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UNIVERSITY OF OXFORD

OxCarre Research Paper 200

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Political Myopia, Public Debt, and Economic Growth

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Political Myopia, Public Debt, and Economic Growth

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December 18, 2017

Abstract

Can economic growth increase public debt? Previous studies on the debt-growth nexus focused on the effects of debt on growth. We present an opposite perspective by showing that growth can reinforce deficit spending. A political economy model of endogenous public debt indicates that the underlying cause is political short-sightedness induced by reelection prospects. Reelection yields accountability but at the same time shortens incumbents' time horizon, giving rise to political myopia and the ensuing budget deficit bias. Our model shows that economic growth exacerbates this undesirable effect of reelection. We test the model's predictions using a panel of U.S. states over the period 1963-2007. Our identification strategy rests on constitutionally-entrenched differences in gubernatorial term limits that provide plausibly exogenous cross-state variation in political time horizon, and aggregate national TFP shocks that are exogenous to individual states. Our more conservative estimates indicate that over a course of five years, a one standard deviation positive TFP shock induces an increase of approximately $494 in real per capita public debt in politically myopic states.

JEL classifications: H63, C61, H74
Keywords: Economic growth, public debt, political myopia, term limits

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1 Introduction

Understanding the effects of excessive public debt on economic growth has been of perennial interest to economists and policymakers, with the main hurdle being sorting out causality from correlation (see Reinhart et al. 2012, and references therein). In this work we identify a causality link running from growth to public debt. We do this by showing that economic growth reinforces deficit spending induced by political short-sightedness. The latter is a feature of economies in which incumbents' time horizons extend more or less until the coming elections (Buchanan and Wagner 1977), and is therefore induced by the possibility to be reelected. Notably, the extent of political myopia may differ considerably across countries as well as across states of a common federation, depending on the extent to which the institutional setting affects reelection prospects.

We construct a political economy model with endogenous public debt, in which time preferences are represented by discount rates. The option to be reelected induces a disciplining measure upon incumbents, turning them more accountable toward their voters.[1] Concurrently, however, this option also shortens their time horizon, thereby increasing their discount rate relative to the interest rate at which they can borrow. All else equal, this discount rate discrepancy, i.e. the extent of political myopia, gives rise to a budget deficit bias and the ensuing public debt buildup – a standard result in models of political myopia and debt (Buchanan and Wagner 1977, Acharya and Rajan 2013, Aguiar et al. 2014, Rieth 2014). Our innovation herein is to examine how economic growth interacts with this phenomenon. In particular, we ask: facing economic growth, will short-sighted politicians use the additional proceeds associated with growth to reduce debt, leave it unchanged, or rather exploit the economic expansion to accumulate it further?

The model illustrates that economic growth may reinforce the myopia-debt nexus. In the event that reelection is possible, incumbents exert effort to maintain a low deficit, as it is rewarded by voters (Brender and Drazen 2008). On the other hand, they also accumulate further debt due to the time rate discrepancy. The overall effect of reelection on debt is ambiguous. However, if preferences exhibit aversion to intergenerational inequality, higher growth rates exacerbate the effects of myopia because they induce redistribution from (wealthier) future generations to the present. Conversely, if reelection is not possible incumbents may not be accountable nor myopic, and growth may not yield debt buildup. We

[1] Empirical evidence on the disciplining effects of reelection prospects are provided by Besley and Case (1995, 2003), List and Sturm (2006), Alt et al. (2011), Aruoba et al. (2015). Besley (2006) provides a synthesis of the related literature.

therefore expect that economic growth will have a positive effect on debt in the presence of myopic (reelection-seeking) politicians but not necessarily otherwise. Importantly, the model shows that this positive effect intensifies with the width of the polity-market discount rate discrepancy.

