2019) choose $\xi = 0.8$ and calibrate $\mu = 0.5$ to match the fraction of the population with credit card debt. Our share of 40% constrained agents is higher than the modal share across seven DSGE models in Coenen et al. (2012), but lower than the 47% share for the SIGMA U.S. model. Constrained agents account for about 35% of aggregate consumption in steady state under our baseline assumption that they also receive an equal share of firm profits.¹⁵

Our unitary intertemporal elasticity of substitution ε_c corresponds to the calibrated value in Leeper et al. (2017), Nakamura and Steinsson (2014) and Auclert et al. (2019). We set the Frisch elasticity of labor supply to $\varepsilon_N = 0.5$. The Frisch elasticity is lower and in the range of microeconomic studies. It is important to match the multiplier in the presence of distortionary taxes and absent wage setting frictions.

We calibrate elasticities for across home and foreign goods and for individual varieties as in Nakamura and Steinsson (2014): $\eta = 2$ and $\theta = 7$. We calibrate the home bias in consumption similarly to Nakamura and Steinsson (2014) when the home region is of size $n = 0.1$, and adjust the home bias with the size of the region to also match the home-bias of the larger (remaining) region implied by their calibration. This yields $\phi_H = \frac{2}{3} + \frac{1}{3}n$ and $\phi_F^* = \frac{2}{3} + \frac{1}{3}(1 - n)$.

We set the labor income share to 0.66. Together with $\theta = 7$ this implies a cost share of capital of $\alpha = 0.20$. We set the adjustment costs of investment and utilization to $\kappa_I = 5$ and $\frac{a''(u)}{a'(u)} = 0.20$, close to the estimates in Leeper et al. (2017) of 5.46 and $\frac{0.16}{1-0.16} = 0.19$.

We calibrate an annual depreciation rate of 8% and an annual nominal interest rate of 4%, as well as an annual inflation rate of 2%. The slightly lower discount rate compared to Nakamura and Steinsson (2014) yields a higher and thus more realistic share of investment in GDP, given the cost share of capital.

The share of public capital in production is calibrated by assuming that the provision of public

¹⁵Calibrated with a zero profit share of constrained agents, their consumption share would be about 25%.

infrastructure maximizes output net of public investment in steady state. This yields $\zeta = \frac{\delta_g K_g}{Y}$, which is about 0.02 in the U.S. data.

Policy rules. We calibrate a standard monetary policy rule, with a persistence of $\rho_r = 0.75$, a reaction coefficient on inflation of $\psi_\pi = 1.5$ and a coefficient on output of $\psi_y = \frac{1}{8}$, as in Galí (2008).

The federal and the state and local government adjust labor tax rates to pay for expenditures, as the federal government does in Nakamura and Steinsson (2014). While Nakamura and Steinsson (2014) assume a balanced budget, however, we find that this yields to strong a response of the tax rate in response to a surprise increase in defense spending. For example, Ramey (2011) estimates an average increase of 0.05pp. over the first year following a 1% increase in government spending. We thus assume that the federal government adjusts labor income taxes to pay for a fraction $1 - \gamma_f$ of current expenditures, where $\gamma_f = 0.8$ in our baseline calibration.

Since there is no guidance on state and local governments, we turn to empirical correlations to guide the calibration. In the state fiscal data, we find that the tax rate exhibits positive autocorrelation, and increased in the tax rate are positively correlated with increases in the interest paid on debt and with expenditures net of IG transfers. In contrast, we do not find correlations that suggest stabilizing of the state budget through adjustments to overall expenditures or transfers (Table D.19). In our baseline rule, we thus use the estimated persistence of the tax rate of 0.80, converted to a quarterly frequency of 0.95, and scale up the coefficients on interest rate payments and net expenditures by the same factor to achieve determinacy – this requires a reaction that is 4.5 times stronger than in the reduced form regressions in Table D.18.

As an alternative, we also consider the same fiscal rule for the state government as for the federal government – with an added small loading of 0.1 on real debt to ensure determinacy. We also consider full adjustment $\gamma_f = 0$ for both the state and the local government tax rates.

Shock process. We calibrate the IG process to the 2009 stimulus package: We choose $\rho = 0.89$ to yield a half-life of six quarters, given the duration of the 2009 stimulus of about three years (Drautzburg and Uhlig, 2015, Fig. 1) and a cumulative (non-discounted) value of 320 bn dollars (Carlino and Inman, 2013), or 0.24% of GDP. This yields $\omega_{IG} = 100 \times (1 - \rho_{IG}) \times 0.0244$. For ease of comparison, we impose the same process for the federal government spending process.

State government spending goes towards government consumption and investment and targeted transfers in proportions equal to those in the state budget. That is, 38% of spending goes towards transfers to constrained agents, treating transfers to municipalities as equivalent as transfers to persons. Of the remainders, 25% is spent on investment, consistent with NIPA data on the importance of state and local government consumption and investment.

States and their marginal propensity to spend. In our baseline calibration, we calibrate the two representative states to be of equal size ($n = 0.5$). We label the home state to be the “Republican” one, while we identify the foreign state as “Democratic”. The states differ only in the pass-through of IG increases to state spending. While only the difference between partisan

propensities to spend has a causal interpretation, for illustrative purposes we also use the point-estimate for the democratic baseline in addition to the estimated Republican-Democratic partisan difference. Specifically, we use the estimates from column (7) of Table 4 as our baseline. Given the evolution of the underlying polarization measure, they imply a Democratic pass-through of 1.59 and a Republican pass-through that is 1.27 lower for the 2000s.¹⁶ These estimates imply an increase in the partisan differences of \$0.99, i.e., before the Reagan era the pass-through difference was only \$0.28 lower under Republican governors.

Our baseline calibration attributes the unobserved heterogeneity to the governors, assuming that if the partisan composition were to change, the mix of governors would reflect the unobserved heterogeneity in the full sample. If we use, instead, the MOV as a proxy for unobserved heterogeneity, due to, for examples, current preferences in the electorate, and removing the effect of the effect of the MOV, we find larger effects: Specifically, when we use column (8) of Table 4 to isolate the effect of partisanship, we get a Democratic baseline of \$2.23, while Republican governors spent \$2.09 less per dollar received in the 2000s, compared to just \$0.53 less before the Reagan era.

To reflect the uncertainty surrounding our estimates, we compute the results not only for the point estimates, but also use the Delta method to compute confidence intervals.¹⁷

4.3 Results

We present results on the effects of a surprise increase in IG transfers in two scenarios that quantify the role of partisanship. First, we illustrate how the dynamics of the economy vary with the preference of the home (“Republican”) governor. Our focus is on how the aggregate responses to the IG increase changes if one were to reduce the partisan differences to their pre-Reagan era level. Second, we fix the partisan differences at the level prevailing in the 2000s and vary the size of the Republican region to compute how IG transfer multipliers would have changed over time as a function of the changing partisan composition of U.S. governors.

4.3.1 Dynamics following a shock to federal transfers

We first present the responses of the fiscal instruments to the IG transfer shock, shown in Figure 6. The top left panel shows the exogenous increase in IG, which initially increases by almost 0.25% of GDP. The other two panels in the top row show the responses of Republican state spending and Democratic state spending. Here, as well as in all subsequent panels, we distinguish between three cases: (1) The “all Democrats” case, in which the Republican governor shares the Democratic propensity to spend (dashed, orange line). (2) The pre-Reagan partisan difference (purple, dotted

¹⁶Even though the estimates are literally for annual increase, we interpret them as applying more broadly to business-cycle increases. This is consistent with our finding that similar pass-through differences hold at multi-year horizons; see Table C.10.

¹⁷We numerically differentiate all our results around the point estimate. In practice, we found the results to be very close to linear in the marginal propensities to spend, that is, the derivative is insensitive to the step size. Intuitively, the MPS parameters serve to scale the size of an exogenous shock and our linearized solution is linear in the shock size.

line), and (3) the post-2000 level of partisan differences (blue, solid line). For these three cases, we focus on our mean point estimate. We also compute the difference between cases (2) and (3), shown as the yellow solid line accompanied by dashed 90% confidence intervals. Since the pre-Reagan partisan differences were small, we focus our discussions on cases (1) and (3), as well as the effects of reducing partisan differences.

In the “all Democrats” case, the spending in both states increases by 0.36% of GDP in both regions. As spending increases more than IG revenue (and the tax base does not rise enough), state labor income tax rates also rise gradually, flattening out at 0.2% after 10 quarters (or 0.01pp., given the 5% steady state rate). The federal tax rate rises by 0.24%, corresponding to a 0.07pp federal tax rate increase.

In the scenario with the “post 2000 partisanship”, the home state has the lower Republican propensity to spend, while the foreign state is unchanged from the previous scenario. Mechanically, the Republican state has lower spending and tax rates. We focus again on the posterior median, shown as the solid, blue line. This is evident in the lower Republican spending increase in this scenario, which is only 0.06% of GDP. Tax rates in the Republican region now fall gradually, by almost 0.2% after 20 quarters. While the level of the pass-through is not causally estimated in our regression, we focus on the partisan differences, shown in yellow lines for the mean (solid), along with the 90% confidence intervals (dashed lines). The spending difference is centered around -0.24% of GDP, since the MPS differ by almost one dollar per dollar received, and IG rises by 0.24% of GDP. The confidence intervals ranges from -0.06% to -0.42% of GDP. The median difference in income tax rates gradually builds up to -0.5%, with a confidence interval between -0.15% and 0.85%. In contrast, income tax rate increases at the federal level and the Democratic state are virtually unchanged from the first scenario.

Underlying the increases in expenditure is both an increase in transfers and government consumption and investment, as Figure D.14 shows. Since these increases are exogenous, we focus on the Republican region. Underlying the overall increase of 0.39% of GDP is an increase of government consumption and investment of about 0.24%, with the remainder spent on transfers. In the Republican region only, spending is proportionately lower with the estimated partisan policy differences.

Next, we describe the overall economic effects of the differences in state fiscal policies. Figure 7 shows, in the top row, aggregate and state level output. When policy-makers in both regions behave as the Democratic baseline, output would rise by almost 0.24% on impact in both regions, and gradually reverse to zero. With the estimated partisan difference, output in the Republican region rises by only 0.06% on impact. This corresponds to a difference of GDP, relative to the pre-Reagan era degree of partisanship, of about -0.13% (-0.04%, -0.22%) in the Republican region – with only small effects of around -0.02% on the Democratic region. Correspondingly, the partisan difference lowers aggregate output by about 0.08% at the point estimate relative to the pre-Reagan era estimate, to an increase of 0.12%. Given the capital adjustment costs, the responses and differences in hours worked (not shown), are slightly larger than those for GDP.

The shock also leads to producer price inflation in both regions. Underlying the price increases

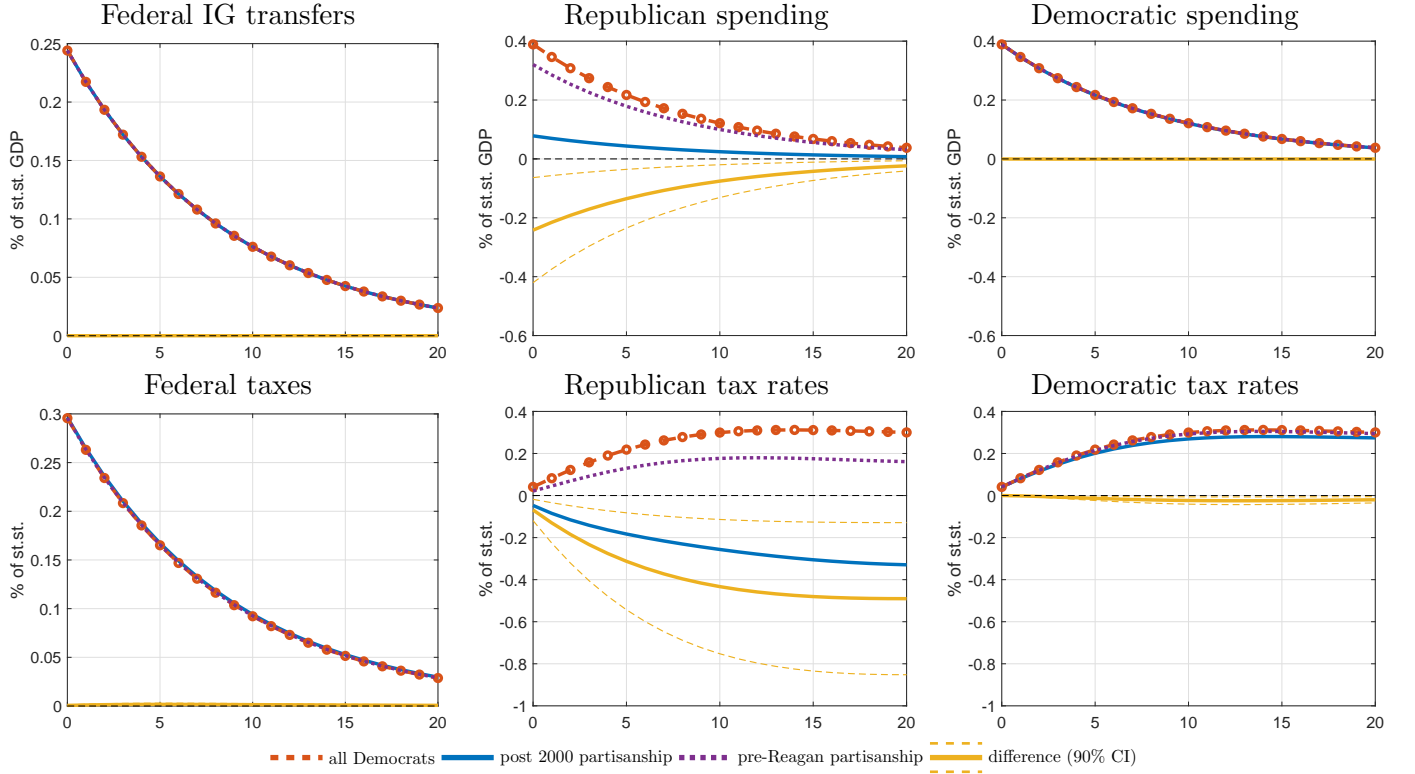


Figure 6: Impulse-responses of state and federal fiscal variables following a shock to IG transfers

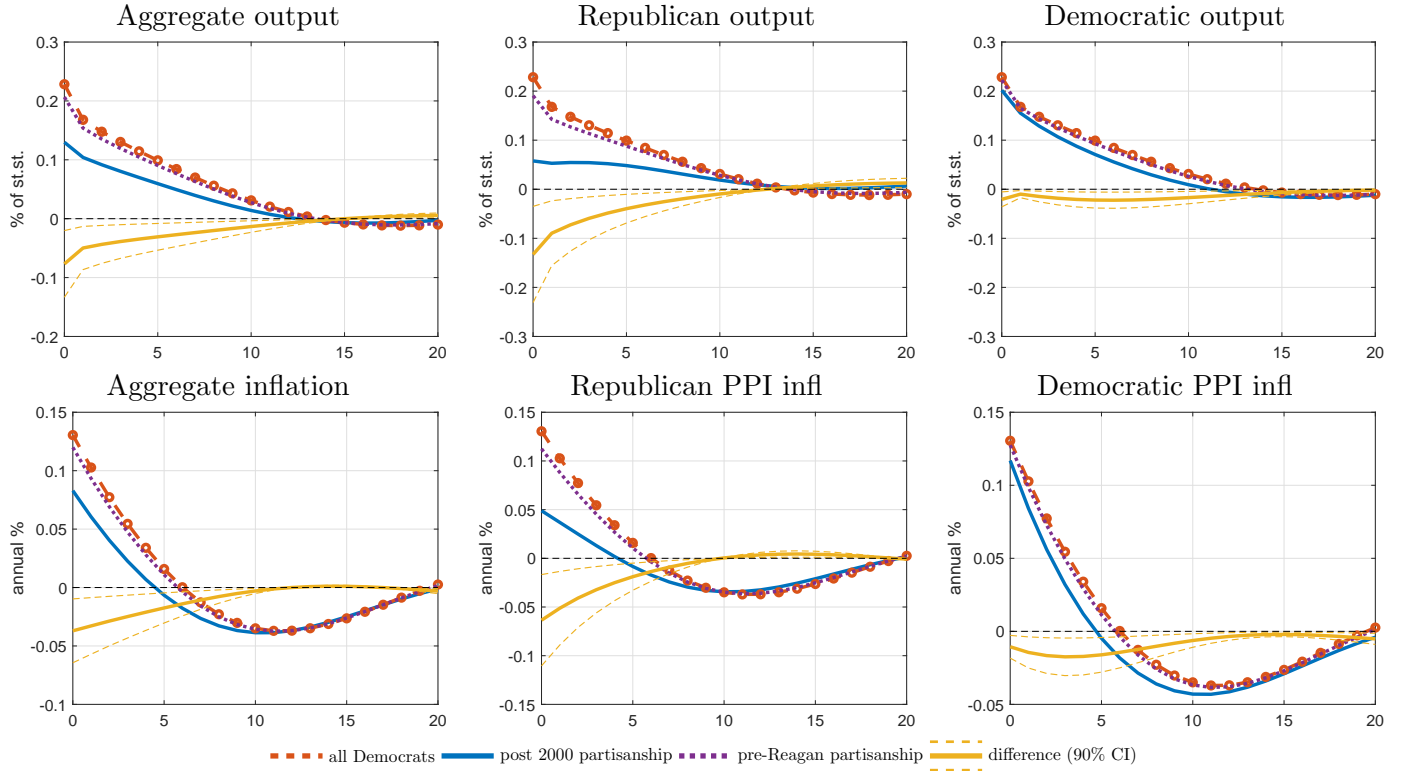


Figure 7: Responses of output and inflation following a shock to IG transfers

are rising factor costs for both capital and labor (not shown). Specifically, absent partisan differences, producer price inflation increases by 0.13pp (at annual rates) in both regions on impact, as the middle row of Figure 7 shows. With the partisan differences, inflation in the home region runs only at slightly above 0.05pp. Higher GDP and the corresponding increase in aggregate inflation leads the monetary authority to raise interest rates.¹⁸ Absent partisan frictions, this increase peaks at about 0.12pp., but is roughly 0.03pp. lower with the estimated partisan differences.

The output response is largely driven by the direct response to spending. This follows from our calibration strategy, which results in an impact multiplier to government spending of 0.8, implying little crowding out in response to a federal spending shock. Here, on impact, consumption is unchanged when policymakers have Democratic preferences, as Appendix Figure D.15 shows. In contrast, it falls in the Republican region, due to lower demand from the constrained agents.¹⁹

4.3.2 Multipliers

After discussing the response of the economy to IG transfer shocks in detail, we now turn to a common summary measure of fiscal stimulus: How much does the federal government stimulate the economy for each dollar it spends? How sensitive is this answer to the preferences of state policymakers? To answer this question, we follow Mountford and Uhlig (2009) and analyze present discounted value (PDV) multipliers: The ratio of the PDV of output relative to the PDV of federal transfers. Figure 8 shows these PDV multipliers over time, along with output and spending, which determine the numerator and denominator, respectively.²⁰

¹⁸The FFR increases modestly, with its response shown in the Appendix Figure D.15.

¹⁹Investment falls on impact, and gradually reverse towards zero with either preferences. The investment decline is smaller with the estimated partisan differences (not shown). Consumption and hours of constrained and unconstrained agents move in opposite directions in response to an IG shock. Figure D.16 shows the response of consumption (top row) and hours in aggregate (left column), for the constrained agents (center column), and unconstrained agents in the Republican region. The behavior of consumption and hours in the other region is similar, and thus omitted. Consumption and hours move in the opposite direction for both agents, reflecting income effects of opposite sign.

²⁰Our concept of the multiplier here is purely from the federal perspective: How much does each dollar spent by the federal government raise output? This answer depends both on how much state spending is “crowded in”, and how much private spending is crowded out. Underlying the concept of the fiscal multiplier is sometimes a focus on whether it is smaller or bigger than unity, since this is the threshold for crowding out. Here, the total government resources spent are larger than those spent by the federal government, so that a multiplier below or above unity does not have the same significance.

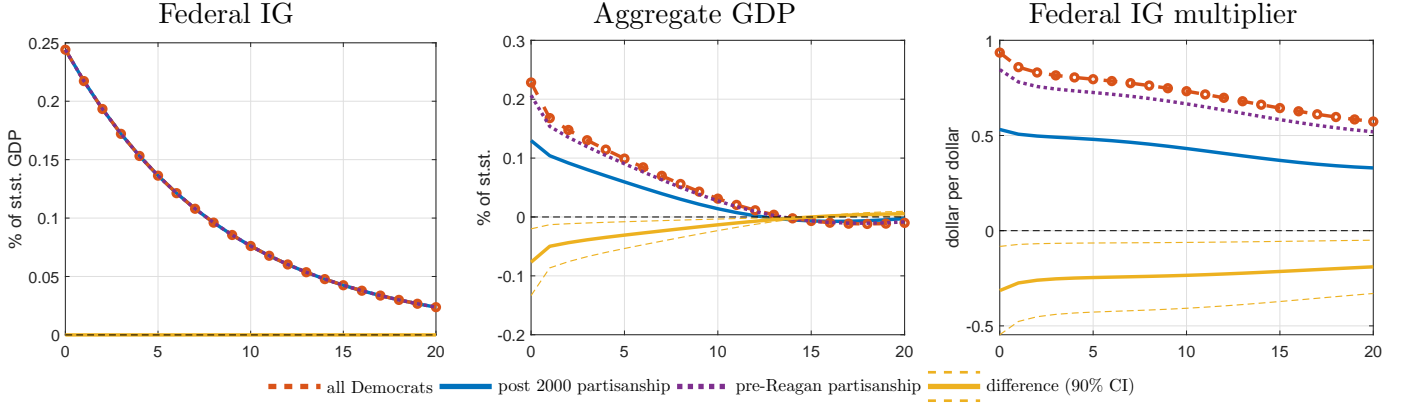


Figure 8: IRFs: Fiscal stimulus, GDP response, and PDV multipliers for IG transfer shocks

Without partisan differences, output rises almost one for one with federal IG spending, resulting in a multiplier just shy of one. With the post 2000 partisan differences, output only rises by only 0.13% on impact, following a 0.24% increase in spending relative to GDP, resulting in a short-term multiplier of about about 0.53. Relative to the small pre-Reagan era partisan difference, the multiplier is 0.31 lower, with a standard error of 0.14. The multipliers and the partisan difference decline only slowly over time and eventually stabilize at a positive long-run multiplier, discussed below. Figure D.18 provides a comparison with a federal defense spending shock and the associated multiplier.

Table 8: Short-run and long-run PDV multipliers on federal consumption and IG transfers as a function of partisan bias and the duration of the ZLB, for different state spending compositions

(a) States spend on welfare, state consumption, and state investment (baseline)								
Multiplier horizon	ELB duration	Federal G increase	IG increase – full sample			IG increase – MOV controls		
			pre-Reagan	2000s	Δ (s.e.)	pre-Reagan	2000s	Δ (s.e.)
Impact	0 qtrs	0.80	0.85	0.53	-0.31 (0.14)	1.18	0.68	-0.50 (0.20)
Impact	10 qtrs	1.24	1.47	0.87	-0.60 (0.27)	2.08	1.13	-0.95 (0.39)
Long-run	0 qtrs	0.54	0.26	0.44	0.18 (0.08)	0.05	0.34	0.29 (0.12)
Long-run	10 qtrs	1.00	0.91	0.78	-0.13 (0.06)	1.01	0.80	-0.21 (0.08)

(b) States spend on state consumption only								
Multiplier horizon	ELB duration	Federal G increase	IG increase – full sample			IG increase – MOV controls		
			pre-Reagan	2000s	Δ (s.e.)	pre-Reagan	2000s	Δ (s.e.)
Impact	0 qtrs	0.80	1.20	0.77	-0.44 (0.19)	1.66	0.97	-0.69 (0.28)
Impact	10 qtrs	1.24	1.91	1.16	-0.75 (0.33)	2.68	1.49	-1.19 (0.49)
Long-run	0 qtrs	0.54	0.41	0.54	0.13 (0.06)	0.26	0.47	0.21 (0.09)
Long-run	10 qtrs	1.00	1.16	0.94	-0.21 (0.09)	1.34	1.01	-0.34 (0.14)

Table 8 compares short-run and long-run multipliers for IG transfers and federal government consumption when states spend on transfers, consumption, and investment in the top panel. The bottom panel considers the case without productive state capital and with states only spending the stimulus on government consumption. Given our calibration strategy, the federal consumption

multiplier is, by construction, 0.80 on impact. The pre-Reagan era IG multiplier with the empirical composition (top panel) would have been comparable, at 0.85.²¹ However, the increased partisan difference lowers it to 0.53. With states spending only on government consumption (bottom panel), the impact IG multipliers would be larger, because government consumption does not discourage work as transfer payments to constrained households do.

Anything that increases the aggregate multiplier in the model or the MPS in the data increases the IG multiplier – and the implied partisan difference. The table illustrates this in two ways. First, if we hold the nominal interest fixed for ten quarters, demand side (spending) policies become more important, and short-run effects of supply side policies become less important. The government spending multiplier thus rises from 0.80 to 1.24 – see, for example, [Christiano et al. \(2011\)](#).²² Here, the IG multiplier rises proportionately when spent only on state consumption, and more than proportionately when spent on a mix of consumption, investment, and transfers. In this case, the multiplier difference rises from -0.31 to -0.60. Second, we would observe a similar increase in magnitude if we based our simulation on estimates that remove the effect of MOV terms on policymakers’ estimated preferences. Both the MPS and the partisan difference in MPS rises by about 50%, yielding about 50% higher multiplier differences.

Comparing our simulation results with a back of the envelope calculation based reveals the important channels in the model. [Wolf \(2019\)](#) argues that, for a class of models, only the aggregate increase in demand and the implied multiplier matters. Applying this recipe to our model yields a partisan effect on the multiplier of -0.4: For each federal dollar spend, the partisan MPS difference of \$0.99 for half the (governor) population, corresponds to a difference of \$0.50. With a multiplier of 0.8, this yields a difference in IG multiplier in the order of 0.4. Here, the difference is smaller because of wealth effects on labor supply for the constrained agents (welfare discourages work), productive state spending, and a different financing mix for federal and state expenditures. In the model with just state consumption spending, we still have a small discrepancy (-0.44 to the naive value of -0.40) due to the differences in distortionary taxes. While government spending multipliers can be sensitive to distortionary taxation, a point [Drautzburg and Uhlig \(2015\)](#) make in the context of the ZLB, we find that our results are comparable when taxes are persistent.²³

Our results suggest that the effects of federal fiscal policy depend on who is running the states. The fraction of states run by Republicans has varied significantly over our sample period: The left panel in [Figure 9](#) shows the fraction of states governed by Republicans, omitting the rare independent governors. This fraction ranges from a low of 30% after Reagan took office to a

²¹The federal consumption multiplier is smaller than that of the IG multiplier because our denominator is the cost of stimulus to the federal government, not overall spending.

²²We implement the ELB in the linearized version of our through *iid* surprise and anticipated monetary policy shocks calibrated to keep interest rates constant for 10 quarters, all revealed at the same time as the fiscal policy shocks.

²³To show this, we keep all parameters fixed while changing only the state and federal government tax rules. [Figure D.18](#) shows multipliers (top row) and tax rate changes for two scenarios in addition to the the baseline: The center column keeps the federal tax rule, and applies the federal tax rule also to state tax rates, so that state taxes adjust to cover 20% of the cost of increased expenditures net of IG revenue. (To ensure stability, we also let taxes adjust to state debt increases, with a loading of 0.1.) In this case partisan pass-through differences yield a multiplier difference centered around -0.25, similar to our baseline. In the case of a balanced budget, which is at odds with the deficit finance typically observed, the multiplier difference is centered around -0.1.

high of roughly two thirds during Clinton’s second term. Using these value to calibrate n in our model, translates to sizable differences in the impact transfer multiplier, shown in the middle panel of Figure 9. The transfer multiplier peaks during the early Reagan years with values slightly above 0.8 and falls to about 0.6 during Clinton’s and Obama’s second terms. Taking the estimation uncertainty into account puts the 90% confidence interval for the impact multiplier in 2018 between 0.1 and 0.42.²⁴

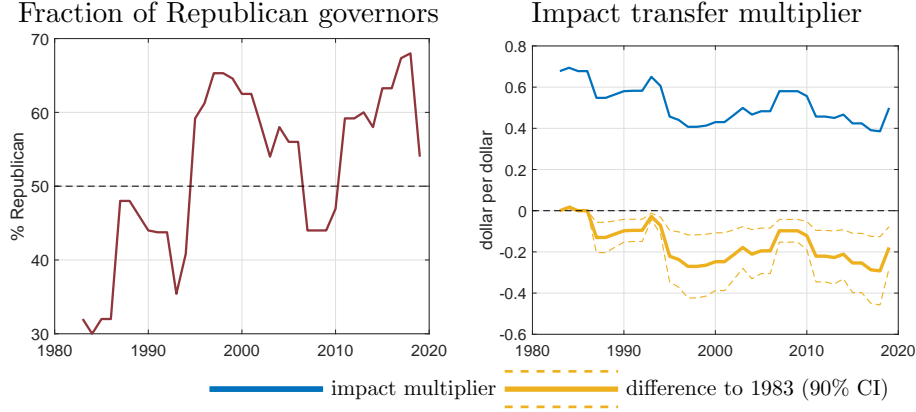


Figure 9: Transfer multipliers for historic shares of Republican vs. Democratic governors

4.3.3 Economic activity in the data

The model predicts that, on impact, Democratic-governed states have higher levels of economic activity, but that after a few quarters growth in Republican-governed states is higher. In our calibration, the higher growth in Republican regions is because of less mean-reversion.²⁵ We now turn to this prediction in the data. Below we report results from baseline regressions (2.2) with indicators of economic activity on the LHS. We use the employment-to-population ratio and state GDP growth as indicators. Neither of the indicators is lined up with the fiscal year, but overall the results are consistent with our model results.

First, we find that current activity – straddling the first half of the fiscal year – is lower in Republican-run states following increases in IG. Specifically, Table C.16 shows that the employment-to-population ratio is lower under marginally elected Republican governors than under Democratic governors when IG is growing. If IG increased by 1pp, the employment to population ratio drops by 0.05pp relative to the Democratic-run state. The partisan difference does not appear to be associated with public employment, and appears to be reversed after one year, although the t -statistics for future activity, which are near 1, are inconclusive.

Second, we find that when measuring future activity – straddling the second half of the fiscal year – is higher in Republican-run states following increases in IG, when measured using GDP. The is in line with the noisy employment-based indicators. Specifically, Table C.17 shows that a 1pp

²⁴The long-run multiplier is essentially invariant to the share of Republican governors in this version of the model.

²⁵Parameterizations that give rise to positive supply side effect that result in higher levels are also possible.

increase in IG transfers leads to future GDP growth that is 0.08pp higher than under Democrats. This result holds both for overall and private-sector GDP growth as well as for compensation growth (not shown).

5 Model validation in aggregate time series

We now test the prediction of our model that the intergovernmental transfer multiplier varies with the state of state politics: Does the impact GDP multiplier for a transfer shock indeed fall with the share of Republican governors? We estimate multipliers off the GDP response to a one-percent innovation in intergovernmental transfers. We allow for time-variation by estimating a linear projection that directly allows for a non-linear effect due to the state of politics.

We use the surprise component of intergovernmental transfers as the transfer shock, treating it as exogenous to any other current shocks. For government purchases, [Blanchard and Perotti \(2002\)](#) justify this identifying assumption with decision making lags in government. Since the NIPA series used in the following time series analysis excludes an important automatic stabilizer, the unemployment insurance program, and some other funds, we view this assumption as a reasonable starting point. In addition, we also include a rich information set, and show that our results are robust to including survey expectations.

An alternative way to allow for time variation in impulse-response is through interaction terms. We also pursue this route and estimate directly:

$$\begin{aligned} \ln GDP_{t+h} = & \alpha_{0,h}^{(\tau)} + \alpha_{Rep,h}^{(\tau)} Rep_{t-4} + \beta_{0,h}^{(\tau)} \ln IG_t + \beta_{Rep,h}^{(\tau)} \ln IG_t \times (Rep_{t-4} - \overline{Rep}) \\ & + \sum_{\ell=1}^4 \mathbf{x}'_{t-\ell} \gamma_{0,\ell}^{(\tau)} + \sum_{\ell=1}^4 \mathbf{x}'_{t-\ell} \times (Rep_{t-4} - \overline{Rep}) \gamma_{Rep,\ell}^{(\tau)} + u_{t+h}. \end{aligned}$$

Here, we lag the share of Republican governors by four quarters to account for the fact that state budgets are passed one fiscal year in advance, the same as in our panel regressions. Table 9 shows the corresponding estimates. Up to four quarters out, the effect of intergovernmental transfers shrinks with the (lagged) fraction of Republican governors, qualitatively the same as in our structural model.

To interpret the estimates in Table 9, we compute the implied IRFs and the cumulative multiplier. Figure 10 shows the IRFs for output and intergovernmental transfers following an increase in IG equal to 1% of GDP, along with the cumulative multiplier. The partisan effects on output are significant up to four quarters out, while the baseline output effect is not significantly different from zero. Partisan effects on IG transfers itself are largely insignificant, consistent with the notion that state partisan considerations do not influence federal transfers. This lack of partisan effects is intuitive, because transfers largely follow administrative formulas. When the Democratic share of governors is one standard deviation (12.5pp.) higher than usual, the estimates imply an impact multiplier of 0.6, which rises up to 2.1 after six quarters, before declining.

Adding survey expectations as a way to control for fiscal foresight does not affect our qualitative

Table 9: Reduced-form output effects of IG innovations and share of Republican governors: Direct regression with single lag for various horizons.

	Impact	h=1	h=2	h=3	h=4
Intergov. Transfers (IG)	-0.008 (-0.80)	-0.007 (-0.42)	-0.023 (-1.08)	-0.027 (-1.29)	-0.017 (-0.71)
Fraction Rep Gov x IG	-0.176** (-2.08)	-0.325* (-1.92)	-0.476** (-2.50)	-0.542** (-2.33)	-0.495* (-1.88)
Fraction Rep Gov.	0.892 (1.26)	1.709 (1.22)	2.745 (1.39)	3.347 (1.38)	4.202 (1.56)
R-squared	1.00	1.00	1.00	0.99	0.99
Observations	219	218	217	216	215

Inference based on Newey-West heteroskedasticity and autocorrelation robust standard errors with six lags. Coefficients on control variables omitted.



For the output and IG transfer IRF, filled markers denote significance at the 10% level or higher. Inference based on Newey-West heteroskedasticity and autocorrelation robust standard errors with two more lags than the response horizon. For the deviations from the baseline, the markers indicate significant differences from the baseline. For the cumulative multiplier, the figure shows point estimates only.

Figure 10: Politics-dependent responses to innovations in intergovernmental transfer: Local projections, 1964q1–2018q3.

results. [Ramey \(2011\)](#) and [Leeper et al. \(2013\)](#) have documented the importance to account for agents' information set for estimating fiscal multipliers. In [Figure E.21](#) we first add one-quarter ahead inflation and output growth expectations from the Survey of Professional Forecasters to our baseline model. Second, we also add one-quarter ahead expectations of both federal and state and local government purchases. Third, we also add three-quarter ahead purchase expectations. In all cases, we include their interactions with the share of Republican governors. In all three cases, we confirm that the impact output effects are lower when a higher share of states is governed by Republicans. Intriguingly, we also find that once we control for expectations that output effects at the two to three year horizon are rises with the share of Republicans.

To test the predictions of our model, we also estimate whether the national government purchases multiplier depends on the share of Republican governors. Our model implies that the share of Republican governors only affects the economy through their use of intergovernmental transfers. When we run the same interacted regression for the government purchases multiplier, we find an insignificant effect of the interaction term; see [Table E.20](#). This shows that our finding is not an artifact of the Republican share of governors being a proxy for some underlying determinant of federal purchases, policy, or the economy more broadly.

6 Conclusion

U.S. governors have partisan fiscal policy preferences. This heterogeneity matters both as the state level and in aggregate. At the state level, regression estimates based on data from close elections show partisan differences in fiscal policy in response to higher federal intergovernmental transfers to states. For tax policies, these difference are more pronounced now than they were before the Reagan-era, in line with the literature on national partisanship.

At the aggregate level, the results imply that the partisan composition of state governments matters for the efficacy of fiscal policy. A standard macroeconomic model of monetary unions augmented with state governments implies that the impact multiplier is lower when many Republicans are running state-governments because of Keynesian demand effects. This is a novel source of time-variation in fiscal multipliers. Time-series evidence also supports the model prediction that the state of politics causes time-variation in how effective federal transfers are in stimulating the economy.

Appendix

A Identification

A.1 Exogenous interaction variable

Let

$$Y = X\alpha + XD\beta + \epsilon, \quad (\text{A.1})$$

where all variables are zero mean.

X may be correlated with ϵ , so that $\mathbb{E}[X\epsilon] \neq 0$. However, we assume that – in a sample of sufficiently close elections:

$$D \perp (\epsilon, X). \quad (\text{A.2})$$

The OLS estimator of $\theta = [\alpha, \beta]'$ is then given by:

$$\hat{\theta} \equiv \begin{bmatrix} \sum_{i,t} x_{i,t}^2 & \sum_{i,t} x_{i,t}^2 d_{i,t} \\ \sum_{i,t} x_{i,t}^2 d_{i,t} & \sum_{i,t} x_{i,t}^2 d_{i,t}^2 \end{bmatrix}^{-1} \begin{bmatrix} \sum_{i,t} x_{i,t}^2 y_{i,t} \\ \sum_{i,t} x_{i,t}^2 d_{i,t} y_{i,t} \end{bmatrix} = \begin{bmatrix} \sum_{i,t} x_{i,t}^2 / N & \sum_{i,t} x_{i,t}^2 d_{i,t} / N \\ \sum_{i,t} x_{i,t}^2 d_{i,t} / N & \sum_{i,t} x_{i,t}^2 d_{i,t}^2 / N \end{bmatrix}^{-1} \begin{bmatrix} \sum_{i,t} x_{i,t}^2 y_{i,t} / N \\ \sum_{i,t} x_{i,t}^2 d_{i,t} y_{i,t} / N \end{bmatrix},$$

where N is the sample size.

To see the estimand associated with $\hat{\beta}$, use a LLN and Slutsky's theorem to write:

$$\begin{bmatrix} \sum_{i,t} x_{i,t}^2 / N & \sum_{i,t} x_{i,t}^2 d_{i,t} / N \\ \sum_{i,t} x_{i,t}^2 d_{i,t} / N & \sum_{i,t} x_{i,t}^2 d_{i,t}^2 / N \end{bmatrix}^{-1} \begin{bmatrix} \sum_{i,t} x_{i,t}^2 y_{i,t} / N \\ \sum_{i,t} x_{i,t}^2 d_{i,t} y_{i,t} / N \end{bmatrix} \xrightarrow{p} \begin{bmatrix} \text{Var}[X] & \text{Cov}[X, XD] \\ \text{Cov}[X, XD] & \text{Var}[XD] \end{bmatrix}^{-1} \begin{bmatrix} \text{Cov}[X, Y] \\ \text{Cov}[XD, Y] \end{bmatrix}$$

We first show that $\text{Cov}[X, XD] = 0$ and $\text{Cov}[XD, Y] = \text{Var}[XD]\beta$, so that $\hat{\beta} \xrightarrow{p} \beta$ under regularity conditions.

1. Claim: $\text{Cov}[X, XD] = 0$.

$$\text{Cov}[X, XD] = \mathbb{E}[X \times XD] = \mathbb{E}[X^2 \mathbb{E}[D|X]] = \mathbb{E}[X^2 \mathbb{E}[D]] = \mathbb{E}[X^2] \times \mathbb{E}[D] = \mathbb{E}[X^2] \times 0 = 0,$$

where the first quality follows from the zero mean property of the RHS variables. The second equality is using the law of iterated expectations. The third equality uses Assumption (A.2). We then factor the expectations and use in the second-to-last equality again that D has mean zero.

2. Claim: $\text{Cov}[XD, Y] = \text{Var}[XD]\beta$.

$$\begin{aligned} \text{Cov}[XD, Y] &= \mathbb{E}[XD \times Y] = \mathbb{E}[XD^2\beta + XD \times \epsilon] = \text{Var}[XD]\beta + \mathbb{E}[X\epsilon \mathbb{E}[D|X, \epsilon]] \\ &= \text{Var}[XD]\beta + \mathbb{E}[X\epsilon \mathbb{E}[D]] = \text{Var}[XD]\beta + \mathbb{E}[X\epsilon] \times \mathbb{E}[D] = \text{Var}[XD]\beta + 0, \end{aligned}$$

where the steps mirror that for the previous claim.

Since $\text{Cov}[X, XD] = 0$, $\begin{bmatrix} \text{Var}[X] & \text{Cov}[X, XD] \\ \text{Cov}[X, XD] & \text{Var}[XD] \end{bmatrix}^{-1} = \text{diag}([\text{Var}[X], \text{Var}[XD]])^{-1}$ and, therefore, $\hat{\beta} \xrightarrow{P} \text{Var}[XD]^{-1} \text{Cov}[XD, Y] = \beta$.

In a setting with $Y = X\alpha + XD\beta + \mathbf{W}'\gamma + \epsilon$, the corresponding assumption is that $D \perp (\epsilon, X, \mathbf{W})$.

While we cannot test our assumption in terms of ϵ , we can test the unconditional correlations of X and D . Indeed, as our discussion of Table 1 highlights, there are no significant partisan differences in our main model variables.

A.2 Bias with matching grants

Consider a simple linear model where party affiliation is exogenous to everything else, but IG transfers (IG) are a function of state spending (E) as well as an exogenous component X . Let μ_p be the mean spending by a governor of party p and let γ_p be the party's IG pass-through to spending. Then

$$\begin{aligned} IG &= X + \theta E \\ E &= \mu_p + \gamma_p IG + \omega_p \epsilon \\ &= \frac{\mu_p + \gamma_p X + \omega_p \epsilon}{1 - \gamma_p \theta}, \end{aligned}$$

where $\omega_p \epsilon$ is the exogenous spending shock – whose variance ω_p^2 may be party-specific.

What does the OLS estimator estimate in population?

$$\gamma_{p,OLS} = \frac{\text{Cov}[IG, E]}{\text{Var}[IG]} = \gamma_p + \frac{\text{Cov}[IG, \omega_p \epsilon]}{\text{Var}[IG]}$$

The various terms are:

$$\begin{aligned} \text{Cov}[IG, \omega_p \epsilon] &= \text{Cov} \left[\frac{1 - \gamma_p \theta + \theta \gamma_p}{1 - \gamma_p \theta} X + \theta \frac{\omega_p}{1 - \gamma_p \theta}, \omega_p \epsilon \right] = \frac{\theta}{1 - \gamma_p \theta} \omega_p^2 \\ \text{Var}[IG] &= \text{Var} \left[\frac{1 - \gamma_p \theta + \theta \gamma_p}{1 - \gamma_p \theta} X + \theta \frac{\omega_p}{1 - \gamma_p \theta} \right] = \frac{1}{(1 - \gamma_p \theta)^2} (\text{Var}[X] + \theta^2 \omega_p^2) \end{aligned}$$

Thus:

$$\gamma_{p,OLS} = \gamma_p + \theta \frac{(1 - \gamma_p \theta)^2}{1 - \gamma_p \theta} \frac{\omega_p^2}{\text{Var}[X] + \theta^2 \omega_p^2} = \gamma_p + \theta (1 - \gamma_p \theta) \frac{\omega_p^2}{\text{Var}[X] + \theta^2 \omega_p^2}$$

If IG is exogenous ($\theta = 0$), then the estimator is consistent. More generally, it is biased.

To get a tractable expression for the bias, assume equal variances of expenditure shocks, i.e., $\omega_p = \omega$, independent of party affiliation. Then the difference between pass-through estimators (which we focus on) is:

$$\begin{aligned} \gamma_{R,OLS} - \gamma_{D,OLS} &= \gamma_R - \gamma_D + \theta \frac{\omega^2}{\text{Var}[X] + \theta^2 \omega^2} (1 - \gamma_R \theta) - (1 - \gamma_D \theta) \\ &= \gamma_R - \gamma_D + \frac{\theta^2 \omega^2}{\text{Var}[X] + \theta^2 \omega^2} \gamma_D - \gamma_R \\ &= (\gamma_R - \gamma_D) \frac{\text{Var}[X]}{\text{Var}[X] + \theta^2 \omega^2} \end{aligned}$$

Thus, under the assumption of equal variance of expenditure shocks, the difference between pass-throughs is proportional to the object of interest $\gamma_R - \gamma_D$ – and biased down. The factor of proportionality approaches unity as the role of matching declines to zero, either because IG is largely exogenous ($\text{Var}[\omega\epsilon]/\text{Var}[X] \rightarrow 0$) or because $\theta \searrow 0$.

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Online Appendix

B Data appendix

B.1 Political variables

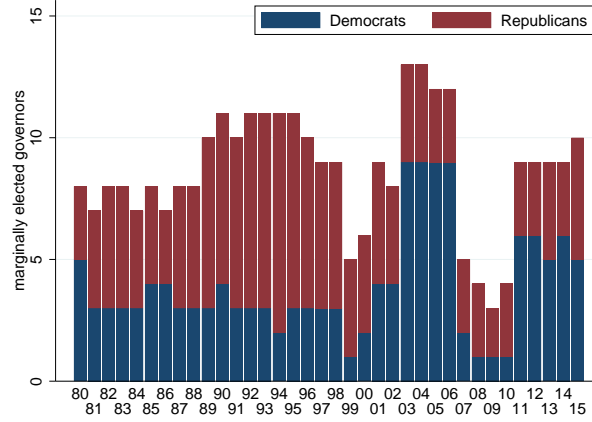


Figure B.1: Democratic and Republican governors elected within a 4pp. margin of victory from calendar year 1980 to 2015.

B.2 Revenues

All census data come from <https://www.census.gov/govs/local/> and https://www2.census.gov/pub/outgoing/govs/special60/State_Govt_Fin.zip.

$$\begin{aligned} TotalRevenues_t &= GeneralRevenues_t + LiquorStoreRevenues_t \\ &\quad + TotalUtilityRevenues + TotalInsuranceTrustRevenues_t \end{aligned}$$

$$\begin{aligned} GeneralRevenues_t &= TotalTaxesRev_t + TotalIntergovernmentalTransferRev_t \\ &\quad + TotalGeneralCharges_t + MiscGeneralRevenueRev_t \end{aligned}$$

$$\begin{aligned} TotalUtilityRevenues_t &= WaterUtilityRevenue_t + ElectricUtilityRev_t \\ &\quad + GasUtilityRev_t + TransitUtilityRev_t \end{aligned}$$

$$\begin{aligned} TotalInsuranceTrustRevenues_t &= TotalEmploymentRetirementRevenue_t + TotalUnemploymentRevenue_t \\ &\quad + TotalWorkerCompensationRevenue_t \\ &\quad + TotalOtherInsuranceTrustRevenue_t \end{aligned}$$

B.2.1 Revenue Definition from Census

- General Government Sector: Within the totals of government revenue and expenditure, internal transfers (e.g., interfund transactions) are “netted out.” Therefore, “general revenue” and “general expenditure” represent only revenue from external sources and expenditures to individuals or agencies outside the government, and do not directly reflect any “transfer” or

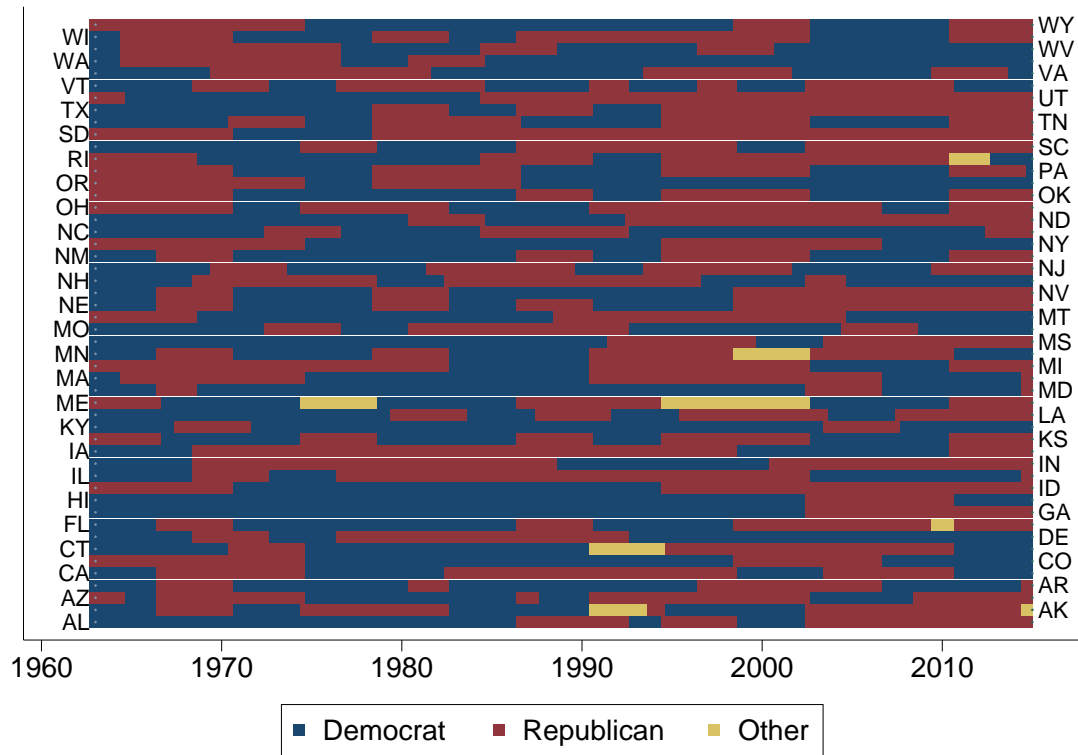
Table B.1: Marginally elected Republican governors up to a 4pp. MOV

#	State	Year	MOV	in sample with following FE			#	State	Year	MOV	in sample with following FE		
				State & Year	Party-State Party-Year	State & Region-Year					State & Year	Party-State Party-Year	State & Region-Year
1	Alabama	1995	-9	yes	yes	yes	81	Mississippi	1995	-3.2	yes	yes	yes
2	Alabama	1996	-9	yes	yes	yes	82	Missouri	2005	-3	yes	yes	yes
3	Alabama	1997	-9	yes	yes	yes	83	Missouri	2006	-3	yes	yes	yes
4	Alabama	1998	-9	yes	yes	yes	84	Missouri	2007	-3	yes	yes	yes
5	Alabama	2003	-2	yes	yes	yes	85	Missouri	2008	-3	yes	yes	yes
6	Alabama	2004	-2	yes	yes	yes	86	Montana	1993	-2.7	yes	yes	yes
7	Alabama	2005	-2	yes	yes	yes	87	Montana	1994	-2.7	yes	yes	yes
8	Alabama	2006	-2	yes	yes	yes	88	Montana	1995	-2.7	yes	yes	
9	California	1983	-1.2	yes	yes	yes	89	Montana	1996	-2.7	yes	yes	
10	California	1984	-1.2	yes	yes	yes	90	Montana	2001	-3.9	yes	yes	yes
11	California	1985	-1.2	yes	yes	yes	91	Montana	2002	-3.9	yes	yes	yes
12	California	1986	-1.2	yes	yes	yes	92	Montana	2003	-3.9	yes	yes	yes
13	California	1991	-3.5	yes	yes	yes	93	Montana	2004	-3.9	yes	yes	yes
14	California	1992	-3.5	yes	yes	yes	94	New Jersey	1982	-1	yes	yes	
15	California	1993	-3.5	yes	yes	yes	95	New Jersey	1983	-1	yes	yes	yes
16	California	1994	-3.5	yes	yes	yes	96	New Jersey	1984	-1	yes	yes	yes
17	Colorado	1999	-1.1	yes	yes	yes	97	New Jersey	1985	-1	yes	yes	yes
18	Colorado	2000	-1.1	yes	yes	yes	98	New Jersey	1994	-1	yes	yes	yes
19	Colorado	2001	-1.1	yes	yes	yes	99	New Jersey	1995	-1	yes	yes	yes
20	Colorado	2002	-1.1	yes	yes	yes	100	New Jersey	1996	-1	yes	yes	yes
21	Connecticut	1995	-3.5	yes	yes	yes	101	New Jersey	1997	-1	yes	yes	yes
22	Connecticut	1996	-3.5	yes	yes	yes	102	New Jersey	1998	-1.1	yes	yes	yes
23	Connecticut	1997	-3.5	yes	yes	yes	103	New Jersey	1999	-1.1	yes	yes	yes
24	Connecticut	1998	-3.5	yes	yes	yes	104	New Jersey	2000	-1.1	yes	yes	yes
25	Florida	2011	-1.1	yes	yes	yes	105	New Jersey	2001	-1.1	yes	yes	yes
26	Florida	2012	-1.1	yes	yes	yes	106	New Jersey	2010	-3.6	yes	yes	yes
27	Florida	2013	-1.1	yes	yes	yes	107	New Jersey	2011	-3.6	yes	yes	yes
28	Illinois	1983	-1	yes	yes	yes	108	New Jersey	2012	-3.6	yes	yes	yes
29	Illinois	1984	-1	yes	yes	yes	109	New Jersey	2013	-3.6	yes	yes	yes
30	Illinois	1985	-1	yes	yes	yes	110	New York	1995	-3.3	yes	yes	yes
31	Illinois	1986	-1	yes	yes	yes	111	New York	1996	-3.3	yes	yes	yes
32	Illinois	1991	-2.6	yes	yes	yes	112	New York	1997	-3.3	yes	yes	yes
33	Illinois	1992	-2.6	yes	yes	yes	113	New York	1998	-3.3	yes	yes	yes
34	Illinois	1993	-2.6	yes	yes	yes	114	Ohio	1982	-1.7	yes	yes	yes
35	Illinois	1994	-2.6	yes	yes	yes	115	Ohio	2011	-2	yes	yes	yes
36	Illinois	1999	-3.6	yes	yes		116	Ohio	2012	-2	yes	yes	yes
37	Illinois	2000	-3.6	yes	yes		117	Ohio	2013	-2	yes	yes	yes
38	Illinois	2001	-3.6	yes	yes	yes	118	Oklahoma	1987	-2.9	yes	yes	yes
39	Illinois	2002	-3.6	yes	yes	yes	119	Oklahoma	1988	-2.9	yes	yes	yes
40	Iowa	1987	-3.9	yes	yes	yes	120	Oklahoma	1989	-2.9	yes	yes	yes
41	Iowa	1988	-3.9	yes	yes	yes	121	Oklahoma	1990	-2.9	yes	yes	yes
42	Iowa	1989	-3.9	yes	yes	yes	122	Pennsylvania	1983	-2.7	yes	yes	yes
43	Iowa	1990	-3.9	yes	yes	yes	123	Pennsylvania	1984	-2.7	yes	yes	yes
44	Kansas	1987	-3.8	yes	yes	yes	124	Pennsylvania	1985	-2.7	yes	yes	yes
45	Kansas	1988	-3.8	yes	yes	yes	125	Pennsylvania	1986	-2.7	yes	yes	yes
46	Kansas	1989	-3.8	yes	yes	yes	126	Rhode Island	1989	-1.7	yes	yes	yes
47	Kansas	1990	-3.8	yes	yes	yes	127	Rhode Island	1990	-1.7	yes	yes	yes
48	Louisiana	1982	-7	yes	yes	yes	128	Rhode Island	1995	-3.8	yes	yes	yes
49	Louisiana	1983	-7	yes	yes		129	Rhode Island	1996	-3.8	yes	yes	yes
50	Maine	1991	-2.6	yes	yes	yes	130	Rhode Island	1997	-3.8	yes	yes	yes
51	Maine	1992	-2.6	yes	yes	yes	131	Rhode Island	1998	-3.8	yes	yes	yes
52	Maine	1993	-2.6	yes	yes	yes	132	Rhode Island	2007	-2	yes	yes	
53	Maine	1994	-2.6	yes	yes	yes	133	Rhode Island	2008	-2	yes	yes	
54	Maryland	2003	-3.9	yes	yes	yes	134	Rhode Island	2009	-2	yes	yes	
55	Maryland	2004	-3.9	yes	yes	yes	135	Rhode Island	2010	-2	yes	yes	yes
56	Maryland	2005	-3.9	yes	yes	yes	136	South Carolina	1987	-3.1	yes	yes	yes
57	Maryland	2006	-3.9	yes	yes	yes	137	South Carolina	1988	-3.1	yes	yes	yes
58	Massachusetts	1991	-3.2	yes	yes	yes	138	South Carolina	1989	-3.1	yes	yes	yes
59	Massachusetts	1992	-3.2	yes	yes	yes	139	South Carolina	1990	-3.1	yes	yes	yes
60	Massachusetts	1993	-3.2	yes	yes	yes	140	South Carolina	1995	-2.5	yes	yes	yes
61	Massachusetts	1994	-3.2	yes	yes	yes	141	South Carolina	1996	-2.5	yes	yes	yes
62	Massachusetts	1999	-3.4	yes	yes	yes	142	South Carolina	1997	-2.5	yes	yes	yes
63	Massachusetts	2000	-3.4	yes	yes	yes	143	South Carolina	1998	-2.5	yes	yes	yes
64	Massachusetts	2001	-3.4	yes	yes	yes	144	South Dakota	1987	-3.6	yes	yes	yes
65	Massachusetts	2002	-3.4	yes	yes		145	South Dakota	1988	-3.6	yes	yes	yes
66	Michigan	1991	-7	yes	yes	yes	146	South Dakota	1989	-3.6	yes	yes	yes
67	Michigan	1992	-7	yes	yes	yes	147	South Dakota	1990	-3.6	yes	yes	yes
68	Michigan	1993	-7	yes	yes	yes	148	Texas	1982	-7	yes		yes
69	Michigan	1994	-7	yes	yes	yes	149	Utah	1989	-1.7	yes	yes	yes
70	Minnesota	1991	-3.3	yes	yes	yes	150	Utah	1990	-1.7	yes	yes	yes
71	Minnesota	1992	-3.3	yes	yes	yes	151	Utah	1991	-1.7	yes	yes	yes
72	Minnesota	1993	-3.3	yes	yes	yes	152	Utah	1992	-1.7	yes	yes	yes
73	Minnesota	1994	-3.3	yes	yes	yes	153	Vermont	2003	-2.6	yes	yes	
74	Minnesota	2007	-1	yes	yes	yes	154	Vermont	2004	-2.6	yes	yes	
75	Minnesota	2008	-1	yes	yes	yes							
76	Minnesota	2009	-1	yes	yes								
77	Minnesota	2010	-1	yes	yes								
78	Mississippi	1992	-3.2	yes	yes	yes							
79	Mississippi	1993	-3.2	yes	yes	yes							
80	Mississippi	1994	-3.2	yes	yes	yes							

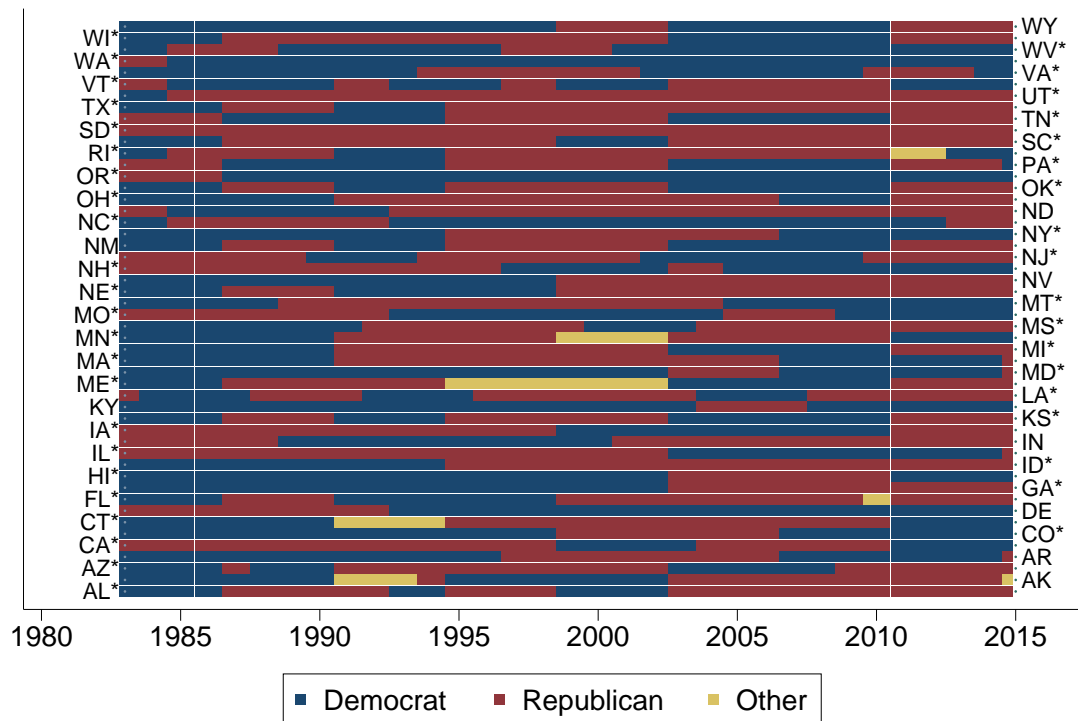
Table B.2: Marginally elected Democratic governors up to a 4pp. MOV

#	State	Year	MOV	in sample with following FE			#	State	Year	MOV	in sample with following FE		
				State & Year	Party-State Party-Year	State & Region-Year					State & Year	Party-State Party-Year	State & Region-Year
1	Arizona	2003	1	yes	yes	yes	81	Pennsylvania	1987	2.3	yes	yes	
2	Arizona	2004	1	yes	yes	yes	82	Pennsylvania	1988	2.3	yes	yes	
3	Arizona	2005	1	yes	yes	yes	83	Pennsylvania	1989	2.3	yes	yes	yes
4	Arizona	2006	1	yes	yes	yes	84	Pennsylvania	1990	2.3	yes	yes	yes
5	Connecticut	2011	.6	yes	yes	yes	85	Tennessee	2003	3.1	yes	yes	yes
6	Connecticut	2012	.6	yes	yes	yes	86	Tennessee	2004	3.1	yes	yes	yes
7	Connecticut	2013	.6	yes	yes	yes	87	Tennessee	2005	3.1	yes	yes	yes
8	Florida	1995	1.5	yes	yes	yes	88	Tennessee	2006	3.1	yes	yes	yes
9	Florida	1996	1.5	yes	yes	yes	89	Texas	1991	2.5	yes	yes	yes
10	Florida	1997	1.5	yes	yes	yes	90	Texas	1992	2.5	yes	yes	yes
11	Florida	1998	1.5	yes	yes	yes	91	Texas	1993	2.5	yes	yes	yes
12	Georgia	1995	2.1	yes	yes	yes	92	Texas	1994	2.5	yes	yes	yes
13	Georgia	1996	2.1	yes	yes	yes	93	Vermont	1985	1.6	yes	yes	yes
14	Georgia	1997	2.1	yes	yes	yes	94	Vermont	1986	1.6	yes	yes	yes
15	Georgia	1998	2.1	yes	yes	yes	95	Vermont	2011	1.8	yes	yes	yes
16	Hawaii	1987	3.9	yes	yes	yes	96	Vermont	2012	1.8	yes	yes	yes
17	Hawaii	1988	3.9	yes	yes	yes	97	Virginia	1990	.4	yes	yes	yes
18	Hawaii	1989	3.9	yes	yes	yes	98	Virginia	1991	.4	yes	yes	yes
19	Hawaii	1990	3.9	yes	yes	yes	99	Virginia	1992	.4	yes	yes	yes
20	Hawaii	1999	1.3	yes	yes	yes	100	Virginia	1993	.4	yes	yes	yes
21	Hawaii	2000	1.3	yes	yes	yes	101	Washington	2005	0	yes	yes	yes
22	Hawaii	2001	1.3	yes	yes	yes	102	Washington	2006	0	yes	yes	yes
23	Hawaii	2002	1.3	yes	yes	yes	103	Washington	2007	0	yes	yes	
24	Idaho	1983	1.3	yes	yes	yes	104	Washington	2008	0	yes		
25	Idaho	1984	1.3	yes	yes	yes	105	West Virginia	2001	2.9	yes	yes	yes
26	Idaho	1985	1.3	yes	yes	yes	106	West Virginia	2002	2.9	yes	yes	yes
27	Idaho	1986	1.3	yes	yes	yes	107	West Virginia	2003	2.9	yes	yes	yes
28	Idaho	1987	.9	yes	yes	yes	108	West Virginia	2004	2.9	yes	yes	yes
29	Idaho	1988	.9	yes	yes	yes	109	Wisconsin	2003	3.7	yes	yes	yes
30	Idaho	1989	.9	yes	yes	yes	110	Wisconsin	2004	3.7	yes	yes	yes
31	Idaho	1990	.9	yes	yes	yes	111	Wisconsin	2005	3.7	yes	yes	yes
32	Illinois	2011	.9	yes	yes	yes	112	Wisconsin	2006	3.7	yes	yes	yes
33	Illinois	2012	.9	yes	yes	yes							
34	Illinois	2013	.9	yes	yes	yes							
35	Kansas	1982	2.1	yes		yes							
36	Louisiana	2004	3.9	yes	yes	yes							
37	Louisiana	2005	3.9	yes	yes	yes							
38	Louisiana	2006	3.9	yes	yes	yes							
39	Louisiana	2007	3.9	yes	yes								
40	Minnesota	2011	.4	yes	yes	yes							
41	Minnesota	2012	.4	yes	yes	yes							
42	Minnesota	2013	.4	yes	yes	yes							
43	Mississippi	2000	1.1	yes	yes								
44	Mississippi	2001	1.1	yes	yes	yes							
45	Mississippi	2002	1.1	yes	yes	yes							
46	Mississippi	2003	1.1	yes	yes	yes							
47	Missouri	2001	.9	yes	yes	yes							
48	Missouri	2002	.9	yes	yes	yes							
49	Missouri	2003	.9	yes	yes	yes							
50	Missouri	2004	.9	yes	yes	yes							
51	Montana	2013	1.6	yes		yes							
52	Nebraska	1983	1.3	yes	yes	yes							
53	Nebraska	1984	1.3	yes	yes	yes							
54	Nebraska	1985	1.3	yes	yes	yes							
55	Nebraska	1986	1.3	yes	yes	yes							
56	Nebraska	1991	.7	yes	yes	yes							
57	Nebraska	1992	.7	yes	yes	yes							
58	Nebraska	1993	.7	yes	yes	yes							
59	Nebraska	1994	.7	yes	yes	yes							
60	New Hampshire	2005	2.2	yes	yes								
61	New Hampshire	2006	2.2	yes	yes								
62	New York	1983	3.4	yes	yes	yes							
63	New York	1984	3.4	yes	yes	yes							
64	New York	1985	3.4	yes	yes	yes							
65	New York	1986	3.4	yes	yes	yes							
66	North Carolina	2009	3.4	yes									
67	North Carolina	2010	3.4	yes									
68	North Carolina	2011	3.4	yes	yes	yes							
69	North Carolina	2012	3.4	yes	yes	yes							
70	Oklahoma	2003	.7	yes	yes	yes							
71	Oklahoma	2004	.7	yes	yes	yes							
72	Oklahoma	2005	.7	yes	yes	yes							
73	Oklahoma	2006	.7	yes	yes	yes							
74	Oregon	2003	1	yes	yes	yes							
75	Oregon	2004	1	yes	yes	yes							
76	Oregon	2005	1	yes	yes	yes							
77	Oregon	2006	1	yes	yes	yes							
78	Oregon	2011	1.5	yes	yes								
79	Oregon	2012	1.5	yes	yes								
80	Oregon	2013	1.5	yes	yes	yes							

(a) Full sample: 1963–2014

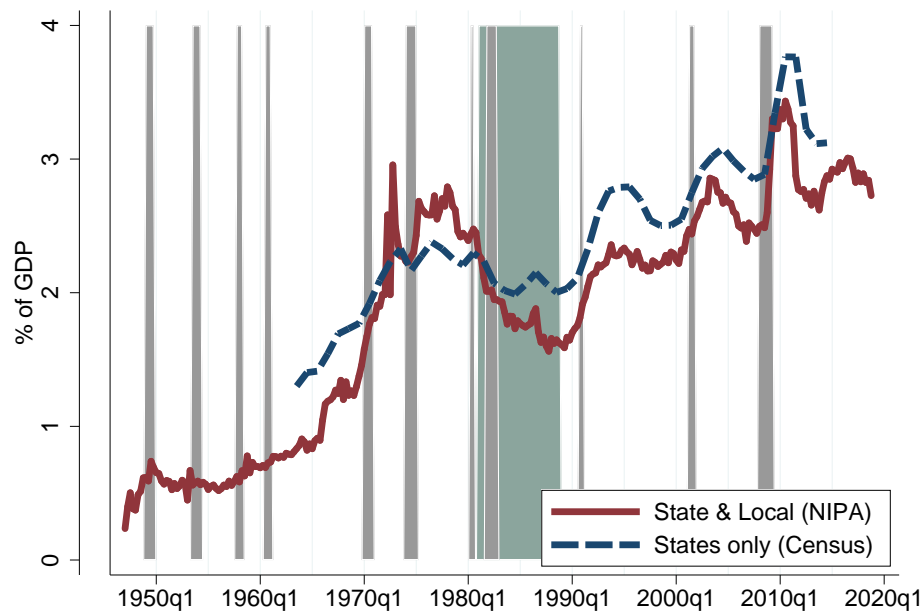


(b) Baseline sample: 1983–2014



* ever in 4pp MOV sample

Figure B.2: State composition
B4



Gray shaded areas indicate NBER recession dates. The green shaded area indicates the Reagan presidency. NIPA only considers a subset of budgeted intergovernmental transfers, so that the sum of state and local according to NIPA does generally lie below the line for transfers to states only according to the Census. However, the NIPA series is close to the series for transfers to states only in the Census budget data.

Figure B.3: Federal intergovernmental transfers to state and local governments in NIPA vs. federal intergovernmental transfers to states only in Census data

“contributions” to or from the utilities, liquor stores, or insurance trust sectors. See Section 3.9 for more information on internal transactions.

- **Utilities Sector:** In the primary classification of government revenue and expenditure, the term “utility” is used to identify certain types of revenue and expenditure categories. Utility revenue relates only to the revenue from sales of goods or services and by-products to consumers outside the government. Revenue arising from outside other aspects of utility operations is classified as general revenue (e.g., interest earnings). Utility expenditure applies to all expenditures for financing utility facilities, for interest on utility debt, and for operation, maintenance, and other costs involved in producing and selling utility commodities and services to the public (other than noncash transactions like depreciation of assets).
- **Liquor Stores Sector:** Liquor stores revenue relates only to amounts received from sale of goods and associated services or products. Liquor store expenditure relates only to amounts for purchase of goods for resale and for provision, operation, and maintenance of the stores. Any associated government activity, such as licensing and enforcement of liquor laws or collection of liquor taxes, are classified under the general government sector
- **Social Insurance Trust Sector:** Insurance trust revenue comprises only (1) retirement and social insurance contributions, including unemployment compensation “taxes” received from employees and other government or private employers, and (2) net earnings on investments set aside to provide income for insurance trusts. Transfers or contributions from other funds of the same government are not classified as insurance trust revenue but rather are reported under special exhibit categories (see Chapters 8 and 9). Insurance trust expenditure comprises only benefit payments and withdrawals of contributions made from retirement and social insurance trust funds. Costs for administering insurance trust systems are classified under the general government sector. Social Insurance Trust Sector: Insurance trust revenue comprises only (1) retirement and social insurance contributions, including unemployment compensation “taxes” received from employees and other government or private employers, and (2) net earnings on investments set aside to provide income for insurance trusts.³ Transfers or contributions from other funds of the same government are not classified as insurance trust revenue but rather are reported under special exhibit categories (see Chapters 8 and 9). Insurance trust expenditure comprises only benefit payments and withdrawals of contributions made from retirement and social insurance trust funds. Costs for administering insurance trust systems are classified under the general government sector.

B.3 Expenditures

$$TotalExpenditure_t = TotalIGExpenditure_t + DirectExpenditure_t$$

$$TotalIGExpenditure_t = TotalIGExpenditure2Federal_t + TotalIGExpenditure2Local_t$$

$$DirectExpenditure_t = TotalCurrentOperationalExpenditure_t$$

$$+ TotalCapitalOutlayExpenditure_t$$

$$+ TotalAssistanceAndSubsidies_t + TotalInterestOnDebt_t$$

$$+ TotalInsuranceTrustBenefits_t$$

$$TotalCapitalOutlayExpenditure_t = TotalConstructions_t + TotalOtherCapitalOutlays_t$$

B.3.1 Expenditures Definition from Census

- Current Operations: Direct expenditure for compensation of own officers and employees and for supplies, materials, and contractual services except any amounts for capital outlay (i.e., for personal services or other objects used in contract construction or government employee construction of permanent structures and for acquisition of property and equipment).
- Interest on Debt: Amounts paid for the use of borrowed money.
- Assistance and Subsidies: Direct cash assistance to foreign governments, private individuals, and nongovernmental organizations (e.g., foreign aid, agricultural supports, public welfare, veteran bonuses, and cash grants for tuition and scholarships) neither in return for goods and services nor in repayment of debt and other claims against the government.
- Capital Outlay: Direct expenditure for purchase or construction, by contract or government employee, construction of buildings and other improvements; for purchase of land, equipment, and existing structures; and for payments on capital leases.
- Intergovernmental expenditure is defined as amounts paid to other governments for performance of specific functions or for general financial support. Includes grants, shared taxes, contingent loans and advances, and any significant and identifiable amounts or reimbursement paid to other governments for performance of general government services or activities.



Figure B.4: Overall revenue components: Average by decade, 1963–2014

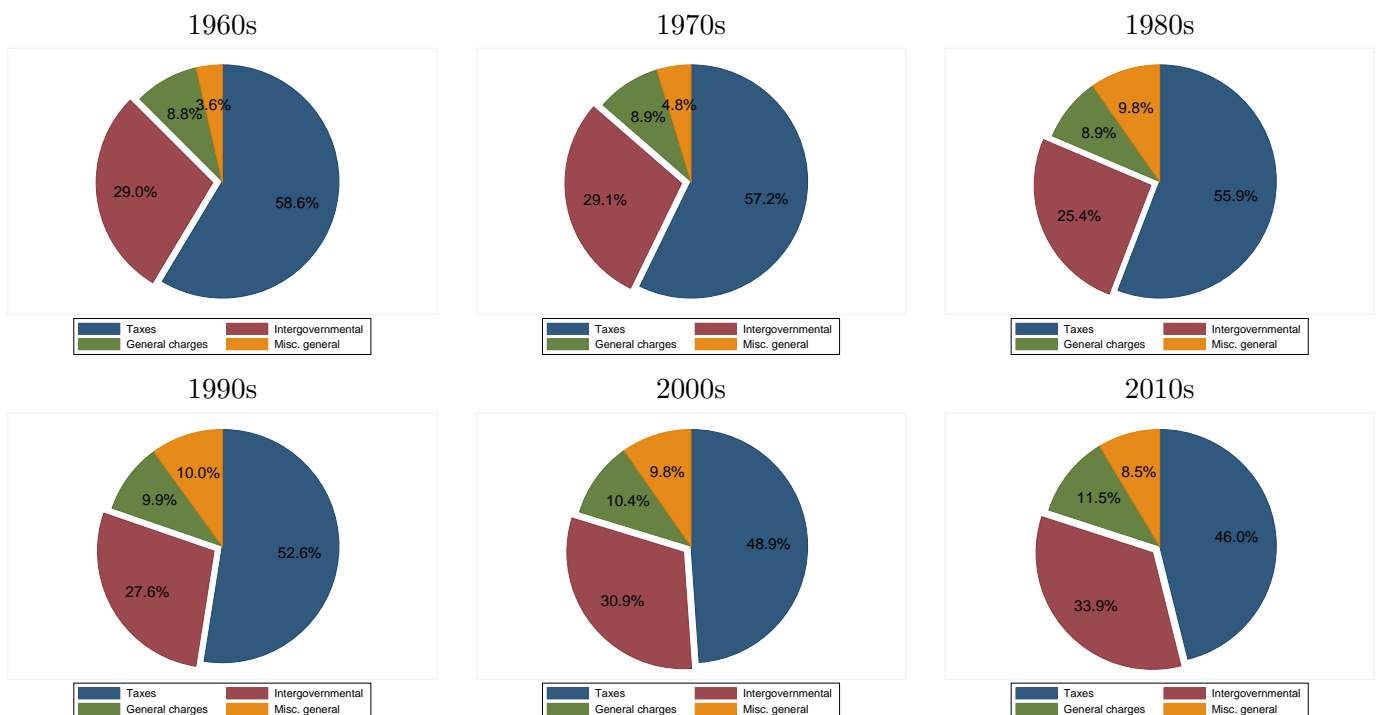


Figure B.5: General revenue components: Average by decade, 1963–2014

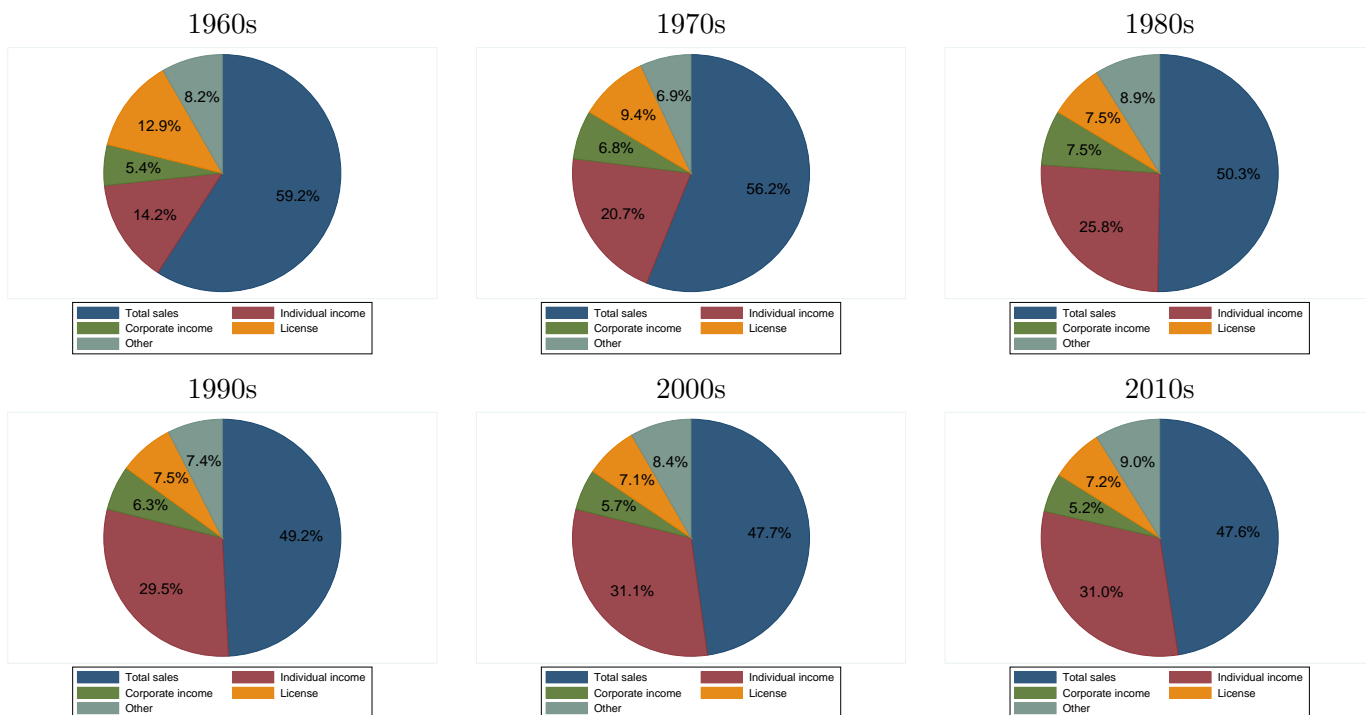


Figure B.6: Tax revenue components: Average by decade, 1963–2014



Figure B.7: Total expenditure components: Average by decade, 1963–2014

Table B.3: Descriptive statistics: Means and standard deviations

	1963-2014	Main sample 1983-2014	Main sample with close elections			Dem=Rep p-val
			Within 4pp.	Dem<4pp.	Rep<4pp.	
Debt per capita xxxx mean	2.1	2.8	3.0	2.7	3.2	0.4
standard deviation	0.8	0.7	0.4	0.2	0.5	.
Debt growth mean	-0.8	0.0	0.0	0.2	-0.1	0.6
standard deviation	11.4	8.3	7.6	7.5	7.6	.
Population xxxx mean	5177.1	5777.4	6570.8	5762.0	7156.6	0.2
standard deviation	1301.4	827.7	563.7	110.7	513.8	.
Population growth mean	1.1	1.0	0.8	0.9	0.8	0.6
standard deviation	0.7	0.6	0.6	0.9	0.4	.
Expenditure growth mean	3.2	2.6	2.6	2.7	2.5	0.2
standard deviation	3.8	3.5	3.4	3.5	3.2	.
Net general rev gr mean	3.0	2.2	2.8	3.1	2.6	0.4
standard deviation	6.8	3.9	3.4	3.0	2.8	.
Income sales tax rev gr mean	2.9	2.1	2.7	2.9	2.5	0.6
standard deviation	5.3	4.6	3.8	3.3	3.3	.
Tax rev growth mean	2.6	2.0	2.6	2.8	2.5	0.6
standard deviation	4.8	4.5	3.8	3.2	3.2	.
General rev share Taxes mean	54.0	51.8	52.5	52.1	52.8	0.5
standard deviation	3.4	2.8	2.3	1.5	1.7	.
General rev share IG mean	29.0	29.0	29.1	29.5	28.8	0.9
standard deviation	3.2	2.4	2.1	1.5	1.6	.
IG growth mean	3.6	3.3	3.3	3.1	3.4	0.6
standard deviation	7.5	6.5	5.8	6.3	5.2	.
IG increases mean	5.5	5.0	4.6	4.6	4.6	0.6
standard deviation	5.6	4.9	4.4	5.0	3.8	.
IG decreases mean	-1.9	-1.6	-1.3	-1.5	-1.2	0.7

Population in 1,000s. Debt per capita in 2012 dollars. All other variables, except for population growth, also in real per capita terms. p-values based on standard errors clustered by state and year after removing state and year fixed effects. The 5 pp. MOV includes two observations that drop out in the presence of these fixed effects. Standard deviations are after taking out state and year fixed effects.

B.4 Additional Variable Definitions

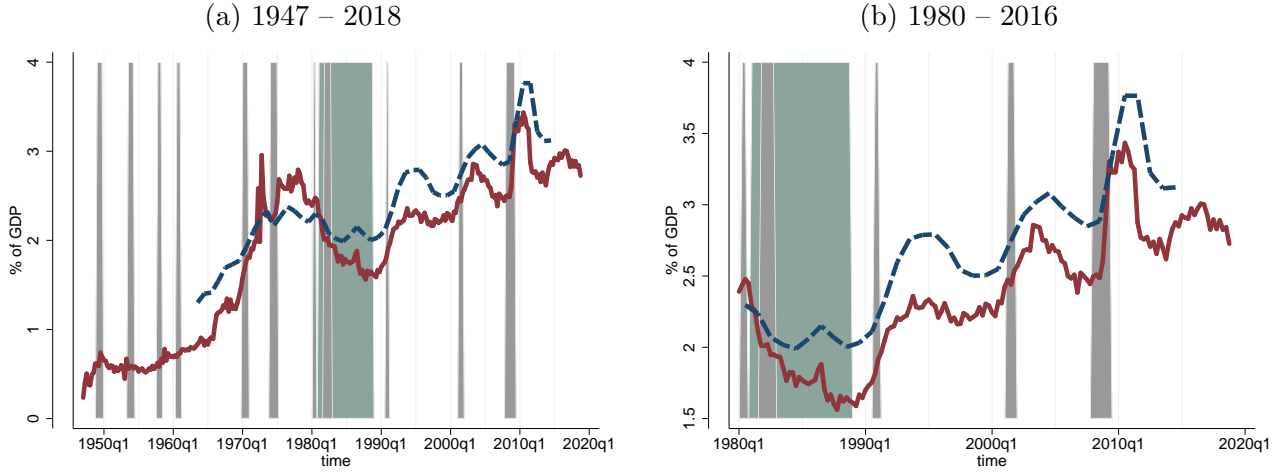
Variables used in the analysis of state level panel data:

- Annual GDP deflator: FRED label A191RD3A086NBEA).
- Personal Income: BEA Regional Accounts (<https://apps.bea.gov/regional/downloadzip.cfm>), Table CA4.
- State GDP and its components: BEA Regional Accounts, GDP by State.
- Population: BEA Regional Accounts.

Variables used in the time-series analysis:

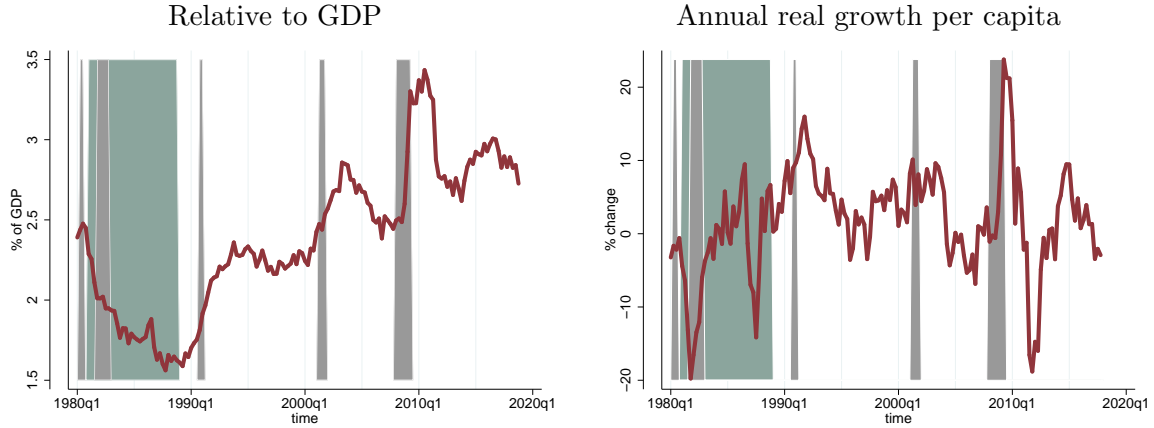
- Civilian population above 16: FRED label CNP16OV
- Real government consumption and investment: FRED label GCEC1
- Real GDP: FRED label GDPC1
- GDP deflator: FRED label GDPDEF
- State and local government expenditures: FRED label SLEXPND
- Federal transfers to state and local governments: FRED label FGSL
- Federal government current transfer receipts from persons: FRED label B233RC1Q027SBEA
- Federal government current transfer receipts from business: FRED label W012RC1Q027SBEA
- Federal government current transfer payments: FRED label W014RC1Q027SBEA
- Federal government current tax receipts: FRED label W006RC1Q027SBEA

We define taxes as current tax receipts plus transfer receipts from persons and business minus federal transfers, but plus federal transfers to state and local governments. We smooth the population estimate by initializing population to be the value in the data and then updating population as: $Pop_t = \frac{3}{4}Pop_{t-1} + \frac{1}{4}CNP16OV_t$.



Two types of coverage differences explain the discrepancies: (1) Capital expenditures and state-run unemployment insurance numbers are excluded from NIPA. (2) The Census series does not cover local governments.

Figure B.8: NIPA federal grants-in-aid to state and local governments vs Census intergovernmental transfers to states.



Note: Intergovernmental transfers from the federal government to state and local governments show both cyclical and idiosyncratic patterns. When Reagan came into office, intergovernmental transfers were cut despite the 1981–82 recession. In all other recession since 1980, intergovernmental transfers rose.

$$\Delta \log \frac{IG_t}{GDP_t} = 0.002 + 0.025 \times \mathbf{1}\{Recession\}_t - 0.019 \times \mathbf{1}\{Reagan\}_t, \quad N = 152.$$

[0.79] [2.04] [2.57]

$$\Delta \log \frac{IG_t}{GDP_t} = 0.008 - 0.950 \times \Delta \log GDP_t - 0.015 \times \mathbf{1}\{Reagan\}_t, \quad N = 152.$$

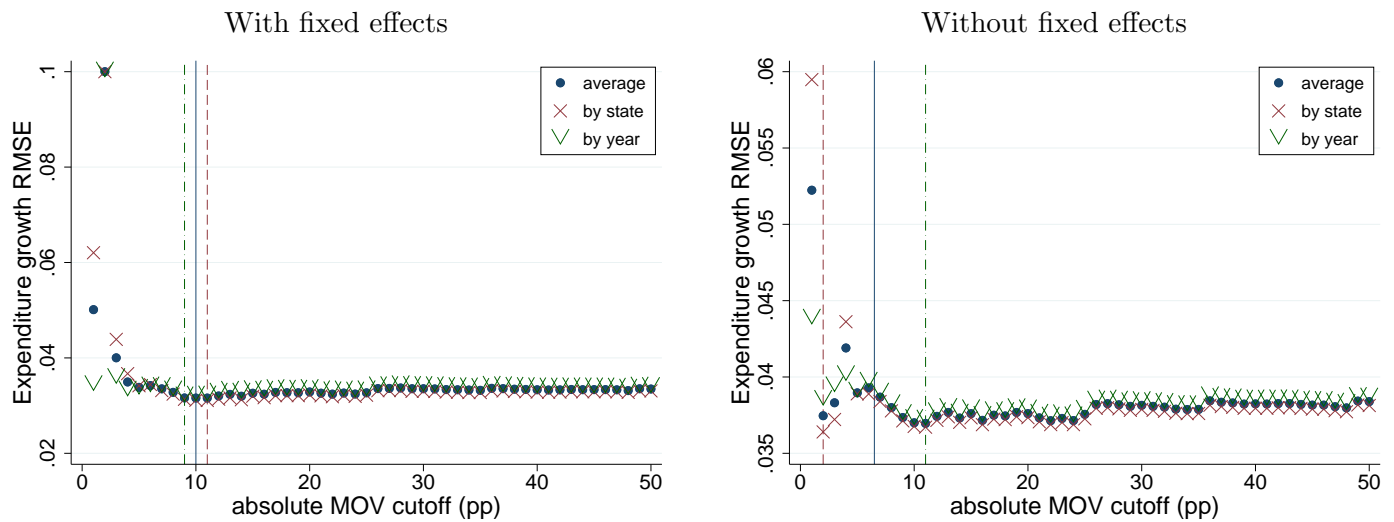
[2.03] [2.21] [2.04]

Robust (absolute) t-statistics in brackets based on Newey-West standard errors with three lags.

Figure B.9: Intergovernmental transfers (Grants-in-aid to state and local governments) since 1980

C Additional estimates

C.1 RDD type results



RMSE truncated at 0.1. Underlying regression is (2.3). RMSE is based on within fit, i.e., net of fixed effects for validating the model with fixed effects.

Figure C.10: Choosing optimal bandwidth by minimizing RMSE via cross-validation either by year or by state with party \times (year, state) fixed effects (left panel) and without fixed effects (right panel)

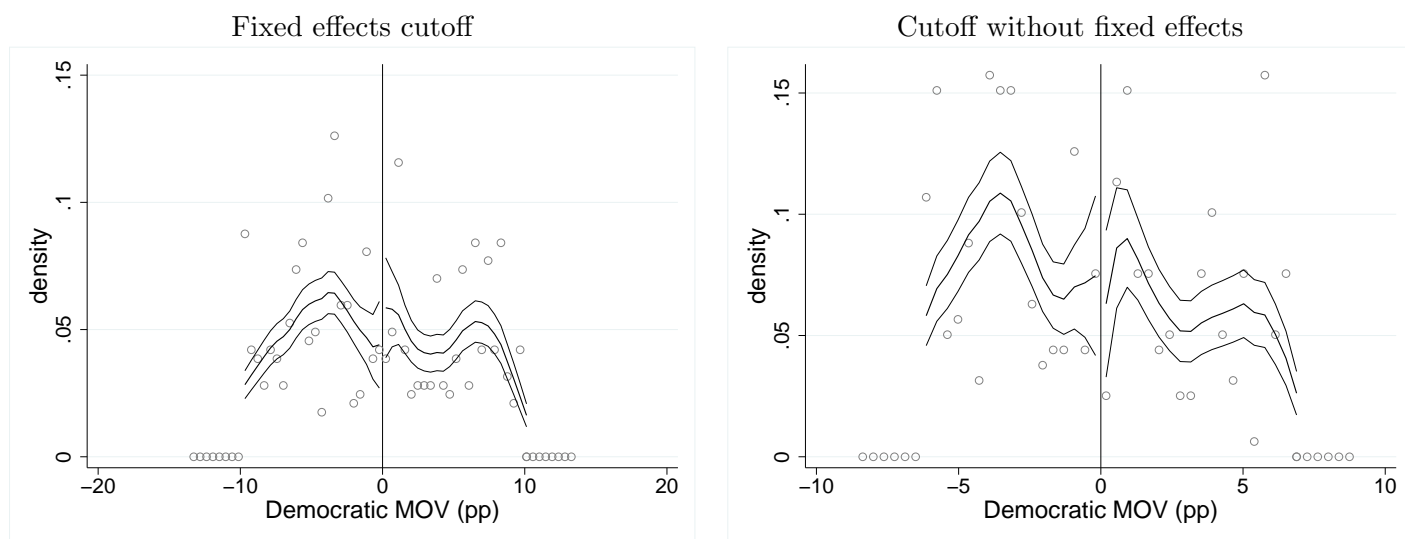
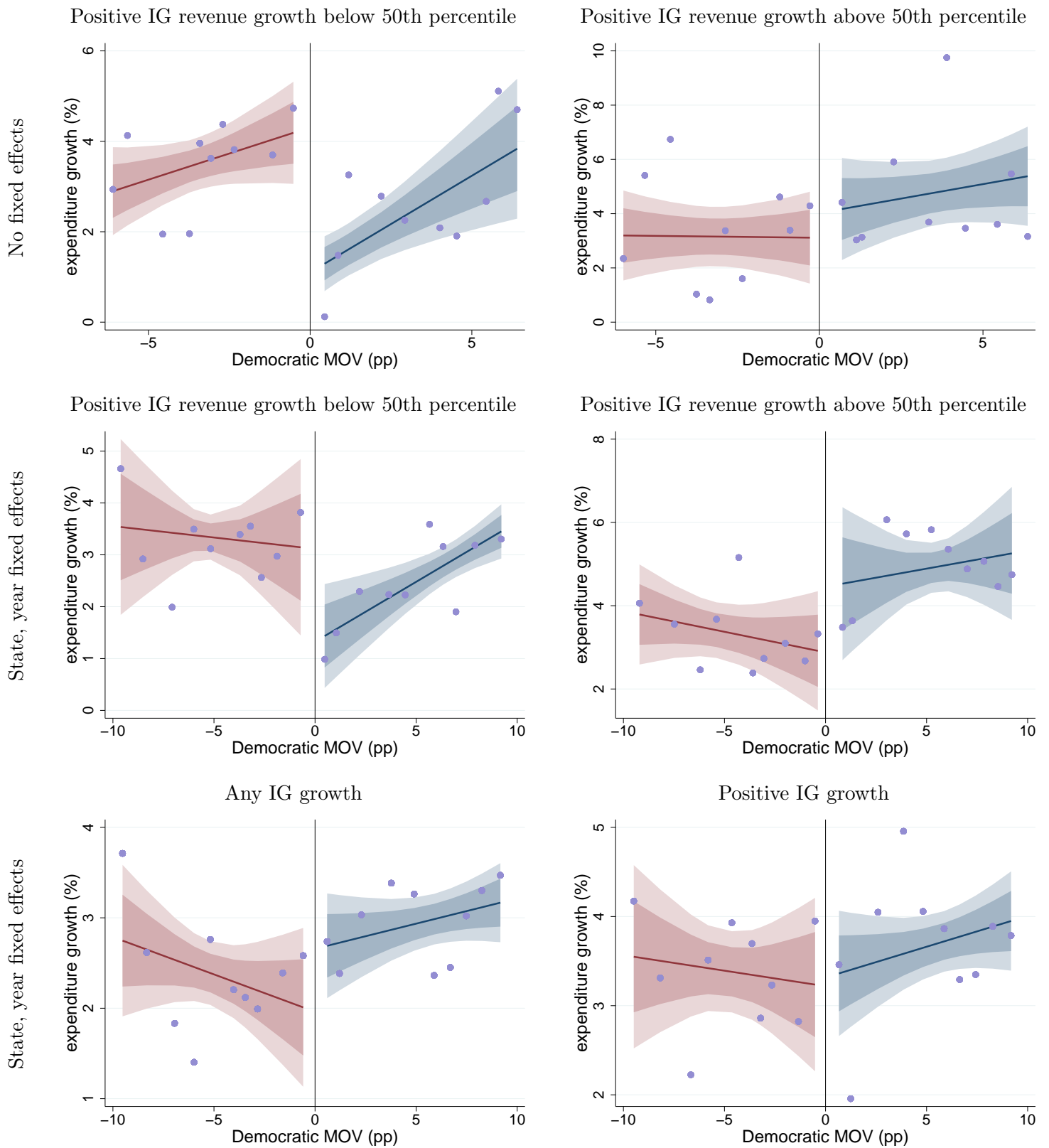
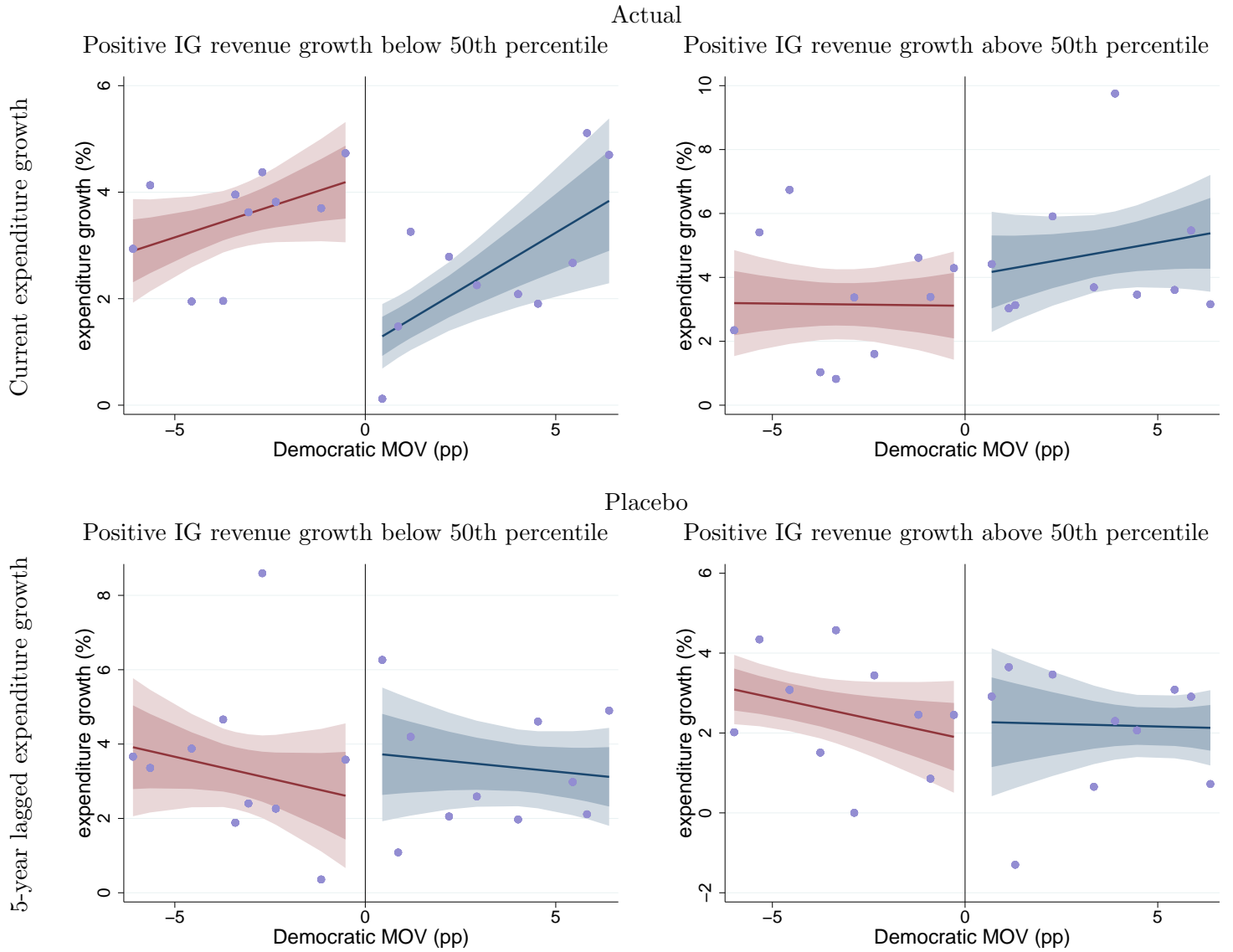


Figure C.11: McCrary density test for mean cutoff



± 1 (± 1.65) standard errors, based on coefficient standard errors clustered by year and state. No fixed effects. All observations receive equal weights within the shown MOV range.

Figure C.12: Expenditure growth binned RDD plot by IG transfer growth: Democratic governors increase expenditure more as IG transfers rise.



± 1 (± 1.65) standard errors, based on coefficient standard errors clustered by year and state. No fixed effects. All observations receive equal weights within the shown MOV range.

Figure C.13: Expenditure growth binned RDD plot by IG transfer growth: Democratic governors increase expenditure more as IG transfers rise. No FE. Placebo test.

Table C.4: Partisan determinants of total expenditure growth by state governments: 1983 to 2014. Full interactions to allow for MOV in addition to effect of governor. MOV cutoff chosen via cross-validation.

Cutoff choice	No fixed effects			With fixed effects			No MOV terms			
	(1) Average	(2) By year	(3) By state	(4) Average	(5) Average	(6) Average	(7) Average	(8) Average	(9) 4pp MOV	(10) 4pp MOV
Pos IG growth	0.181*** (4.16)	0.190*** (4.02)	0.164*** (3.80)	0.169** (2.66)	0.189*** (2.84)	0.200** (2.43)	0.184*** (5.00)	0.132*** (4.44)	0.227*** (4.08)	0.194*** (5.37)
Neg IG growth	-0.018 (-0.26)	-0.031 (-0.44)	0.015 (0.30)	-0.046 (-0.81)	-0.081 (-1.25)	0.168** (2.53)	0.081* (2.02)	-0.014 (-1.44)	0.123 (1.63)	-0.034 (-0.56)
Rep gov x Pos IG growth	-0.266*** (-3.49)	-0.325*** (-3.66)	-0.212** (-2.52)	-0.236** (-2.45)	-0.220* (-2.03)	-0.287** (-2.74)	-0.136*** (-2.84)	-0.101** (-2.22)	-0.286*** (-3.98)	-0.271*** (-3.88)
Rep gov x Neg IG growth	0.337*** (3.33)	0.375*** (3.10)	0.310*** (4.15)	0.343*** (5.53)	0.313*** (3.58)	0.230*** (2.82)	0.166*** (6.22)	0.186*** (5.91)	0.199** (2.62)	0.266*** (3.58)
Rep gov	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.016* (1.91)	0.018** (2.35)	0.024*** (4.20)	0.008** (2.41)	0.000 (0.00)	0.018*** (3.82)	0.000 (.)
MOV	0.002** (2.09)	0.002 (1.29)	0.002* (1.90)	0.001* (1.76)	0.002* (1.83)	0.001 (1.43)				
MOV x Pos IG growth	-0.010 (-1.37)	-0.013 (-1.40)	-0.007 (-1.16)	-0.007 (-0.70)	-0.010 (-0.84)	-0.004 (-0.33)				
MOV x Neg IG growth	0.001 (0.10)	0.003 (0.21)	-0.005 (-0.54)	0.007 (0.88)	0.013 (1.26)	-0.015 (-1.60)				
Rep gov x MOV x Pos IG growth	-0.013 (-0.98)	-0.021 (-1.25)	-0.010 (-0.96)	-0.016 (-1.26)	-0.010 (-0.82)	-0.023 (-1.30)				
Rep gov x MOV x Neg IG growth	0.027 (1.45)	0.032* (1.85)	0.036** (2.13)	0.019 (1.20)	0.003 (0.18)	0.044*** (3.28)				
Rep gov x MOV	-0.001 (-0.56)	0.002 (0.68)	-0.000 (-0.22)	-0.000 (-0.16)	-0.001 (-0.63)	0.001 (0.57)				
R-squared	0.54	0.56	0.53	0.46	0.56	0.18	0.17	0.52	0.22	0.69
R-sq, within	0.10	0.11	0.09	0.11	0.11	0.18	0.17	0.08	0.22	0.12
Observations	634	580	680	636	634	636	636	634	269	259
States	47	47	48	47	47	47	47	47	44	41
Years	32	32	32	32	32	32	32	32	32	32
State FE	By party	By party	By party	Yes	Yes	None	None	By party	None	By party
Year FE	By party	By party	By party	Yes	By region	None	None	By party	None	By party
MOV cutoff (pp)	10.0	9.0	11.0	10.0	10.0	10.0	10.0	10.0	4.0	4.0

Estimated following equation 2.2. Column (8) is estimated without lagged debt changes and GDP growth. t -statistics based on standard errors clustered by state and year. p -values based on t -distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$. To compute a dollar-to-dollar pass-through, multiply the elasticity by the Expenditure/IG revenue ratio.

Table C.5: Robustness of partisan determinants of total expenditure growth by state governments:
Interaction with economic variables. 5pp. MOV, 1983 to 2014.

	Control variable					
	(1) None	(2) Debt	(3) IG rev. share	(4) Pop. growth	(5) Exp/GDP	(6) Rev/GDP
Pos IG growth	0.195*** (5.90)	0.189*** (5.75)	0.228*** (3.83)	0.207*** (5.64)	0.141*** (3.44)	0.192*** (6.38)
Neg IG growth	-0.020 (-0.27)	-0.010 (-0.13)	-0.022 (-0.31)	-0.072 (-0.94)	0.023 (0.24)	-0.028 (-0.26)
Rep gov x Pos IG growth	-0.233*** (-3.40)	-0.232*** (-3.33)	-0.293*** (-3.01)	-0.233*** (-3.10)	-0.170** (-2.57)	-0.242*** (-3.67)
Rep gov x Neg IG growth	0.264** (2.69)	0.295** (2.68)	0.254** (2.36)	0.363*** (3.87)	0.187 (1.58)	0.278** (2.06)
Control		-0.008 (-0.88)	0.123 (0.44)	-1.507 (-1.20)	-1.659** (-2.13)	-0.193 (-0.25)
Control x Pos IG growth		0.011 (0.25)	-0.849 (-1.04)	3.747 (1.32)	-1.743 (-0.58)	1.430 (0.33)
Control x Neg IG growth		0.001 (0.05)	0.091 (0.06)	-11.979 (-1.27)	0.381 (0.13)	0.560 (0.19)
Rep gov x Control x Pos IG growth		0.002 (0.04)	0.680 (0.55)	3.509 (0.60)	2.411 (0.75)	0.214 (0.04)
Rep gov x Control x Neg IG growth		-0.023 (-1.10)	-2.699 (-1.53)	19.506* (1.71)	-6.857* (-1.99)	-9.022 (-1.61)
Rep gov x Control		0.010 (1.15)	-0.729** (-2.64)	1.182 (0.77)	-2.041* (-1.99)	-1.284 (-1.36)
R-squared	0.65	0.66	0.68	0.67	0.75	0.67
R-sq, within	0.13	0.15	0.21	0.17	0.36	0.17
Observations	313	313	313	313	313	313
States	43	43	43	43	43	43
Years	32	32	32	32	32	32

Estimated following equation 2.2. *t*-statistics based on standard errors clustered by state and year. *p*-values based on *t*-distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$.

C.2 Expenditure growth

Table C.6: Partisan determinants of total expenditure growth by state governments: 1983 to 2014. **IG excluding welfare. No control variables. Effects of dropping New England and states without line item veto.**

	All	w/o NE	Veto	All	w/o NE	Veto	All	w/o NE	Veto
IG incr.	0.193*** (6.14)	0.218*** (7.84)	0.197*** (6.89)	0.228*** (7.08)	0.238*** (8.11)	0.237*** (7.66)	0.194*** (5.37)	0.241*** (8.61)	0.229*** (8.44)
IG decr.	-0.108 (-1.12)	-0.194 (-1.70)	-0.053 (-0.45)	-0.124 (-1.67)	-0.193** (-2.11)	-0.151 (-1.44)	-0.034 (-0.56)	-0.309*** (-2.95)	-0.211** (-2.26)
Republican Gov.	0.021* (1.96)	0.033** (2.41)	0.035** (2.53)	0.014* (1.77)	0.010 (1.35)	0.010 (1.21)			
Rep x IG incr.	-0.183** (-2.05)	-0.232** (-2.68)	-0.255*** (-3.04)	-0.328*** (-5.16)	-0.331*** (-5.16)	-0.364*** (-4.96)	-0.271*** (-3.88)	-0.323*** (-3.45)	-0.323*** (-4.38)
Rep x IG decr.	0.216* (2.00)	0.320*** (3.43)	0.220 (1.64)	0.368*** (4.35)	0.419*** (3.98)	0.405*** (3.38)	0.266*** (3.58)	0.591*** (4.29)	0.507*** (3.96)
R-squared	0.75	0.77	0.75	0.62	0.65	0.64	0.69	0.73	0.72
R-sq, within	0.12	0.16	0.15	0.18	0.21	0.22	0.12	0.16	0.16
Observations	239	200	214	266	229	239	259	221	234
States	40	35	36	41	35	36	41	35	36
Years	31	30	30	32	32	31	32	31	31
State FE	Yes	Yes	Yes	Yes	Yes	Yes	By party	By party	By party
Year FE	By region	By region	By region	Yes	Yes	Yes	By party	By party	By party
Sample	all	w/o NE	Item Veto	all	w/o NE	Item Veto	all	w/o NE	Item Veto

Estimated following equation 2.2. Column (8) is estimated without lagged debt changes and GDP growth. t -statistics based on standard errors clustered by state and year. p -values based on t -distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$. To compute a dollar-to-dollar pass-through, multiply the elasticity by the Expenditure/IG revenue ratio.

Table C.7: Partisan determinants of total expenditure growth by state governments: 1983 to 2014. **IG excluding welfare. No control variables. Effects of switching governors.**

	Veto	Switches	Veto	Switches	Veto	Switches
IG incr.	0.197*** (6.89)	0.195*** (6.06)	0.237*** (7.66)	0.243*** (6.01)	0.229*** (8.44)	0.209*** (5.87)
IG decr.	-0.053 (-0.45)	0.163 (1.27)	-0.151 (-1.44)	-0.054 (-0.37)	-0.211** (-2.26)	0.098 (0.63)
Republican Gov.	0.035** (2.53)	0.038 (1.25)	0.010 (1.21)	0.015 (0.74)		
Rep x IG incr.	-0.255*** (-3.04)	-0.076 (-0.78)	-0.364*** (-4.96)	-0.261*** (-3.29)	-0.323*** (-4.38)	-0.151* (-1.79)
Rep x IG decr.	0.220 (1.64)	-0.076 (-0.71)	0.405*** (3.38)	0.236 (1.62)	0.507*** (3.96)	0.111 (0.65)
R-squared	0.75	0.76	0.64	0.72	0.72	0.78
R-sq, within	0.15	0.25	0.22	0.23	0.16	0.23
Observations	214	83	239	129	234	112
States	36	18	36	25	36	23
Years	30	22	31	28	31	25
State FE	Yes	Yes	Yes	Yes	By party	By party
Year FE	By region	By region	Yes	Yes	By party	By party
Sample	Item Veto	Switch	Item Veto	Switch	Item Veto	Switch

Estimated following equation 2.2. Column (8) is estimated without lagged debt changes and GDP growth. t -statistics based on standard errors clustered by state and year. p -values based on t -distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$. To compute a dollar-to-dollar pass-through, multiply the elasticity by the Expenditure/IG revenue ratio.

Table C.8: Partisan determinants of total expenditure growth by state governments: 1983 to 2014. **IG excluding welfare. No control variables. Effects of excluding election years.**

	All	No elec.	All	No elec.	All	No elec.
IG incr.	0.193*** (6.14)	0.235*** (6.63)	0.228*** (7.08)	0.216*** (5.70)	0.194*** (5.37)	0.229*** (7.71)
IG decr.	-0.108 (-1.12)	0.005 (0.04)	-0.124 (-1.67)	-0.076 (-0.84)	-0.034 (-0.56)	0.061 (0.51)
Republican Gov.	0.021* (1.96)	0.030** (2.66)	0.014* (1.77)	0.013 (1.40)		
Rep x IG incr.	-0.183** (-2.05)	-0.243** (-2.19)	-0.328*** (-5.16)	-0.351*** (-4.87)	-0.271*** (-3.88)	-0.362*** (-5.17)
Rep x IG decr.	0.216* (2.00)	0.114 (0.77)	0.368*** (4.35)	0.330*** (3.18)	0.266*** (3.58)	0.180 (1.27)
R-squared	0.75	0.80	0.62	0.67	0.69	0.74
R-sq, within	0.12	0.20	0.18	0.20	0.12	0.19
Observations	239	158	266	197	259	183
States	40	38	41	40	41	39
Years	31	23	32	30	32	27
State FE	Yes	Yes	Yes	Yes	By party	By party
Year FE	By region	By region	Yes	Yes	By party	By party
Sample	all	No election	all	No election	all	No election

Estimated following equation 2.2. Column (8) is estimated without lagged debt changes and GDP growth. *t*-statistics based on standard errors clustered by state and year. *p*-values based on *t*-distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$. To compute a dollar-to-dollar pass-through, multiply the elasticity by the Expenditure/IG revenue ratio.

Table C.9: Legislative control and partisan determinants of total expenditure growth by state governments: Interaction with share of Democratic legislatures in state congress. 5pp. MOV, 1983 to 2014.

	(1) Baseline	(2) Item veto	(3) Interacted	(4) Interacted & item veto
Pos IG growth	0.195*** (5.90)	0.214*** (7.54)	0.102*** (2.90)	0.109** (2.55)
Neg IG growth	-0.020 (-0.27)	-0.078 (-0.64)	-0.145 (-1.03)	-0.337* (-1.85)
Rep gov x Pos IG growth	-0.233*** (-3.40)	-0.266*** (-3.02)	-0.134* (-1.74)	-0.137 (-1.57)
Rep gov x Neg IG growth	0.264** (2.69)	0.327* (1.91)	0.463*** (2.85)	0.637*** (3.15)
Control			0.082 (0.82)	-0.049 (-0.37)
Control x Pos IG growth			1.505** (2.21)	1.681** (2.19)
Control x Neg IG growth			-2.401* (-1.99)	-3.785** (-2.74)
Rep gov x Control x Pos IG growth			-1.456 (-1.66)	-1.819* (-1.78)
Rep gov x Control x Neg IG growth			1.842 (1.44)	3.299** (2.28)
Rep gov x Control			-0.023 (-0.17)	0.120 (0.68)
R-squared	0.65	0.68	0.68	0.70
R-sq, within	0.13	0.14	0.22	0.24
Observations	313	270	279	239
States	43	36	41	35
Years	32	31	30	29

Estimated following equation 2.2. t -statistics based on standard errors clustered by state and year. p -values based on t -distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$.

Table C.10: Partisan determinants of total expenditure growth by state governments over longer horizons: (transfers exclude welfare) 1983 to 2014, 4pp. MOV

Horizon	(1) 1-year	(2) 2-year	(3) 3-year	(4) 4-year	(4) 4-year	(4) 4-year
Republican Gov.	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	-0.007 (-0.25)	0.055*** (2.87)
IG incr.	0.194*** (5.37)	0.182*** (5.82)	0.177*** (3.21)	0.247*** (6.36)	0.201*** (4.54)	0.213*** (5.34)
IG decr.	-0.034 (-0.56)	0.023 (0.27)	0.070 (1.30)	0.016 (0.15)	-0.122 (-1.28)	-0.165* (-1.81)
Rep x IG incr.	-0.271*** (-3.88)	-0.228*** (-3.96)	-0.186*** (-2.77)	-0.236*** (-5.55)	-0.173** (-2.61)	-0.175*** (-3.15)
Rep x IG decr.	0.266*** (3.58)	0.150 (1.49)	0.082 (1.02)	-0.025 (-0.20)	0.037 (0.42)	-0.062 (-0.67)
R-squared	0.69	0.80	0.83	0.83	0.75	0.88
R-sq, within	0.12	0.13	0.11	0.15	0.17	0.20
Observations	259	259	259	259	266	239
States	41	41	41	41	41	40
Years	32	32	32	32	32	31
StateFE	By party	By party	By party	By party	Yes	Yes
YearFE	By party	By party	By party	By party	Yes	By region
Controls	No	No	No	No	No	No

t-statistics based on standard errors clustered by state and year. *p*-values based on *t*-distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$. To compute a dollar-to-dollar pass-through, multiply the elasticity by the Expenditure/IG revenue ratio of four.

Table C.12: Marginal propensities to spend (elasticity) by use of expenditure: 4pp. MOV, 1968 to 2014.

	ExpOther	Educ	PublicWelf	Highways	NatResPark	FinAdmin	Judicial	HousCom	Sanitation	AirTrans
IG incr.	0.297** (2.64)	0.035 (0.54)	0.155** (2.12)	0.063 (0.36)	0.076 (0.55)	0.285 (0.83)	0.022 (0.31)	1.734** (2.20)	-1.942*** (-2.92)	0.568 (1.24)
IG decr.	-0.572 (-1.56)	-0.066 (-0.47)	-0.329* (-1.75)	1.071* (1.75)	0.398 (1.43)	-0.406 (-0.58)	-0.295 (-1.10)	1.379 (1.62)	-0.343 (-0.37)	-3.424*** (-3.01)
Rep x IG incr.	-0.304** (-2.10)	-0.136 (-1.02)	-0.398** (-2.69)	0.227 (0.83)	-0.475** (-2.06)	-0.264 (-0.66)	0.032 (0.17)	-2.086** (-2.41)	2.480* (1.96)	0.478 (0.41)
Rep x IG decr.	0.779** (2.14)	0.265 (1.52)	0.698*** (3.31)	-0.993 (-1.36)	-0.089 (-0.26)	0.276 (0.37)	0.205 (0.64)	-2.003** (-2.29)	0.647 (0.46)	3.710*** (2.80)
R-squared	0.60	0.45	0.58	0.43	0.36	0.43	0.39	0.46	0.54	0.26
R-sq, within	0.06	0.02	0.06	0.06	0.03	0.01	0.00	0.07	0.02	0.02
Observations	225.00	259.00	259.00	259.00	259.00	259.00	259.00	257.00	228.00	234.00
States	39	41	41	41	41	41	41	41	39	38
Years	26	32	32	32	32	32	32	32	32	32
Expenditure share	34.0	31.2	20.4	8.0	2.4	1.5	1.1	0.7	0.4	0.3

Estimated following equation 2.2. Party by year and party by state fixed effects. *t*-statistics based on standard errors clustered by state and year. *p*-values based on *t*-distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$.

Table C.11: Partisan difference in marginal propensity to spend out of IG revenue in the aftermath of the Great Recession

	(1)	(2)	(3)	(4)	(5)	(6)
4-yr IG growth	0.513*** (8.38)	0.543*** (8.87)	0.584*** (8.54)	0.569*** (7.86)	0.311*** (7.45)	0.525*** (4.10)
4-yr Republican fraction	-0.022 (-0.87)	-0.024 (-0.97)	-0.023 (-0.90)	-0.027 (-1.11)	-0.031 (-1.10)	-0.024 (-0.97)
4-yr Rep. x 4-yr IG growth	-0.243* (-2.00)	-0.325** (-2.69)	-0.451*** (-3.14)	-0.478*** (-3.49)	-0.308*** (-3.96)	-0.386** (-2.54)
R-squared	0.64	0.67	0.70	0.74	0.68	0.53
Observations	50	47	40	40	40	36
Other FE	No	No	No	Region	Region	Region
Exclude wealth funds?	No	Yes	Yes	Yes	Yes	Yes
Line item veto only?	No	No	Yes	Yes	Yes	Yes
Which IG	All	All	All	All	No welfare	Positive growth

Data on all elections. We regress 4-yr expenditure growth regression for $t \in \{2008, 2012\}$: $\ln \frac{E_{s,t}}{E_{s,t-4}} = \alpha_s + \beta_R \left(\frac{1}{4} \sum_{j=1}^4 Rep_{s,t-j} \right) + \gamma_0 \ln \frac{IG_{s,t}}{IG_{s,t-4}} + \gamma_R \left(\frac{1}{4} \sum_{j=1}^4 Rep_{s,t-j} \right) \times \ln \frac{IG_{s,t}}{IG_{s,t-4}} + \epsilon_{s,t}$, yielding an effective sample of one difference per state. Standard error are heteroskedasticity robust.

C.3 Revenue growth

Table C.13: Growth of net general revenue components: State FE, Region x Year FE, with controls

	Net general revenue				
	(1) 100 pp.	(2) 6 pp.	(3) 5 pp.	(4) 4 pp.	(5) 3 pp.
Debt change	0.029 (1.46)	-0.004 (-0.08)	0.055 (1.57)	0.047 (0.84)	0.018 (0.39)
GDP growth	0.364*** (4.76)	0.071 (0.48)	-0.074 (-0.39)	-0.016 (-0.07)	-0.298 (-1.18)
Rep x Debt change	0.018 (0.59)	0.036 (0.68)	-0.066 (-1.27)	-0.063 (-1.05)	-0.155** (-2.22)
Rep x Growth	-0.031 (-0.55)	0.173 (0.66)	0.209 (0.97)	0.333 (1.27)	0.878** (2.49)
Republican Gov.	0.003 (0.80)	-0.000 (-0.04)	0.007 (0.66)	0.005 (0.42)	0.000 (0.00)
IG incr.	0.074 (1.62)	0.099* (1.98)	0.155** (2.35)	0.169** (2.49)	0.171* (1.71)
IG decr.	-0.030 (-1.01)	-0.083 (-0.97)	-0.127 (-0.78)	-0.189 (-1.09)	-0.383** (-2.59)
Rep x IG incr.	-0.026 (-0.52)	-0.118 (-1.52)	-0.176** (-2.07)	-0.174 (-1.63)	-0.131 (-0.69)
Rep x IG decr.	0.018 (0.38)	0.183 (1.59)	0.348** (2.42)	0.293* (1.94)	0.127 (0.92)
R-squared	0.48	0.66	0.73	0.77	0.86
R-sq, within	0.05	0.04	0.06	0.09	0.31
Observations	1499	374	300	239	119
States	48	45	43	40	28
Years	32	32	31	31	27

t-statistics based on standard errors clustered by state and year. *p*-values based on *t*-distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$.

Table C.14: Growth of tax revenue components: State FE, Region x Year FE, with controls

	Tax revenue				
	(1) 100 pp.	(2) 6 pp.	(3) 5 pp.	(4) 4 pp.	(5) 3 pp.
Debt change	0.015 (0.68)	0.036 (1.03)	0.061 (1.52)	0.090 (1.26)	0.046 (0.90)
GDP growth	0.510*** (5.67)	-0.006 (-0.04)	-0.159 (-0.75)	-0.153 (-0.70)	-0.346 (-1.66)
Rep x Debt change	0.015 (0.46)	-0.003 (-0.05)	-0.057 (-0.98)	-0.095 (-1.32)	-0.123** (-2.33)
Rep x Growth	-0.007 (-0.09)	0.329 (1.47)	0.340 (1.38)	0.539* (1.99)	1.273*** (3.70)
Republican Gov.	-0.002 (-0.26)	0.005 (0.55)	0.012 (1.18)	0.013 (0.93)	0.000 (0.00)
IG incr.	0.047 (1.01)	0.114** (2.27)	0.175** (2.43)	0.201*** (3.38)	0.144 (1.26)
IG decr.	-0.080* (-1.85)	-0.198** (-2.43)	-0.173 (-1.10)	-0.276* (-1.75)	-0.349** (-2.75)
Rep x IG incr.	0.059 (0.80)	-0.176** (-2.59)	-0.217** (-2.15)	-0.220* (-1.72)	-0.162 (-0.96)
Rep x IG decr.	0.045 (0.54)	0.317*** (2.94)	0.463*** (2.86)	0.414** (2.17)	0.338*** (2.79)
R-squared	0.49	0.66	0.71	0.79	0.90
R-sq, within	0.07	0.05	0.07	0.13	0.39
Observations	1499	374	300	239	119
States	48	45	43	40	28
Years	32	32	31	31	27

t-statistics based on standard errors clustered by state and year. *p*-values based on *t*-distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$.

Table C.15: Growth of income and sales tax revenue growth: State FE, Region x Year FE, with controls

	Income & sales tax				
	(1) 100 pp.	(2) 6 pp.	(3) 5 pp.	(4) 4 pp.	(5) 3 pp.
Debt change	0.034 (1.41)	0.079** (2.06)	0.099* (1.97)	0.094 (1.38)	0.045 (0.90)
GDP growth	0.371*** (4.86)	-0.070 (-0.43)	-0.162 (-0.81)	-0.197 (-0.92)	-0.336* (-1.79)
Rep x Debt change	-0.001 (-0.03)	-0.035 (-0.60)	-0.048 (-0.72)	-0.063 (-0.87)	-0.127** (-2.44)
Rep x Growth	0.024 (0.26)	0.267 (1.11)	0.225 (0.99)	0.565** (2.39)	1.294*** (4.07)
Republican Gov.	-0.003 (-0.50)	0.009 (0.83)	0.021* (1.87)	0.017 (1.03)	0.000 (0.00)
IG incr.	0.039 (0.74)	0.094 (1.34)	0.195** (2.19)	0.224*** (3.20)	0.144 (1.16)
IG decr.	-0.101** (-2.26)	-0.161* (-1.86)	-0.195 (-1.16)	-0.282 (-1.64)	-0.339** (-2.41)
Rep x IG incr.	0.088 (1.07)	-0.133* (-1.70)	-0.273** (-2.57)	-0.234* (-1.73)	-0.103 (-0.64)
Rep x IG decr.	0.053 (0.58)	0.332*** (2.93)	0.548*** (2.90)	0.490** (2.40)	0.515*** (4.09)
R-squared	0.51	0.70	0.73	0.79	0.91
R-sq, within	0.05	0.06	0.09	0.15	0.44
Observations	1499	374	300	239	119
States	48	45	43	40	28
Years	32	32	31	31	27

t-statistics based on standard errors clustered by state and year. *p*-values based on *t*-distribution with degrees of freedom equal to the number of year-clusters. ***: $p < 0.1$, **: $p < 0.05$, *: $p < 0.01$.

C.4 Private sector activity

Table C.16: Partisan determinants of employment-to-population ratio changes: 1983 to 2014.

	Current ($t - \frac{1}{2}$) total employment						Future ($t + \frac{1}{2}$) total emp.	Current public emp.
	(1) ≤ 5 pp.	(2) ≤ 4 pp.	(3) ≤ 3 pp.	(4) ≤ 4 pp.	(5) ≤ 4 pp.	(6) ≤ 10 pp.	(7) ≤ 4 pp.	(8) ≤ 4 pp.
IG incr.	4.179*** (2.86)	4.376** (2.44)	-0.609 (-0.60)	3.555** (2.59)	4.612*** (2.94)	2.175 (1.55)	-2.793*** (-3.37)	1.911*** (2.93)
IG decr.	-1.319 (-1.06)	-1.199 (-0.63)	0.166 (0.11)	-0.782 (-0.63)	-1.715 (-0.84)	0.093 (0.05)	-0.416 (-0.31)	0.073 (0.05)
Rep x IG incr.	-5.256*** (-3.33)	-4.684** (-2.52)	-0.307 (-0.27)	-4.043*** (-2.82)	-5.121*** (-3.23)	-3.847** (-2.21)	3.680*** (3.78)	-1.072 (-1.19)
Rep x IG decr.	1.100 (0.75)	0.099 (0.04)	1.172 (0.66)	0.362 (0.23)	1.642 (0.78)	-0.755 (-0.29)	-0.862 (-0.58)	-1.515 (-0.93)
Republican Gov.				0.145 (1.15)	0.161 (0.76)	0.000 (0.00)		
R-squared	0.86	0.84	0.90	0.79	0.90	0.79	0.86	0.64
R-sq, within	0.15	0.16	0.02	0.13	0.27	0.05	0.10	0.05
Observations	313.00	259.00	169.00	266.00	239.00	634.00	259.00	259.00
States	43	41	32	41	40	47	41	41
Years	32	32	32	32	31	32	32	32
State FE	By party	By party	By party	Yes	Yes	By party	By party	By party
Year FE	By party	By party	By party	Yes	By region	By party	By party	By party
Controls	No	No	No	No	No	MOV terms	No	No

All regressions include state and year fixed effects. t -statistics based on standard errors clustered by state and year.

Table C.17: Partisan determinants of per capita GDP growth: 1983 to 2014.

	Future ($t + \frac{1}{2}$) private GDP						Future overall GDP	Current ($t - \frac{1}{2}$) private GDP
	(1) ≤ 5 pp.	(2) ≤ 4 pp.	(3) ≤ 3 pp.	(4) ≤ 4 pp.	(5) ≤ 4 pp.	(6) ≤ 10 pp.	(7) ≤ 4 pp.	(8) ≤ 4 pp.
IG incr.	-0.098*** (-3.23)	-0.116*** (-5.80)	-0.080 (-1.44)	-0.069** (-2.72)	-0.110*** (-4.55)	-0.051 (-1.25)	-0.102*** (-5.39)	-0.021 (-0.29)
IG decr.	0.026 (0.39)	0.063 (0.66)	0.080 (0.77)	0.014 (0.26)	0.076 (1.12)	0.089 (1.38)	0.067 (0.82)	-0.047 (-0.73)
Rep x IG incr.	0.085** (2.42)	0.107*** (3.03)	0.095 (1.51)	0.059 (1.64)	0.077** (2.28)	0.018 (0.36)	0.091*** (2.96)	0.011 (0.14)
Rep x IG decr.	-0.031 (-0.43)	-0.084 (-0.80)	-0.079 (-0.59)	-0.035 (-0.68)	-0.037 (-0.59)	-0.136 (-1.52)	-0.078 (-0.87)	0.025 (0.36)
Republican Gov.				-0.008 (-1.21)	-0.004 (-0.45)	0.000 (0.00)		
R-squared	0.76	0.75	0.76	0.62	0.78	0.55	0.75	0.71
R-sq, within	0.06	0.08	0.02	0.04	0.10	0.02	0.08	0.01
Observations	313.00	259.00	169.00	266.00	239.00	634.00	259.00	259.00
States	43	41	32	41	40	47	41	41
Years	32	32	32	32	31	32	32	32
State FE	By party	By party	By party	Yes	Yes	By party	By party	By party
Year FE	By party	By party	By party	Yes	By region	By party	By party	By party
Controls	No	No	No	No	No	MOV terms	No	No

All regressions include state and year fixed effects. t -statistics based on standard errors clustered by state and year.

D Model appendix

D.1 Households

The economy consists of two representative regions, with (population) measures of $n \in (0, 1)$ and $1 - n$, respectively. Two types of households live within each region. A measure $\mu \in (0, 1]$ of households is unconstrained, while a measure $1 - \mu$ of households has no access to saving or borrowing. Each household has the same labor endowment and supplies labor elastically.

Constrained home households Constrained households consume their entire income. They maximize utility by setting their labor supply N_t^c and consuming the proceeds.

$$U_t = \max_{\{C_s^u, B_s^u, N_s^u, I_s, u_s, K_s\}_{s \geq t}} \mathbb{E}_t \sum_{s=t}^{\infty} \beta^{s-t} \tilde{u}(C_s^u, N_s; G_s^{st}) \quad (\text{D.1})$$

$$P_t C_t^c \leq W_t N_t^c + T r_t + P r_t^c \quad (\text{D.2})$$

Optimality:

$$[N_t^c] \quad \tilde{u}_{c,t}((1 - \tau_t)w_t N_t^c + t r_t + p r_t^c, N_t^c; G_s^{st})(1 - \tau_t) \frac{W_t}{P_t} = -\tilde{u}_{c,t}((1 - \tau_t)w_t N_t^c + t r_t + p r_t^c, N_t^c; G_s^{st}). \quad (\text{D.3})$$

Preferences:

$$[GHH] \quad \tilde{u}(C, N; G^{st}) = \frac{\left((C^{1-1/\lambda} + \kappa_G^c ((1 - \phi)G^{st})^{1-1/\lambda})^{\frac{\lambda}{\lambda-1}} - \kappa_N^c \frac{N^{1+1/\epsilon_N}}{1+1/\epsilon_N} \right)^{1-1/\epsilon_c} - 1}{1 - 1/\epsilon_c}.$$

$$[SEP] \quad \tilde{u}(C, N; G^{st}) = \frac{\left(((1 - \kappa_G^c)C^{1-1/\lambda} + \kappa_G^c ((1 - \phi)G^{st})^{1-1/\lambda})^{\frac{\lambda}{\lambda-1}} \right)^{1-1/\epsilon_c} - 1}{1 - 1/\epsilon_c} - \kappa_N^c \frac{N^{1+1/\epsilon_N}}{1 + 1/\epsilon_N}.$$

In the GHH case:

$$\begin{aligned} \tilde{u}_c &= \left(\left(C^{1-1/\lambda} + \kappa_G^c (G^{st})^{1-1/\lambda} \right)^{\frac{\lambda}{\lambda-1}} - \kappa_N^c \frac{N^{1+1/\epsilon_N}}{1 + 1/\epsilon_N} \right)^{-1/\epsilon_c} \left(1 + \kappa_G^c (G^{st}/C)^{1-1/\lambda} \right)^{\frac{1}{\lambda-1}} \\ \tilde{u}_N &= \left(\left(C^{1-1/\lambda} + \kappa_G^c (G^{st})^{1-1/\lambda} \right)^{\frac{\lambda}{\lambda-1}} - \kappa_N^c \frac{N^{1+1/\epsilon_N}}{1 + 1/\epsilon_N} \right)^{-1/\epsilon_c} \kappa_N^c N^{1/\epsilon_N} \end{aligned}$$

In the separable case:

$$\begin{aligned} \tilde{u}_c &= C^{-1/\epsilon_c} (1 - \kappa_G^c) \left((1 - \kappa_G^c) + \kappa_G^c (G^{st}/C)^{1-1/\lambda} \right)^{\frac{1-\lambda/\epsilon_c}{\lambda-1}} \\ \tilde{u}_N &= \kappa_N^c N^{1/\epsilon_N} \end{aligned}$$

For future reference, let lower case letters denote the real counterpart of nominal variables, e.g., $w_t \equiv \frac{W_t}{P_t}$.

With GHH preferences:

$$[GHH] \quad (1 - \tau_t)w_t \left(1 + \kappa_G^c (G^{st}/(w_t N_t^c + tr_t + pr_t^c))^{1-1/\lambda}\right)^{\frac{1}{\lambda-1}} = \kappa_N^c (N_t^c)^{1/\varepsilon_N}. \quad (D.4)$$

With separable preferences,

$$[SEP] \quad (1 - \tau_t)(1 - \kappa_G^c)w_t \left((1 - \kappa_G^c) + \kappa_G^c (G^{st}/(w_t N_t^c + tr_t + pr_t^c))^{1-1/\lambda}\right)^{\frac{1-\lambda/\varepsilon_G}{\lambda-1}} = \kappa_N^c (N_t^c)^{1/\varepsilon_N} C^{1/\varepsilon_C}. \quad (D.5)$$

Given w_t , this equation implicitly pins down labor supply.

Unconstrained home households Unconstrained households choose consumption C_t^u , real bond holdings B_{t-1}^u/P_t , labor supply N_t^u , investment I_t^u , capacity utilization u_t , and physical capital K_{t-1} to maximize lifetime utility subject to the budget constraint, and the law of motion for capital.

$$U_t = \max_{\{C_s^u, B_s^u, N_s^u, I_s^u, u_s, K_s\}_{s \geq t}} \mathbb{E}_t \sum_{s=t}^{\infty} \beta^{s-t} u(C_s^u, B_{s-1}^u/P_t, N_s^u; G_s^{st}) \quad (D.6)$$

$$P_t(C_t^u + I_t) + K_{t-1}\delta(u_t) + B_t^u \leq (1 - \tau_t)W_t N_t^u + r_t^k u_t K_{t-1} + B_{t-1}^u R_{t-1}^n + Tr_t + Pr_t \quad (D.7)$$

$$K_t \leq (1 - \delta(u_t))K_{t-1} + \left(1 - \frac{\kappa_I}{2} \left(\frac{I_t}{I_{t-1}} - 1\right)^2\right) I_t \quad (D.8)$$

In the presence of complete markets, the household can also purchase a set of Arrow-Debreu securities at the beginning of time.

We model preferences of the unconstrained households as having the same functional form as those by the constrained households plus an additively separately demand for bond holdings:

$$u(C, b, N; G^{st}) = \tilde{u}(C, N; G^{st}) + \kappa_b \frac{b^{1-1/\varepsilon_b}}{1 - 1/\varepsilon_b}. \quad (D.9)$$

This implies that the ratio of substitution between consumption and bonds is given by:

$$[GHH] \quad \frac{u_b}{u_c} = \kappa_b b^{-1/\varepsilon_b} \frac{\left((C^{1-1/\lambda} + \kappa_G^c (G^{st})^{1-1/\lambda})^{\frac{\lambda}{\lambda-1}} - \kappa_N^c \frac{N^{1+1/\varepsilon_N}}{1+1/\varepsilon_N}\right)^{1/\varepsilon_c}}{(1 + \kappa_G^c (G^{st}/C)^{1-1/\lambda})^{\frac{1}{\lambda-1}}} \quad (D.10)$$

$$[SEP] \quad \frac{u_b}{u_c} = \kappa_b b^{-1/\varepsilon_b} \frac{C^{1/\varepsilon_c}}{(1 + \kappa_G^c (G^{st}/C)^{1-1/\lambda})^{\frac{1-\lambda/\varepsilon_G}{\lambda-1}}} \quad (D.11)$$

Using $\beta^t \lambda_t$ and $\beta^t \nu_t$ as the Lagrange multipliers on (D.50) and (D.8), the FOC are given by:

$$\begin{aligned} [C] \quad & u_{c,t} = \lambda_t P_t \\ [N] \quad & u_{N,t} = -\lambda(1 - \tau_t)W_t \\ [B] \quad & \lambda_t = \mathbb{E}_t \left[\beta \left(\frac{u_{b,t+1}}{P_{t+1}} + \lambda_{t+1} R_t^n \right) \right] \end{aligned}$$

$$\begin{aligned}
[I] \quad & \lambda_t P_t = \nu_t \left(1 - \frac{\kappa_I}{2} \left(\frac{I_t}{I_{t-1}} - 1 \right)^2 - \kappa_I \left(\frac{I_t}{I_{t-1}} - 1 \right) \frac{I_t}{I_{t-1}} \right) + \mathbb{E}_t \left[\beta \nu_{t+1} \left(\frac{I_{t+1}}{I_t} - 1 \right) \frac{I_{t+1}}{I_t} \right] \\
[K] \quad & \nu_t = \mathbb{E}_t \left[\beta \left((1 - \delta_{t+1}) \nu_{t+1} + (r_{t+1}^k u_{t+1} - \delta(u_{t+1})) \lambda_{t+1} \right) \right] \\
[u] \quad & \nu_t \delta'(u_t) K_{t-1} = \lambda_t r_t^k K_{t-1}
\end{aligned}$$

Eliminating λ_t and defining $q_t^n \equiv \frac{\nu_t}{\lambda_t}$ and $M_{t+1}^n \equiv \beta \frac{u_{c,t+1}}{u_{c,t}} \frac{P_t}{P_{t+1}}$:

$$[N] \quad \frac{-u_{N,t}}{u_{c,t}} = (1 - \tau_t) \frac{W_t}{P_t} \quad (\text{D.12})$$

$$[B] \quad 1 = \mathbb{E}_t \left[M_{t+1}^n \left(\frac{u_{b,t+1}}{u_{c,t+1}} + R_t^n \right) \right] \quad (\text{D.13})$$

$$[I] \quad P_t = q_t^n \left(1 - \frac{\kappa_I}{2} \left(\frac{I_t}{I_{t-1}} - 1 \right)^2 - \kappa_I \left(\frac{I_t}{I_{t-1}} - 1 \right) \frac{I_t}{I_{t-1}} \right) + \mathbb{E}_t \left[M_{t+1}^n q_{t+1}^n \left(\frac{I_{t+1}}{I_t} - 1 \right) \frac{I_{t+1}}{I_t} \right] \quad (\text{D.14})$$

$$[K] \quad q_t^n = \mathbb{E}_t \left[M_{t+1}^n \left((1 - \delta_{t+1}) q_{t+1}^n + r_{t+1}^k u_{t+1} - \delta(u_{t+1}) \right) \right] \quad (\text{D.15})$$

$$[u] \quad q_t^n \delta'(u_t) = r_t^k \quad (\text{D.16})$$

Utilization costs:

$$\delta(u) = \bar{\delta}_0 + \bar{\delta}_1(u - 1) + \frac{1}{2} \bar{\delta}_2(u - 1)^2 \quad (\text{D.17})$$

With this specification, $\delta'(1) = \bar{\delta}_1$, $\delta''(1) = \bar{\delta}_2$.

Private sector demand. Total home consumption is given by:

$$C_t = \mu C_t^u + (1 - \mu) C_t^c. \quad (\text{D.18})$$

$$N_t = \mu N_t^u + (1 - \mu) N_t^c. \quad (\text{D.19})$$

Total home investment is given by:

$$I_t = \mu I_t^c. \quad (\text{D.20})$$

Similarly for bond holds and capital.

Following [Nakamura and Steinsson \(2014\)](#), the composite consumption (and investment) good is given by an aggregate of home and foreign varieties:

$$C_t = \left(\phi_H^{1/\eta} C_{Ht}^{1-1/\eta} + \phi_F^{1/\eta} \right)^{\frac{\eta}{\eta-1}}, \quad \phi_F = 1 - \phi_H, \quad (\text{D.21})$$

where the individual varieties enter as follows:

$$C_{Xt} = \left(\int_0^1 c_{xt}(z)^{1-1/\theta} dz \right)^{\frac{\theta}{\theta-1}}, \quad X \in \{H, F\}. \quad (\text{D.22})$$

All individual prices p_{xt} are denominated in “dollars” and common across regions.

The corresponding price indices and individual demands are:

$$C_{Xt} = \phi_X C_t \left(\frac{P_{Xt}}{P_t} \right)^{-\eta} \quad (\text{D.23})$$

$$c_{xt}(z) = C_{Xt} \left(\frac{p_{xt}(z)}{P_{Xt}} \right)^{-\theta} \quad (\text{D.24})$$

$$P_{Xt} = \left(\int_0^1 p_{xt}(z)^{1-\theta} dz \right)^{\frac{1}{1-\theta}} \quad (\text{D.25})$$

$$P_t = \left(\phi_H P_{Ht}^{1-\eta} + \phi_F P_{Ft}^{1-\eta} \right)^{\frac{1}{1-\eta}} \quad (\text{D.26})$$

Foreign households. The foreign region is set up symmetrically, with equal demand elasticities and an analogous home bias $\phi_H^* > 1 - n$. * superscripts denote foreign demands.

Perfect risk sharing. With perfect risk sharing we have that:

$$X_t \equiv \frac{P_t^*}{P_t} = M_t \equiv M_t^n \frac{P_{t+1}}{P_t}. \quad (\text{D.27})$$

Also assume that, initially, $NFA_t = 0$.

Imperfect risk sharing. In this case, marginal utility is only equalized ex ante.

To ensure stationarity, we assume that:

$$R_{Ht}^n = R_t^n \exp(-\psi_{NFA} NFA_t) \quad R_{Ft}^n = R_t^n \exp(-\psi_{NFA} NFA_t^*) = R_t^n \exp(\psi_{NFA} NFA_t), \quad (\text{D.28})$$

where households take the net foreign asset position (NFA) as given. These returns also enter the budget constraints of the optimizing household and the local government.

D.2 Firms

Within each region, there is a unit measure of firms, indexed by z . Firms produce

$$y_{xt}(z) = \bar{A}_t (K_t^e)^\alpha N_t(z)^{1-\alpha}. \quad (\text{D.29})$$

Firms face a demand curve given by:

$$D_{ht} = D_{Ht} \left(\frac{p_{ht}(z)}{p_{Ht}} \right)^{-\theta}.$$

Optimal factor demands satisfy:

$$[N_t(z)] \quad W_t = (1 - \alpha) \frac{y_{xt}(z)}{N_t(z)} MC_{ht}(z). \quad (\text{D.30})$$

$$[K_t(z)^e] \quad r_t^k = \alpha \frac{y_{xt}(z)}{K_t(z)^e} MC_{ht}(z). \quad (\text{D.31})$$

Prices can only reset prices with probability $1 - \xi$ and otherwise increase prices at an exogenous rate $\bar{\Pi} \geq 1$. Home firms' objective is therefore:

$$\begin{aligned} \mathbb{E}_t \sum_{s=0}^{\infty} \left(\prod_{u=0}^{s-1} M_{t+u}^n \xi \right) & \left(P_{h,t}(z) \bar{\Pi}^s D_{H,t+s} \left(\frac{\bar{\Pi}^s P_{h,t}(z)}{P_{H,t+s}} \right)^{-\theta} - W_{t+s} N_{t+s}(z) - r_{t+s}^k K_{t+s}^e(z) \right) \quad (\text{D.32}) \\ & = \mathbb{E}_t \sum_{s=0}^{\infty} \left(\prod_{u=0}^{s-1} M_{t+u}^n \xi \right) \left(P_{h,t}(z) \bar{\Pi}^s D_{H,t+s} \left(\frac{\bar{\Pi}^s P_{h,t}(z)}{P_{H,t+s}} \right)^{-\theta} - MC_{ht} D_{H,t+s} \left(\frac{\bar{\Pi}^s P_{h,t}(z)}{P_{H,t+s}} \right)^{-\theta} \right). \end{aligned} \quad (\text{D.33})$$

Optimal pricing:

$$P_{ht}(z) = \frac{\theta}{\theta - 1} \frac{CN_t^n}{CD_t}, \quad (\text{D.34})$$

where

$$\begin{aligned} CN_t^n & \equiv \mathbb{E}_t \sum_{j=0}^{\infty} (\bar{\Pi}^{-\theta} \xi)^j \left(\prod_{u=0}^{j-1} M_{t,t+u}^n \right) y_{h,t+j}(z) MC_{t+j}(z), = y_{h,t}(z) MC_t^n(z) + \mathbb{E}_t[M_{t,t+1}^n \bar{\Pi}^{-\theta} \xi CN_{t+1}^n]. \\ CD_t & \equiv \mathbb{E}_t \sum_{j=0}^{\infty} (\bar{\Pi}^{1-\theta} \xi)^j \left(\prod_{u=0}^{j-1} M_{t,t+u}^n \right) y_{h,t+j}(z) = y_{h,t}(z) + \mathbb{E}_t[M_{t,t+1}^n \bar{\Pi}^{1-\theta} \xi CD_{t+1}]. \end{aligned}$$

For foreign producers, the above expression applies with discount factor $M_{t,t+1}^{n*}$ and with (f, F) replacing (h, H) .

Equivalently, the real target price is:

$$p_{ht}(z) \equiv \frac{P_{ht}(z)}{P_t} = \frac{\theta}{\theta - 1} \frac{CN_t}{CD_t}, \quad (\text{D.35})$$

where

$$CN_t = y_{h,t}(z) MC_t^n(z) + \mathbb{E}_t[M_{t,t+1}^n \Pi_{t+1} \bar{\Pi}^{-\theta} \xi CN_{t+1}].$$

In the foreign region, the real target price is:

$$p_{ft}(z) \equiv \frac{P_{ft}(z)}{P_t} = \frac{\theta}{\theta - 1} \frac{CN_t^*}{CD_t^*}, \quad (\text{D.36})$$

where

$$CN_t^* = y_{f,t}(z) \frac{MC_t^{n*}(z)}{P_t^*} X_t + \mathbb{E}_t[M_{t,t+1}^{n*} \Pi_{t+1} \bar{\Pi}^{-\theta} \xi CN_{t+1}^*].$$

Note that CN_t^* is expressed relative to home currency prices, the future inflation rate is also that of the home region.

The home producer price index becomes:

$$P_{Ht} = \left((1 - \xi) P_{ht}(z)^{1-\theta} + \xi (P_{H,t-1} \bar{\Pi})^{1-\theta} \right)^{\frac{1}{1-\theta}}$$

$$\begin{aligned}
\Leftrightarrow \quad \Pi_{H,t} &\equiv \frac{P_{Ht}}{P_{H,t-1}} = \left((1-\xi) \left(\frac{P_{ht}(z)}{P_t} \frac{P_t}{P_{H,t}} \Pi_{H,t} \right)^{1-\theta} + \xi \bar{\Pi}^{1-\theta} \right)^{\frac{1}{1-\theta}} \\
&\Leftrightarrow \quad \Pi_{Ht}^{1-\theta} = (1-\xi) \left(\frac{p_{ht}}{p_{Ht}} \Pi_{H,t} \right)^{1-\theta} + \xi \bar{\Pi}^{1-\theta}
\end{aligned}$$

Similarly, foreign producer price inflation is given by:

$$\Pi_{Ft}^{1-\theta} = (1-\xi) \left(\frac{p_{ft}}{p_{Ft}} \Pi_{F,t} \right)^{1-\theta} + \xi \bar{\Pi}^{1-\theta}$$

using that p_{Ft} is also expressed relative to P_t .

Public infrastructure. We model public infrastructure with a congestion externality in the average level of variety production, $\bar{y}_{ht} \equiv \int_0^1 y_{ht}(z) dz$:

$$\bar{A}_t = A_t^{\frac{1}{1-\zeta}} \left(\frac{K_{t-1}^G}{\bar{y}_{ht}} \right)^{\frac{\zeta}{1-\zeta}}. \quad (\text{D.37})$$

With this choice, the average production level across varieties is given by:

$$\bar{y}_{ht} = A_t (K_{t-1}^G)^\zeta ((K_t^e)^\alpha N_t(z)^{1-\alpha})^{1-\zeta} \approx Y_{Ht}. \quad (\text{D.38})$$

To a first order, this also represents aggregate supply.

Note that by definition:

$$\Pi_{Ht} \equiv \frac{P_{Ht}}{P_{H,t-1}} = \frac{p_{Ht}}{p_{H,t-1}} \Pi_t \quad \Leftrightarrow \quad p_{Ht} = \frac{\Pi_{Ht}}{\Pi_t} p_{H,t-1}. \quad (\text{D.39})$$

D.3 Government

We are considering the cash-less limit, in which monetary policy does not generate revenue for the government.

Monetary authority The monetary authority sets interest rates according to:

$$R_t^n = (\bar{\Pi}/\beta)^{\rho_r} \left(\left(\frac{\bar{\Pi}_t}{\bar{\Pi}} \right)^{\psi_{r\pi}} \left(\frac{\bar{Y}_t}{\bar{Y}} \right)^{\psi_{ry}} \right)^{1-\rho_r}, \quad (\text{D.40})$$

$$\bar{\Pi}_t \equiv n\Pi_t + (1-n)\Pi_t^* \quad (\text{D.41})$$

$$\bar{Y}_t \equiv nY_t + (1-n)Y_t^*. \quad (\text{D.42})$$

State governments

$$\begin{aligned}
G_{st,t} &= \psi_{IG} \left(\frac{IG_t}{P_t} - \bar{IG} \right) + G_{st,t}^x \\
G_{st,t}^x &= (1 - \rho_{st,g}) \bar{G}^{st} + \rho_{st,g} G_{st,t-1}^x + \omega_{st,g} \epsilon_{st,t}^x
\end{aligned}$$

Motivated by our estimates that most spending components adjust to changes in transfers, we assume that states spend a fraction $1 - \phi$ on public services. These may affect the households' flow utility. States invest the remaining fraction ϕ of overall spending in infrastructure:

$$K_{st,t} = (1 - \delta_G)K_{st,t-1} + \phi G_{st,t}. \quad (\text{D.43})$$

States adjust labor taxes to finance the current deficit:

$$(1 - \gamma^s)((R_{t-1}^n - 1)B_{t-1}^{st} - (\bar{R}^n - 1)\frac{\bar{b}^{st}}{\Pi}P_t) + P_t G_t^{st} - P_t \bar{G}_t^{st} - (IG_t - P_t \bar{I}G) = \tau_t^{st} W_t N_t - \bar{\tau}^{st} P_t \bar{w} \bar{N}. \quad (\text{D.44})$$

The remainder of the budget is financed through debt issuance. The budget is:

$$P_t G_t^{st} + Tr_t^{st} + R_{t-1}^n B_{t-1}^{st} = B_t^{st} + IG_t + \tau_t^{st} W_t N_t. \quad (\text{D.45})$$

Federal government. The federal government levies lump-sum and distortionary taxes to finance federal government consumption and to provide intergovernmental transfers to states. Nominal per capita transfers are equal to IG_t in each region.

For simplicity, federal transfers and real per capita purchases in the states are exogenous:

$$IG_t = \rho_{IG} IG_{t-1} + \sigma_{IG} \epsilon_{IG,t}. \quad (\text{D.46})$$

$$G_t^f = \rho_{Gf} G_{t-1}^f + \sigma_{Gf} \epsilon_{Gf,t}. \quad (\text{D.47})$$

Purchases equal real per capita amounts $G_{Ht}^f = G_{Ft}^f = G_t^f$ per region (exogenous).

Nominal budget

$$(nP_t + (1 - n)P_t^*)G_t^f + IG_t + Tr_t^f + R_{t-1}^n B_{t-1}^f = \tau_t^f (nW_t N_t + (1 - n)W_t^* N_t^*) + B_t^f \quad (\text{D.48})$$

Similar to state governments, labor income taxes finance a fraction of the budget every period (out of steady state):

$$(1 - \gamma^f)((R_{t-1}^n - 1)B_{t-1}^f - (\bar{R}^n - 1)P_t \frac{\bar{b}^f}{\Pi}) + (nP_t + (1 - n)P_t^*)G_t^f - \bar{P}\bar{G}^f + IG_t - \bar{I}\bar{G} = \tau_t^f (nW_t N_t + (1 - n)W_t^* N_t^*) \quad (\text{D.49})$$

The federal government finances the remaining fraction γ^f of expenditures via nominal debt issuance.

D.4 Home NFA

Consolidating the home budget constraint for the unconstrained and the constrained agent:

$$\begin{aligned} & (1 - \mu)P_t C_t^c + \mu(P_t(C_t^u + I_t^u) + B_t^u) \\ & \leq (1 - \mu)((1 - \tau_t)W_t N_t^c + Tr_t + Pr_t^c) + \mu((1 - \tau_t)W_t N_t^u + r_t^k u_t K_{t-1} + B_{t-1}^u R_{t-1}^n + Tr_t + Pr_t) \\ \Leftrightarrow & P_t C_t + P_t I_t + B_t = (1 - \tau_t)W_t N_t + r_t^k u_t K_{t-1} + B_{t-1} R_{t-1}^n + Tr_t + Pr_t \end{aligned} \quad (\text{D.50})$$

Substituting in for profits:

$$P_t C_t + P_t I_t + B_t = -\tau W_t N_t + P_{Ht} Y_t + B_{t-1} R_{t-1}^n + Tr_t$$

Substituting in for state transfers (takes care of state taxes):

$$P_t C_t + P_t I_t + P_t G_t^{st} + (B_t - B_t^{st}) = IG_t - \tau_t^f W_t N_t + P_{Ht} Y_t + (B_{t-1} - B_{t-1}^{st})(R_{t-1}^n - \psi_{R,NFA} \frac{NFA_{t-1}}{n}) + Tr_t^f$$

The foreign counterpart is:

$$\begin{aligned} & P_t^* C_t^* + P_t^* I_t^* + P_t^* G_t^{st*} + (B_t^* - B_t^{st*}) \\ &= IG_t^* - \tau_t^f W_t^* N_t^* + P_{Ft} Y_t^* + (B_{t-1}^* - B_{t-1}^{st*})(R_{t-1}^n + \psi_{R,NFA} \frac{NFA_{t-1}}{1-n}) + Tr_t^f \end{aligned}$$

The population-weighted difference is:

$$\begin{aligned} & nP_t(C_t + I_t + G_t^{st}) + n(B_t - B_t^{st}) - (1-n)P_t^*(C_t^* + I_t^* + G_t^{st*}) - (1-n)(B_t^* - B_t^{st*}) \\ &= (1-n)\tau_t^f W_t^* N_t^* - n\tau_t^f W_t N_t + nP_{Ht} Y_t - (1-n)P_{Ft} Y_t^* \\ &+ (n(B_{t-1} - B_{t-1}^{st}) - (1-n)(B_t^* - B_t^{st*}))(R_{t-1}^n - \psi_{R,NFA} NFA_{t-1}) \end{aligned}$$

This leads to the following law of motion for the net foreign asset position:

$$\begin{aligned} NFA_t &\equiv \frac{n(B_t - B_t^{st}) - (1-n)(B_t^* - B_t^{st*})}{P_t} \\ &= NFA_{t-1} \frac{R_{t-1}^n}{\Pi_t} - \psi_{R,NFA} \frac{NFA_{t-1}^2}{\Pi_t} \\ &+ (1-n)X_t(C_t^* + I_t^* + G_t^{st*}) - n(C_t + I_t + G_t^{st}) + nP_{Ht} Y_t - (1-n)p_{Ft} Y_t^* \\ &+ X_t(1-n)\tau_t^f w_t^* N_t^* - n\tau_t^f w_t N_t, \end{aligned}$$

where $p_{Xt} = \frac{P_{Xt}}{P_t}$ for $x \in \{H, F\}$ and $X_t \equiv \frac{P_t^*}{P_t}$.

Note: To a first order, around a zero NFA, changes in payments do not matter.

D.5 Market clearing

Market clearing implies:

$$b_t^f = n(b_t - b_t^{st}) + (1-n)(b_t^* - b_t^{st*}) \quad (D.51)$$

$$K_t^e = u_t K_{t-1} \quad (D.52)$$

$$K_t^{e*} = u_t^* K_{t-1}^* \quad (D.53)$$

$$N_t = \mu N_t^u + (1-\mu)N_t^c \quad (D.54)$$

$$N_t^* = \mu N_t^{u*} + (1-\mu)N_t^{c*} \quad (D.55)$$

$$Y_t = Y_{Ht} = nD_t \left(\frac{P_{Ht}}{P_t} \right)^{-\eta} + (1-n)D_t^* \left(\frac{P_{Ht}}{P_t^*} \right)^{-\eta} \quad (D.56)$$

$$Y_t^* = Y_{Ft} = nD_t \left(\frac{P_{Ft}}{P_t} \right)^{-\eta} + (1-n)D_t^* \left(\frac{P_{Ft}}{P_t^*} \right)^{-\eta} \quad (D.57)$$

where $D_t = \phi_H C_t + \phi_H I_t + \phi_H G_t^{st} + G_t^f$.

Normalization:

$$P_t = 1 \tag{D.58}$$

D.6 Steady state

The model is calibrated at a quarterly frequency.

Capital output ratio. From the Capital FOC:

$$\frac{\bar{K}}{\bar{Y}} = \frac{\alpha}{1/\beta - 1 + \delta}.$$

Overall consumption. Calibrating the combined government spending to GDP ratio yields the aggregate consumption to GDP ratio, given the capital to output ratio:

$$\frac{\bar{C}}{\bar{Y}} = 1 - \frac{\bar{G}}{\bar{Y}} - \delta \bar{K} \bar{Y}.$$

Group consumption. Constrained agent's consumption follows from their budget constrained, given the calibration assumption that they provide the same amount of labor in steady state:

$$\frac{\bar{C}^c}{\bar{Y}} = (1 - \alpha) \left(1 - \frac{1}{\theta}\right) (1 - \bar{\tau}^f - \bar{\tau}^{st}) + \frac{tr^{st} + tr^f}{\bar{Y}} + \kappa_{pr}^c \frac{1}{\theta}.$$

Consumption of the unconstrained is the residual:

$$\frac{\bar{C}^{ru}}{\bar{Y}} = \frac{1}{\mu} \frac{\bar{C}}{\bar{Y}} - \frac{1 - \mu}{\mu} \frac{\bar{C}^c}{\bar{Y}}$$

Optimal government consumption. We calibrate the weight in the utility function so that in steady state, the provision of public services is optimal. From the CES aggregator over private consumption and public services $(1 - \phi)G_{st}$, we have that the MRS is given by:

$$MRS_{G,C}^c = \kappa_G^c G_{st}^{-1/\lambda} (1 - \phi)^{1-1/\lambda} (C^c)^{1/\lambda} \stackrel{!}{=} 1 \quad \Leftrightarrow \quad \kappa_G^c = \left(\frac{G_{st}}{C^c}\right)^{1/\lambda} (1 - \phi)^{1/\lambda-1}$$

Consequently, the CES aggregator in steady state is given by:

$$\left((\bar{C}^c)^{1-1/\lambda} + \kappa_G^c ((1 - \phi)G^{st})^{1-1/\lambda}\right)^{\frac{\lambda}{\lambda-1}} = \bar{C}^c \left(1 + \frac{\bar{G}^{st}}{\bar{C}^c}\right)^{\frac{\lambda}{\lambda-1}} \tag{D.59}$$

Optimal state infrastructure. Infrastructure is chosen to maximize average output net of investment (ignoring the one quarter time to build):

$$\begin{aligned} \max_{K_t^G} \bar{A}(K_t^G)^\zeta (N_t^{1-\alpha} K_t^\alpha)^{1-\zeta} - \delta K_t^G \\ [K_t^G] : \quad \frac{\zeta Y_t}{K_t^G} = \delta \\ \implies \delta \bar{K}^G = \bar{I}^{st} = \zeta \bar{Y} \implies \zeta = \frac{\bar{I}^{st}}{\bar{Y}} \end{aligned}$$

Monetary policy. Absent a premium for government securities, the nominal interest rate is simply:

$$\bar{R}^n = \frac{1}{\beta} \frac{1}{\bar{\Pi}}.$$

Federal government.

$$\frac{\bar{tr}^f}{\bar{Y}} = \bar{\tau}^f (1 - \alpha) \left(1 - \frac{1}{\theta}\right) - \frac{\bar{G}^f}{\bar{Y}} - \frac{\bar{I}G}{\bar{Y}} - \left(\frac{\bar{R}^n}{\bar{\Pi}} - 1\right) \frac{\bar{b}^f}{\bar{Y}},$$

where $\frac{\bar{b}}{\bar{Y}} = 0.7 \times 4$ and $\frac{\bar{I}G}{\bar{Y}} = 0.05$ and $\bar{\tau}^f = 0.30$.

We also calibrate $\frac{\bar{G}}{\bar{Y}} = 0.20$ and $\frac{\bar{G}^f}{\bar{Y}} = 0.6 \frac{\bar{G}}{\bar{Y}} = 0.12$.

State government.

$$\frac{\bar{tr}^{st}}{\bar{Y}} = \bar{\tau}^{st} (1 - \alpha) \left(1 - \frac{1}{\theta}\right) - \frac{\bar{G}^{st}}{\bar{Y}} + \frac{\bar{I}G}{\bar{Y}} - \left(\frac{\bar{R}^n}{\bar{\Pi}} - 1\right) \frac{\bar{b}^{st}}{\bar{Y}},$$

where $\frac{\bar{b}}{\bar{Y}} = 0.05 \times 4$ and $\frac{\bar{I}G}{\bar{Y}} = 0.05$ and $\bar{\tau}^{st} = 0.05$.

The share of state infrastructure spending is:

$$\phi = \frac{\delta \bar{K}^g / \bar{Y}}{\bar{G}^{st} / \bar{Y}} = \frac{\zeta}{\bar{G}^{st} / \bar{Y}}$$

Constrained households We choose κ_N^c such that $\bar{N}^c = \bar{N}^u = \bar{N} = \frac{1}{3}$.

With GHH preferences:

$$[GHH] \quad \kappa_N^c = (1 - \tau_t)(1 - \alpha)(1 - \frac{1}{\theta}) \left(1 + (\bar{G}^{st} / \bar{C}^c)\right)^{\frac{1}{\lambda-1}} (\bar{N}^c)^{-(1+1/\varepsilon_N)} \bar{Y}. \quad (D.60)$$

With separable preferences,

$$[SEP] \quad \kappa_N^c = (1 - \tau)(1 - \alpha)(1 - \frac{1}{\theta}) \left(1 + (\bar{G}^{st} / \bar{C}^c)\right)^{\frac{1-\lambda/\varepsilon_C}{\lambda-1}} (\bar{N}^c)^{-(1+1/\varepsilon_N)} \bar{Y} (C^c)^{-1/\varepsilon_C}. \quad (D.61)$$

Consumption follows from the budget constraint as:

$$\frac{(1 - \mu) \bar{C}^c}{\bar{Y}} = (1 - \bar{\tau})(1 - \alpha)(1 - \frac{1}{\theta})(1 - \mu) + (1 - \mu) \frac{Tr}{\bar{Y}} + (1 - \mu) \kappa_{Pr}^c \frac{1}{\theta} \quad (D.62)$$

where κ_{Pr}^c determines which fraction (if any) of profits households receive.

Unconstrained households κ_N^u is determined analogously as for the constrained households.

D.7 Fiscal rule estimates

Table D.18: Full sample estimate of the tax adjustment rule

	(1)	(2)	(3)	(4)
Lagged tax rate		-0.1191*** (-6.40)	-0.1192*** (-6.43)	-0.1901*** (-7.24)
Lagged interest on debt (% change)	0.0005** (2.29)	0.0005** (2.04)	0.0005** (2.04)	0.0006* (1.99)
Exp Growth	0.0064*** (5.19)	0.0056*** (4.74)		
IG transfers (% change)	-0.0011* (-1.87)	-0.0010* (-1.83)		
Exp net of IG (% change)			0.0055*** (4.70)	0.0046*** (4.07)
R-squared	0.34	0.38	0.38	0.44
R-sq, within	0.02	0.08	0.08	0.12
Observations	2372	2372	2372	1499
States	50	50	50	48
Years	50	50	50	32
StateFE	Yes	Yes	Yes	Yes
YearFE	By region	By region	By region	By region
IG to Exp	0.25	0.25	0.25	0.25
Net expenditure to GDP			0.09	0.09
Coefficient G net of IG			0.070	0.064
Debt to GDP			0.07	0.07
Interest on debt to GDP		0.004	0.004	0.004
Coefficient Int on Debt		0.158	0.158	0.217
Annual persistence		0.88	0.88	0.81

Table D.19: Full sample estimate of the other fiscal adjustment rules

	(1)	(2)	(3)	(4)	(5)	(6)
Lagged LHS	-0.1901*** (-7.24)	-0.1194*** (-6.39)	-0.1708*** (-6.63)	-0.1731*** (-6.66)	-0.1649*** (-8.07)	-0.1656*** (-7.96)
Lagged interest on debt (% change)	0.0006* (1.99)		-0.0033 (-0.62)		0.0063 (0.68)	
Exp net of IG (% change)	0.0046*** (4.07)	0.0054*** (4.68)				
Lagged Total debt (% change)		0.0073 (0.17)		1.8573* (1.76)		1.9060 (1.06)
LD.TaxRate			2.2061*** (4.95)	2.2300*** (5.01)	1.8984** (2.41)	1.9407** (2.45)
R-squared	0.44	0.38	0.45	0.45	0.41	0.41
R-sq, within	0.12	0.08	0.10	0.10	0.09	0.09
Observations	1499	2372	1499	1499	1499	1499
States	48	50	48	48	48	48
Years	32	50	32	32	32	32
StateFE	Yes	Yes	Yes	Yes	Yes	Yes
YearFE	By region	By region	By region	By region	By region	By region
LHS	Δ rate	Δ rate	Exp. growth	Exp. growth	Transf. growth	Transf. growth

D.8 Dynare

D.8.1 Variables

One-off

1. Exchange rate X_t

$$X_t = \left(\phi_H^* p_{Ht}^{1-\eta} + (1 - \phi_H^*) p_{Ft}^{1-\eta} \right)^{\frac{1}{1-\eta}}$$

2. Net foreign asset position NFA_t

$$\begin{aligned} NFA_t = & NFA_{t-1} \frac{R_{t-1}^n}{\Pi_t} - \psi_{R,NFA} \frac{NFA_{t-1}^2}{\Pi_t} \\ & + (1 - n)X_t(C_t^* + I_t^* + G_t^{st*}) - n(C_t + I_t + G_t^{st}) + np_{Ht}Y_t - (1 - n)p_{Ft}Y_t^* \\ & + \tau_t^f (X_t(1 - n)w_t^*N_t^* - nw_tN_t), \end{aligned}$$

3. FFR R_t^n

$$R_t^n = (\bar{\Pi}/\beta)^{\rho_r} \left(\left(\frac{\bar{\Pi}_t}{\bar{\Pi}} \right)^{\psi_{r\pi}} \left(\frac{\bar{Y}_t}{\bar{Y}} \right)^{\psi_{ry}} \right)^{1-\rho_r}$$

4. Federal labor income tax rate τ_t^f .

$$\begin{aligned} & (1 - \gamma^f)((R_{t-1}^n - 1) \frac{b_{t-1}^f}{\bar{\Pi}_t} - (\bar{R}^n - 1) \frac{\bar{b}^f}{\bar{\Pi}} + (n + (1 - n)X_t^*)G_t^f - \bar{G}^f + ig_t - \bar{IG}) \\ & = \tau_t^f (nw_tN_t + (1 - n)w_t^*N_t^*) - \bar{\tau}^f \bar{w} \bar{N}. \end{aligned}$$

5. Federal bond issuance b_t^f

$$(n + (1 - n)X_t)G_t^f + \frac{IG_t}{P_t} + tr_t^f + \frac{R_{t-1}^n}{\Pi_t} b_{t-1}^f = \tau_t^f (nw_tN_t + (1 - n)X_t w_t^* N_t^*) + b_t^f$$

6. Federal purchases G_t^f

AR(1)

7. Federal IG transfers IG_t .

AR(1)

8. Federal transfers to agents tr_t^f .

constant

9. Aggregate inflation $\bar{\Pi}_t$

$$\bar{\Pi}_t = n\Pi_t + (1 - n)\Pi_t^*.$$

10. Aggregate output \bar{Y}_t .

$$\bar{Y}_t = nY_t + (1 - n)Y_t^*.$$

11. bond market clearing b_t .

$$b_t^f = n(b_t - b_t^{st}) + (1 - n)(b_t^* - b_t^{st*})$$

12. foreign budget constraint b_t^*

$$\begin{aligned} X_t \left(C_t^{u*} + \frac{1}{\mu} I_t^* \right) + \frac{1}{\mu} b_t^* &= (1 - \tau_t^f - \tau_t^{st*}) X_t w_t^* N_t^{u*} + \frac{1}{\mu} X_t r_t^{k,r*} u_t^* K_{t-1}^* + \frac{1}{\mu} b_{t-1}^* \frac{R_{t-1}^n}{\Pi_t} + X_t \frac{Tr_t^{st*}}{P_t^*} + \frac{Tr_t^f}{P_t} \\ &+ \frac{1 - (1 - \mu) \kappa_{prc}}{\mu} X_t \left(Y_{F,t} - r_t^{k,r*} u_t^* K_{t-1}^* - w_t^* N_t^* \right) \end{aligned}$$

Symmetric

S1 Production function $\rightarrow N_t, N_t^*$

$$Y_{Ht} = A_t (K_{t-1}^G)^\zeta ((K_t^e)^\alpha N_t^{1-\alpha})^{1-\zeta}$$

Normalize $\bar{Y}_H = 1$. Then

$$\begin{aligned} \bar{A}_t &= (K_{t-1}^G)^{-\zeta} ((K_t^e)^\alpha \bar{N}^{1-\alpha})^{-(1-\zeta)} \\ &= \left(\phi_k \frac{\bar{G}^{st}}{\bar{Y}} \right)^{-\zeta} \left(\left(\frac{\alpha(1 - 1/\theta)}{1/\beta - (1 - \delta)} \right)^\alpha \bar{N}^{1-\alpha} \right)^{-(1-\zeta)} \end{aligned}$$

using that

$$\frac{\bar{Y}}{\bar{K}} = \frac{1/\beta - (1 - \delta)}{\alpha(1 - 1/\theta)}$$

S2 Stochastic discount factor M_t, M_t^*

$$M_t = \beta \frac{u_{c,t+1}}{u_{c,t}} \frac{1}{\Pi_{t+1}}$$

In steady state:

$$\bar{M}^n = \frac{\beta}{\bar{\Pi}}$$

S3 Marginal utility of income $\rightarrow C_t^u, C_t^{u*}$

In the GHH case:

$$u_c = (1 - \kappa_G^u) \left((1 - \kappa_G^u) \left(C^{1-1/\lambda} + \kappa_G^u ((1 - \psi_g^k) G^{st})^{1-1/\lambda} \right)^{\frac{\lambda}{\lambda-1}} - \kappa_N^c \frac{N^{1+1/\epsilon_N}}{1 + 1/\epsilon_N} \right)^{-1/\epsilon_c} \left((1 - \kappa_G^u) + \kappa_G^u ((1 - \psi_g^k) G^{st})^{1-1/\lambda} \right)^{\frac{1-\lambda/\epsilon_c}{\lambda-1}}$$

In the separable case:

$$u_c = C^{-1/\epsilon_c} (1 - \kappa_G^u) \left((1 - \kappa_G^u) + \kappa_G^u ((1 - \psi_g^k) G^{st}/C)^{1-1/\lambda} \right)^{\frac{1-\lambda/\epsilon_c}{\lambda-1}}$$

S4 Resource constraint $\rightarrow Y_{Ht}, Y_{Ft}$

$\phi_H^* < 1$ is equivalent to $(1 - \phi_H) < 1/n - 1$ or $2 < 1/n + \Phi_H$. For $n \leq \frac{1}{2}$, this assumption is always satisfied. This requires $\phi_H \geq \frac{2n-1}{n} \in (0, 1)$ for $n \in (0.5, 1)$.

$$\phi_F = 1 - \phi_H, \phi_F^* = 1 - \phi_H^* = \frac{1-n-n(1-\phi_H)}{1-n}.$$

$$(1-n)Y_{Ft} = \left(n\phi_F(C_t + G_t^{st} + I_t) + nG_t^f + (1-n)\phi_F^*(C_t^* + G_t^{st*} + I_t^*)X_t^\eta \right) \left(\frac{P_{Ft}}{P_t} \right)^{-\eta}$$

$$\begin{aligned} nY_{Ht} &= \left(n\phi_H(C_t + G_t^{st} + I_t) + nG_t^f + (1-n)\phi_H^*(C_t^* + G_t^{st*} + I_t^*)X_t^\eta \right) \left(\frac{P_{Ht}}{P_t} \right)^{-\eta} \\ &= \left(n\phi_H(C_t + G_t^{st} + I_t) + nG_t^f + n(1-\phi_H)(C_t^* + G_t^{st*} + I_t^*)X_t^\eta \right) \left(\frac{P_{Ht}}{P_t} \right)^{-\eta} \end{aligned}$$

using that $\phi_H^* = (1 - \phi_H)\frac{n}{1-n}$. In the symmetric steady state:

$$\begin{aligned} \frac{\bar{C}}{\bar{Y}} &= 1 - \frac{\bar{G}}{\bar{Y}} - \frac{\bar{I}}{\bar{Y}} \\ &= 1 - \frac{\bar{G}}{\bar{Y}} - \delta \frac{\alpha(1-1/\theta)}{1/\beta + \delta - 1} \end{aligned}$$

S5 Constrained consumption C_t^c, C_t^{c*}

$$C_t^c = (1 - (\tau_t^f + \tau_t^{st}))w_t N_t^c + tr_t + \kappa_{pr}^c(Y_{Ht} - r_t^k K_{t-1}u_t - w_t N_t)$$

In steady state:

$$\frac{\bar{C}^c}{\bar{Y}} = (1 - \bar{\tau}^f - \bar{\tau}^{st})(1 - \alpha)(1 - 1/\theta) + \frac{\bar{tr}}{\bar{Y}} + \frac{1}{\theta}\kappa_{pr}^c$$

S6 Overall consumption C_t, C_t^*

$$C_t = \mu C_t^u + (1 - \mu)C_t^c$$

S7 Labor supply N_t, N_t^*

$$N_t = \mu N_t^u + (1 - \mu)N_t^c$$

Calibrated to $\bar{N} = \frac{1}{3}$.

S8 Constrained labor supply N_t^c, N_t^{c*}

$$[GHH] \quad (1 - \tau_t)w_t(1 - \kappa_G^c) \left((1 - \kappa_G^c) + \kappa_G^c(G^{st}/C_t^c)^{1-1/\lambda} \right)^{\frac{1}{\lambda-1}} = \kappa_N^c(N_t^c)^{1/\varepsilon_N}.$$

xor

$$[SEP] \quad (1 - \tau_t)(1 - \kappa_G^c)w_t \left((1 - \kappa_G^c) + \kappa_G^c(G^{st}/(w_t N_t^c + tr_t + pr_t^c))^{1-1/\lambda} \right)^{\frac{1-\lambda/\epsilon_C}{\lambda-1}} = \kappa_N^c(N_t^c)^{1/\varepsilon_N} C^{1/\epsilon_C}.$$

Implies κ_N^c

S9 Unconstrained labor supply N_t^u, N_t^{u*}
 analogous as for constrained
 Implies κ_N^u

S10 Investment I_t, I_t^*

$$1 = q_t \left(1 - \frac{\kappa_I}{2} \left(\frac{I_t}{I_{t-1}} - 1 \right)^2 - \kappa_I \left(\frac{I_t}{I_{t-1}} - 1 \right) \frac{I_t}{I_{t-1}} \right) + \mathbb{E}_t \left[M_{t+1}^n \Pi_{t+1} q_{t+1} \left(\frac{I_{t+1}}{I_t} - 1 \right) \frac{I_{t+1}}{I_t} \right]$$

In steady state

$$\frac{\bar{I}}{\bar{Y}} = \frac{\delta \bar{K}}{\bar{Y}} = \delta \frac{\alpha(1-1/\theta)}{1/\beta + \delta - 1}.$$

S11 Utilization u_t, u_t^*

$$\bar{\delta}_1 + \bar{\delta}_2(u_t - 1) = \frac{r_t^{k,r}}{q_t}$$

In steady state, $\bar{u} = 1$ and $\bar{\delta}_1 = \frac{1}{\beta} + \delta - 1$.

S12 Tobin's Q q_t, q_t^*

$$q_t = \mathbb{E}_t \left[M_{t+1}^n \Pi_{t+1} \left((1 - \delta_{t+1}) q_{t+1} + r_{t+1}^k u_{t+1} - \delta(u_{t+1}) \right) \right]$$

In steady state, $\bar{q} = 1$.

S13 Capital K_t, K_t^*

$$K_t = (1 - \delta(u_t)) K_{t-1} + \left(1 - \frac{\kappa_I}{2} \left(\frac{I_t}{I_{t-1}} - 1 \right)^2 \right) I_t$$

In steady state:

$$\frac{\bar{K}}{\bar{Y}} = \frac{\alpha(1-1/\theta)}{1/\beta + \delta - 1}$$

S14 Bond Euler equation $\rightarrow u_{c,t}, u_{c,t}^*$

$$1 = \mathbb{E}_t \left[M_{t+1}^n \left(\frac{u_{b,t+1}}{u_{c,t+1}} + (R_t^n - \psi_{r,NFANFA_t}) \right) \right],$$

where

$$[GHH] \quad \frac{u_b}{u_c} = \kappa_b b^{-1/\epsilon_b} (1 - \kappa_G^u) \frac{\left(((1 - \kappa_G^u)(C^u)^{1-1/\lambda} + \kappa_G^u (G^{st})^{1-1/\lambda})^{\frac{\lambda}{\lambda-1}} - \kappa_N^c \frac{N^{1+1/\epsilon_N}}{1+1/\epsilon_N} \right)^{1/\epsilon_c}}{\left((1 - \kappa_G^u) + \kappa_G^u (G^{st}/C^u)^{1-1/\lambda} \right)^{\frac{1}{\lambda-1}}}$$

$$[SEP] \quad \frac{u_b}{u_c} = \kappa_b b^{-1/\epsilon_b} (1 - \kappa_G^u) \frac{(C^u)^{1/\epsilon_c}}{((1 - \kappa_G^u) + \kappa_G^u (G^{st}/C^u)^{1-1/\lambda})^{\frac{1-\lambda/\epsilon_C}{\lambda-1}}}$$

Calibrate κ_b to match $\bar{b} = \bar{b}^f + \bar{b}^{st}$.

S15 Relative producer prices $p_{H,t}, p_{F,t}$

$$1 = \left(\phi_H p_{Ht}^{1-\eta} + (1 - \phi_H) p_{Ft}^{1-\eta} \right)^{\frac{1}{1-\eta}}$$

$$p_{H,t} = p_{H,t-1} \frac{\Pi_{H,t}}{\Pi_t}$$

In steady state, relative prices are unity .

S16 Real wages w_t, w_t^* .

$$\begin{aligned} w_t &= (1 - \alpha) \frac{y_{Ht}}{N_t} m c_{ht}^r. \\ &= \frac{1 - \alpha}{\alpha} \frac{K_t^e}{N_t} r_t^{k,r}. \end{aligned}$$

In steady state:

$$\bar{w} = (1 - \alpha)(1 - 1/\theta) \frac{1}{\bar{N}},$$

using that steady state output is unity.

S17 Rental rate of capital r_t^k, r_t^{k*}

$$r_t^{k,r} = \alpha \frac{y_{Ht}}{K_{t-1} u_t} m c_{ht}^r.$$

S18 State capital K_t^{st}, K_t^{st*} .

$$K_{st,t} = (1 - \delta_G) K_{st,t-1} + \phi G_{st,t}.$$

S19 State transfers tr_t^{st}, tr_t^{st*} .
constant

S20 State debt issuance b_t^{st}, b_t^{st*}

$$G_t^{st} + tr_t^{st} + \frac{R_{t-1}^n}{\Pi_t} b_{t-1}^{st} = b_t^{st} + \frac{IG_t}{P_t} + \tau_t^{st} w_t N_t.$$

and

$$X_t G_t^{st*} + X_t tr_t^{st*} + \frac{R_{t-1}^n}{\Pi_t} b_{t-1}^{st} = b_t^{st} + X_t \frac{IG_t}{P_t} + X_t \tau_t^{st} w_t^* N_t^*.$$

Calibrate debt, set transfers in steady state:

$$\frac{\bar{tr}^{st}}{\bar{Y}} = \bar{\tau}^{st}(1 - \alpha) \left(1 - \frac{1}{\theta}\right) - \left(\frac{\bar{R}_n}{\bar{\Pi}} - 1\right) \frac{\bar{b}^{st}}{\bar{Y}} - \frac{\bar{G}^{st}}{\bar{Y}}$$

S21 State labor income tax rate $\tau_t^{st}, \tau_t^{st*}$.

$$(1 - \gamma^s)((R_{t-1}^n - 1) \frac{b_{t-1}^{st}}{\bar{\Pi}_t} - (\bar{R}^n - 1) \frac{\bar{b}^{st}}{\bar{\Pi}}) + G_t^{st} - \bar{G}_t^{st} - (\frac{IG_t}{P_t} - \bar{I}G) + = \tau_t^{st} w_t N_t - \bar{\tau}^{st} \bar{W} \bar{N}.$$

Calibrated.

S22 State government spending G_t^{st}, G_t^{st*}

$$G_{st,t} = \psi_{IG}(\frac{IG_t}{P_t} - \bar{I}G) + G_{st,t}^x$$

S23 Exogenous state government spending $G_{x,t}^{st}, G_{x,t}^{st*}$

$$G_{st,t}^x = (1 - \rho_{st,g})\bar{G}^{st} + \rho_{st,g}G_{st,t-1}^x + \omega_{st,g}\epsilon_{st,t}^x$$

S24 Producer price inflation Π_{Ht}, Π_{Ft}

$$\begin{aligned} \Pi_{Ht}^{1-\theta} &= (1 - \xi) \left(\frac{p_{ht}}{p_{Ht}} \Pi_{H,t} \right)^{1-\theta} + \xi \bar{\Pi}^{1-\theta} \\ \Pi_{Ft}^{1-\theta} &= (1 - \xi) \left(\frac{p_{ft}}{p_{Ft}} \Pi_{F,t} \right)^{1-\theta} + \xi \bar{\Pi}^{1-\theta} \end{aligned}$$

In steady state, $\Pi_H = \Pi_F = \bar{\Pi}$.

S25 State inflation Π_t, Π_t^*

$$\begin{aligned} \left(\frac{P_t^*}{P_{t-1}^*} \right)^{1-\eta} &= \phi_H^* \frac{P_{Ht}^{1-\eta}}{\phi_H^* P_{H,t-1}^{1-\eta} + (1 - \phi_H^*) P_{F,t-1}^{1-\eta}} + (1 - \phi_H^*) \frac{P_{Ft}^{1-\eta}}{\phi_H^* P_{H,t-1}^{1-\eta} + (1 - \phi_H^*) P_{F,t-1}^{1-\eta}} \\ \Leftrightarrow (\Pi_t^*)^{1-\eta} &= \phi_H^* \frac{\Pi_{Ht}^{1-\eta}}{\phi_H^* + (1 - \phi_H^*)(p_{F,t-1}/p_{H,t-1})^{1-\eta}} + (1 - \phi_H^*) \frac{\Pi_{Ft}^{1-\eta}}{\phi_H^*(p_{H,t-1}/p_{F,t-1})^{1-\eta} + (1 - \phi_H^*)} \\ \Pi_t &= \Pi_t^* \frac{X_{t-1}}{X_t}. \end{aligned}$$

$$\begin{aligned} \hat{\pi}_t &= \phi_H \hat{\pi}_{H,t} + (1 - \phi_H) \hat{\pi}_{F,t} \\ \hat{\pi}_t^* &= \phi_H^* \hat{\pi}_{H,t} + (1 - \phi_H^*) \hat{\pi}_{F,t} \end{aligned}$$

S26 Calvo denominators CD_t, CD_t^*

$$CD_t = Y_{Ht} + \mathbb{E}_t[M_{t,t+1}^n \bar{\Pi}^{1-\theta} \xi CD_{t+1}].$$

In steady state:

$$\overline{CD} = \frac{\bar{Y}_H}{1 - \beta \xi \bar{\Pi}^{-\theta}}$$

S27 Calvo (real) numerators CN_t, CN_t^*

$$\begin{aligned} CN_t &= Y_{H,t} MC_t^r + \mathbb{E}_t[M_{t,t+1}^n \Pi_{t+1} \bar{\Pi}^{-\theta} \xi CN_{t+1}] \\ CN_t^* &= Y_{F,t} MC_t^{r*} + \mathbb{E}_t[M_{t,t+1}^{n*} \Pi_{t+1} \bar{\Pi}^{-\theta} \xi CN_{t+1}^*] \end{aligned}$$

In steady state:

$$\overline{CN} = \frac{\bar{Y}_H}{1 - \beta \xi \bar{\Pi}^{-\theta}} \left(1 - \frac{1}{\theta}\right).$$

Note: Effectively omitted one budget constraint, since only difference of private sector (aggregated) budget constraint enters

D.9 Welfare

We approximate flow utility following a shock as follows:

$$\begin{aligned} U_t^j &= \bar{u}_c \hat{C}_t^j + \bar{u}_G \hat{G}_{st,t} + \bar{u}_N \hat{N}_t^j \\ &= \bar{u}_c (\hat{C}_t^j + \hat{G}_{st,t} - (1 - \bar{\tau}_{st} - \bar{\tau}_f) \bar{w} \hat{N}_t^j), \end{aligned}$$

where the second line uses that government consumption equates marginal utilities in steady state and agents equate marginal utility of leisure and consumption.

D.10 Additional model results

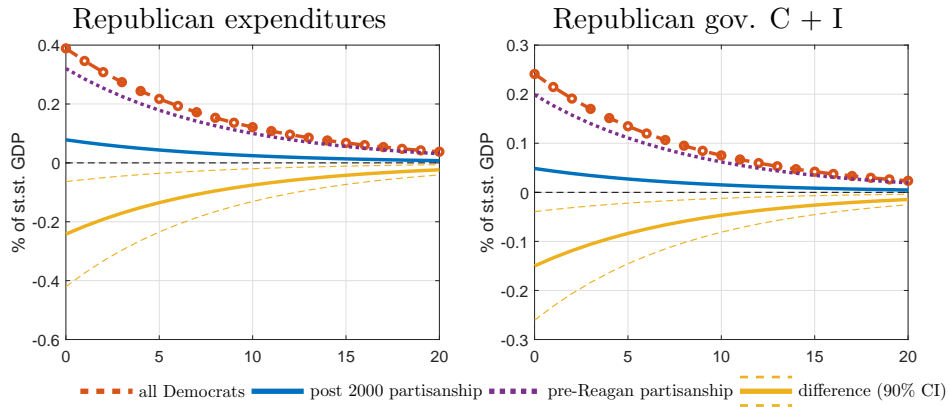


Figure D.14: IRFs: Expenditures and government consumption and fixed investment

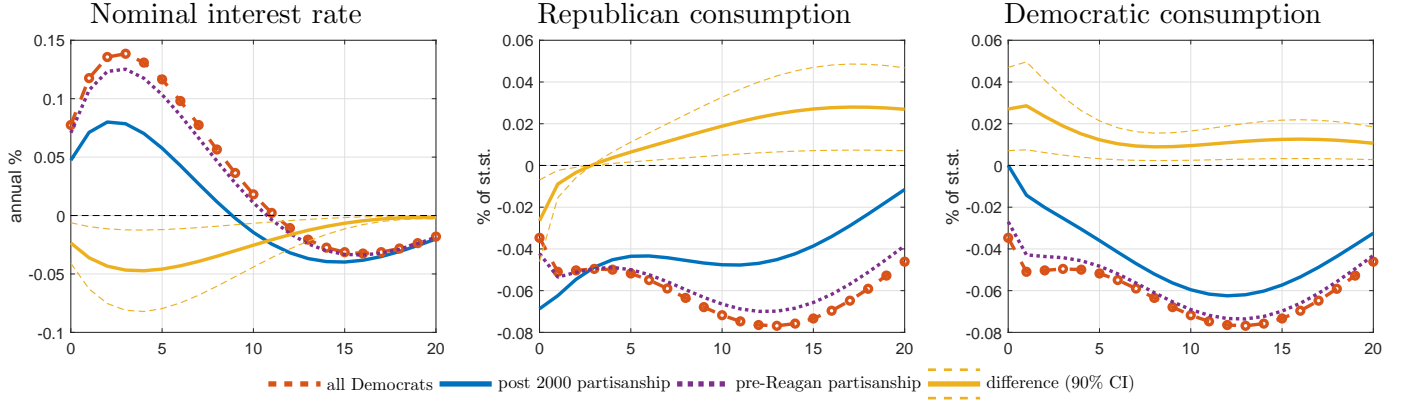


Figure D.15: Responses of interest rates and consumption following a shock to IG transfers

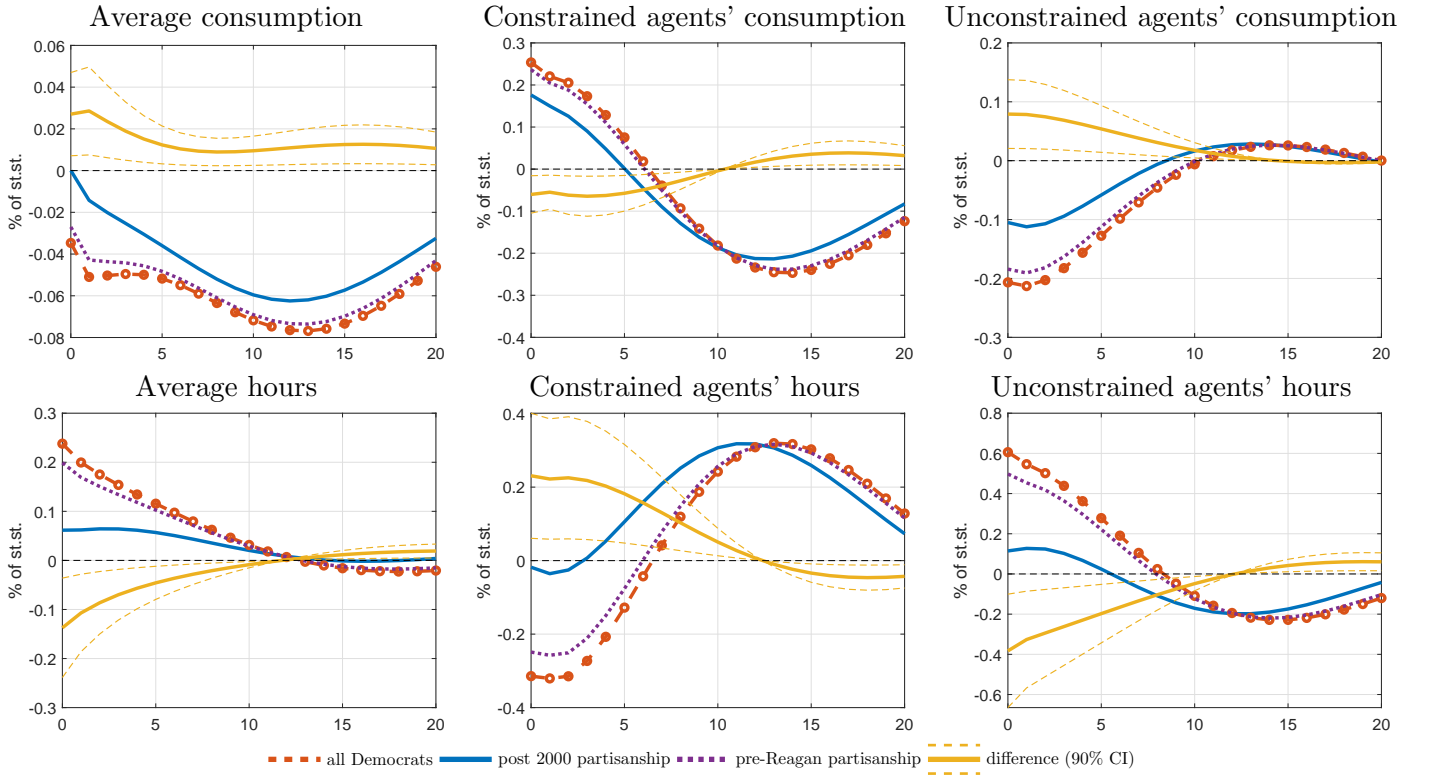


Figure D.16: Responses of consumption and hours for constrained and unconstrained agents in the Republican region following an IG shock

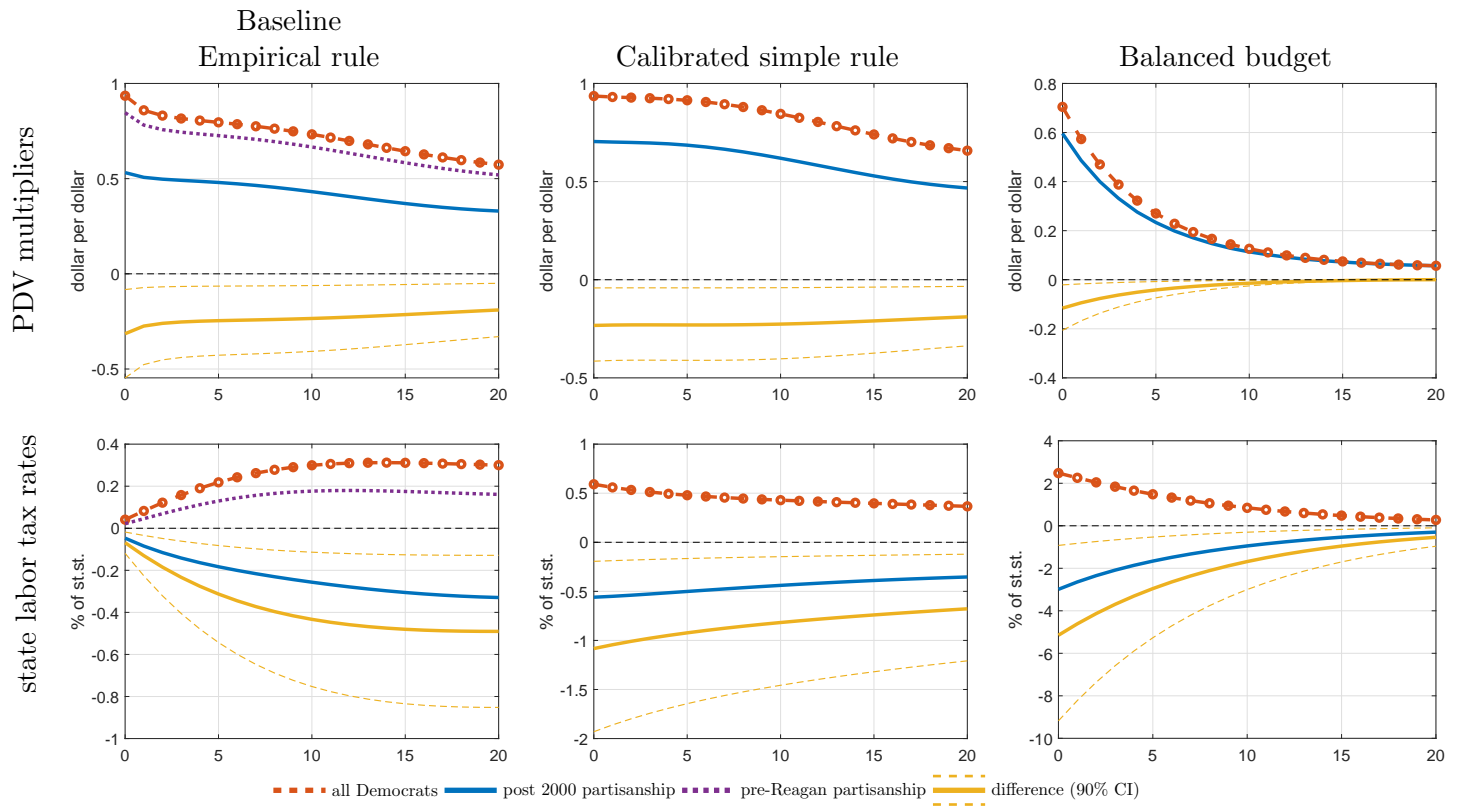


Figure D.17: PDV multipliers and distortionary taxes

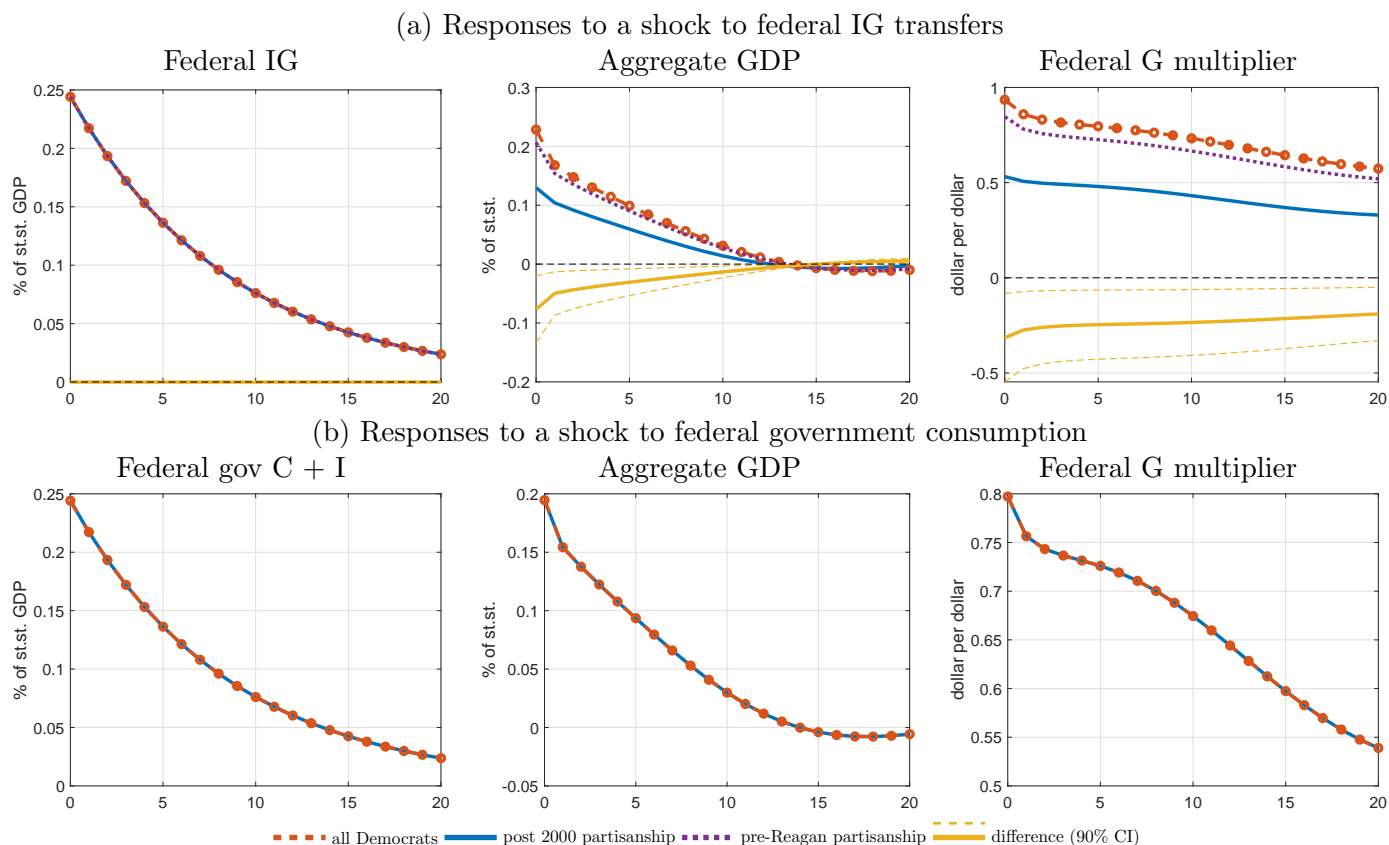


Figure D.18: IRFs: Fiscal stimulus, GDP response, and PDV multipliers. Comparison of IG transfer and federal G shocks

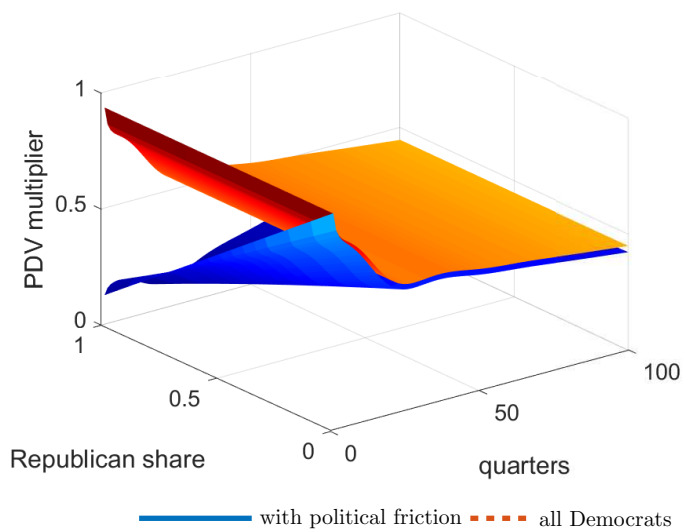
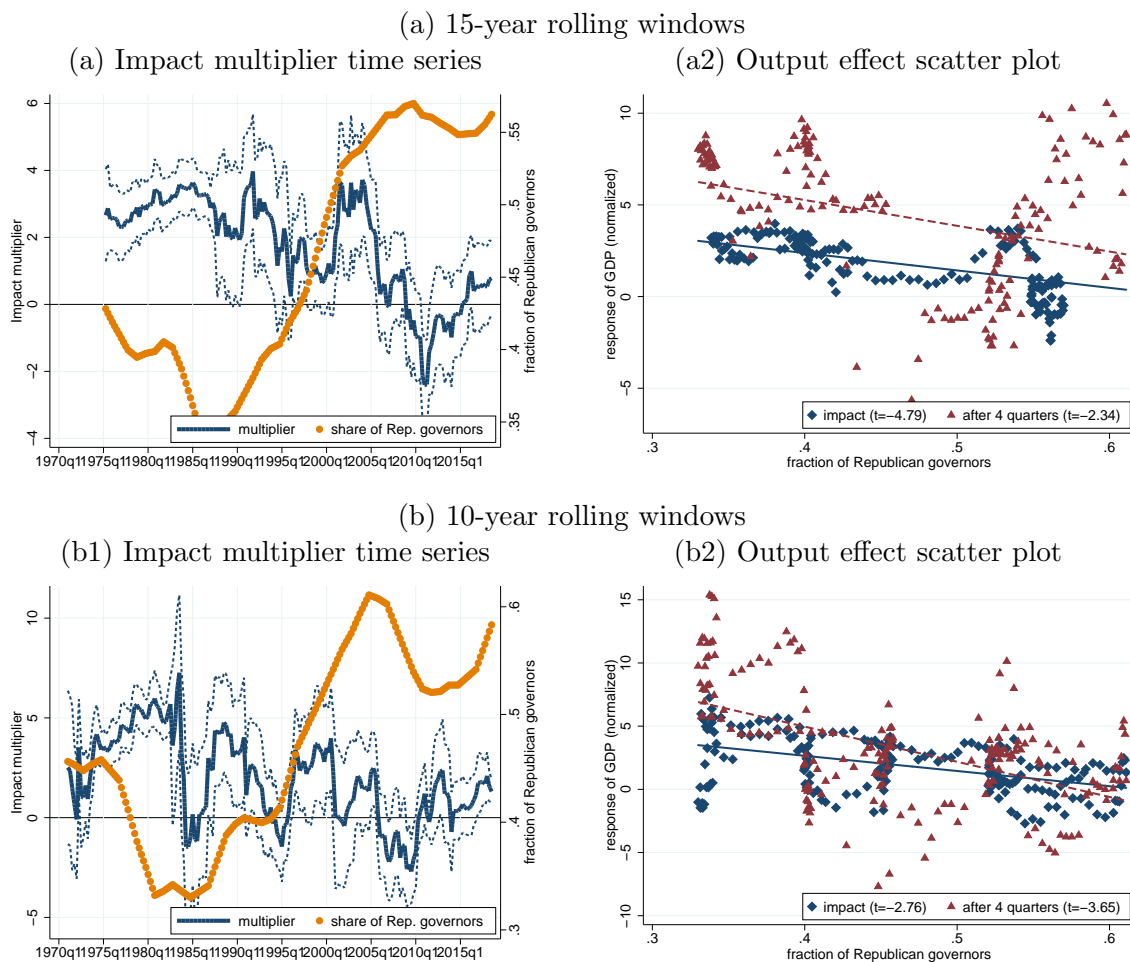


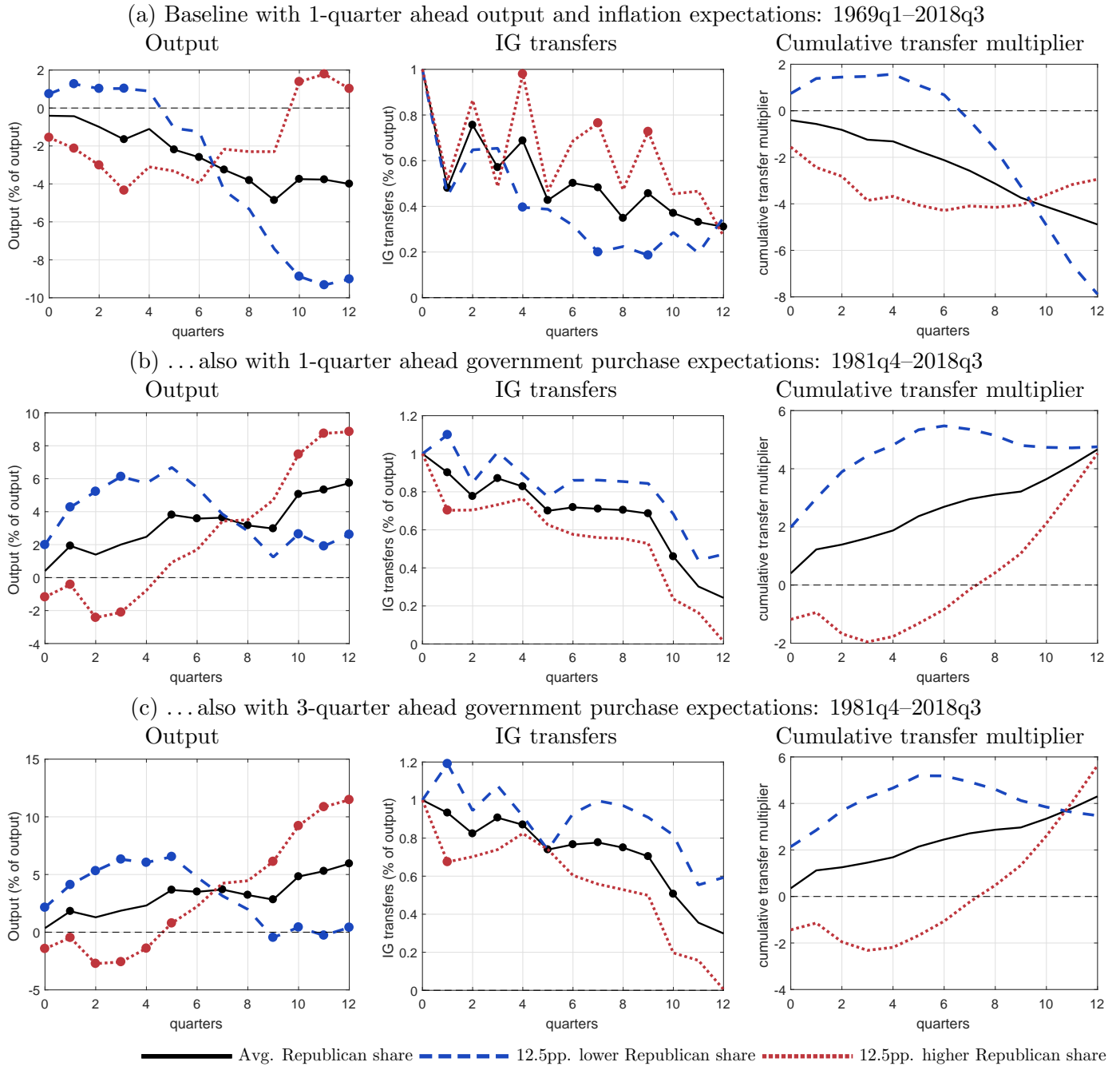
Figure D.19: PDV multipliers over time and as a function of the share of Republican governors: baseline

E Additional time series estimates



Note: Only the impact response has the interpretation of a multiplier; the four-quarter ahead result is the cumulative effect on GDP relative to the impact effect on IG.

Figure E.20: Reduced-form 15-year and 10-year rolling window output effects of IG transfers and share of Republican governors.



For the output and IG transfer IRF, filled markers denote significance at the 10% level or higher. Inference based on Newey-West heteroskedasticity and autocorrelation robust standard errors with two more lags than the response horizon. For the deviations from the baseline, the markers indicate significant differences from the baseline. For the cumulative multiplier, the figure shows point estimates only. Panel (a) adds the (lagged) one quarter ahead real GDP growth and GDP inflation expectations to the variables in the baseline model in Figure 10. Panel (b) additionally includes the (lagged) one quarter ahead real growth in federal government purchases and in state and local government purchases. Panel (c) also adds the (lagged) three quarter ahead real growth in federal government purchases and in state and local government purchases. In all three cases, we also add the interactions with the lagged share of Republican governors.

Figure E.21: Responses to innovations in intergovernmental transfer: Direct regressions with controls for expectations

Table E.20: Reduced-form output effects of innovations to government spending and share of Republican governors: Direct regression with single lag for various horizons.

(a) Intergovernmental transfers on GDP					
	Impact	h=1	h=2	h=3	h=4
Intergov. Transfers (IG)	-0.008 (-0.80)	-0.007 (-0.42)	-0.023 (-1.08)	-0.027 (-1.29)	-0.017 (-0.71)
Fraction Rep Gov x IG	-0.176** (-2.08)	-0.325* (-1.92)	-0.476** (-2.50)	-0.542** (-2.33)	-0.495* (-1.88)
Fraction Rep Gov.	0.892 (1.26)	1.709 (1.22)	2.745 (1.39)	3.347 (1.38)	4.202 (1.56)
R-squared	1.00	1.00	1.00	0.99	0.99
Observations	219	218	217	216	215
(b) Intergovernmental transfers on IG transfers					
	Impact	h=1	h=2	h=3	h=4
Intergov. Transfers (IG)	1.000	0.532*** (2.76)	0.837*** (6.82)	0.668*** (3.45)	0.806*** (4.70)
Fraction Rep Gov x IG	0.000	-0.309 (-0.38)	0.558 (0.84)	-0.752 (-0.75)	1.708 (1.35)
Fraction Rep Gov.	0.000	-2.243 (-0.52)	-0.784 (-0.12)	-2.445 (-0.27)	0.814 (0.07)
R-squared	1.00	0.99	0.99	0.98	0.97
Observations	219	218	217	216	215
(c) Government purchases on GDP					
	Impact	h=1	h=2	h=3	h=4
Gov. purchases (G)	0.153** (2.21)	0.077 (0.76)	0.105 (0.77)	0.022 (0.14)	0.032 (0.17)
Fraction Rep Gov x G	-0.365 (-0.48)	-0.664 (-0.66)	-0.101 (-0.08)	0.183 (0.14)	0.625 (0.42)
Fraction Rep Gov.	0.605 (0.81)	1.390 (0.98)	2.423 (1.22)	3.090 (1.28)	4.009 (1.47)
R-squared	1.00	1.00	1.00	0.99	0.99
Observations	219	218	217	216	215
(d) Government purchases on purchases					
	Impact	h=1	h=2	h=3	h=4
Gov. purchases (G)	1.000	1.039*** (13.06)	1.091*** (7.84)	1.183*** (7.36)	1.306*** (7.17)
Fraction Rep Gov x G	0.000	-0.097 (-0.17)	0.574 (0.66)	1.502 (1.32)	1.257 (0.97)
Fraction Rep Gov.	0.000	1.584 (1.60)	3.775** (2.07)	5.904** (2.45)	8.036*** (3.02)
R-squared	1.00	0.99	0.98	0.98	0.97
Observations	219	218	217	216	215

Inference based on Newey-West heteroskedasticity and autocorrelation robust standard errors with six lags. Coefficients on control variables omitted. Standard errors on impact in panels (b) and (d) are not well defined since the equation fits perfectly.