These predictions are corroborated by the empirical analysis. We undertake an empirical investigation of the effect of growth on debt via a U.S. state-level analysis. The advantage of an intra-U.S. perspective is that it provides a relatively homogenous environment with constitutionally-entrenched differences in political institutions. Specifically, gubernatorial term lengths are largely the same across states; however, gubernatorial term limits differ considerably. This, in turn, provides institutionally-driven, plausibly exogenous cross-state variation in reelection-prospects, and hence in political myopia levels that map to the framework considered in the model.

Besley and Case (1995) find that the behavior of U.S. governors is consistent with the predictions of reputation-building models. Specifically, in cases of non-binding term limits U.S. governors implement policies that may help them get reelected. Our framework suggests that reelection promotes both reputation-building and political short-sightedness, concurrently. We follow this insight in two ways. First, we regard states with no restrictions on reelection prospects to be more susceptible to myopic politicians, who weigh short term effects of current policies on reelection probabilities high in their calculations (we identify 14 such states); conversely, we consider states with some restrictions on reelection possibilities to be less likely to encourage such a behavior. Second, we consider governors who have an opportunity to be reelected to be relatively politically short-sighted, compared to those who are within their last term.[2]

To that end, we assembled a panel of the 50 U.S. states over the period 1963-2007, partitioned into 5-year intervals. The adoption of this timeframe is of interest for testing the main hypothesis which relates to political processes that are expected to take effect during several years.[3] As an initial step we divide the sample into *myopic* and *non-myopic*

[2]Consistent with the model, this perspective suggests that governors in non-binding terms are both reputation-builders (Besley and Case 1995), and myopic. As will be evident, the difference between the two may be negligible when it comes to policies with immediate payoffs, such as those that took the focus in Besley and Case (1995) (e.g. taxes); however, it may play an important role in policies that adopt a long-term perspective, such as those related to public debt. We further elaborate on this issue when discussing the related literature and later when describing the details of the empirical design.

[3]Nonetheless, in the empirical part we test various time intervals, ranging from 1-year to 15-years, finding that the main patterns are apparent in all cases in a magnitude that increases with the length of the interval. We further elaborate on the adoption of 5-year intervals in the baseline analysis in the sub-section that outlines the empirical methodology.

states based on differences in gubernatorial term limits.[4] To avoid potential endogeneity bias in estimating the effect of growth we use aggregate (national) TFP shocks. As each individual state is too small to affect aggregate technological shocks, the latter are considered as plausibly exogenous in the panel estimations. Importantly, we show that these shocks are equivalently expansionary in the two state-groups. We find that technical change affects the public debt of the relatively politically myopic group of states in an economically meaningful and persistent way, and is only weakly associated with that of the relatively non-myopic group. In particular, over a course of five years, a one standard deviation positive TFP shock induces an increase of approximately \$494 in real per capita public debt in states with no gubernatorial term limits, relative to the remaining states.

Our main measure of political myopia adds a time dimension to this division by accounting for governor terms directly. Specifically, we examine the proportion of years within the time period investigated that the governor is not in his/her last term. While myopic states are assigned a value of 1 throughout the sample, in the remaining states this measure ranges from 0 to 1, and changes over time. This measure provides variation in political time horizon based on the underlying assumption that political myopia is affected strictly by reelection prospects (rather than by incumbents' quality or experience, for instance). Importantly, this variation is based on the exogenous cross-state institutional differences in the extent of gubernatorial term limits. We outline further characteristics of this measure in the empirical part. Interacting this measure with the aggregate TFP shocks yields a positive and significant coefficient, pointing at patterns similar to those observed under the initial division albeit with a larger magnitude. Under this measure, a one standard deviation positive TFP shock increases real per capita public debt in the relatively myopic states by \$604.

We show that the main result is apparent under a wide array of tests. First, it is robust to a myriad of potential political channels that range from the relative bargaining power of the legislature to the budgeting experience of the governor, including a range of additional fiscal-affecting cross-state institutional differences (discussed in more detail in the next section, as well as in the empirical part), together with their interaction with the TFP shocks. Second, it is applicable using various time-frames, and is increasing with the width of the time interval considered. Third, it holds under different time periods, and increases with time. Fourth, it is observed using different measures of myopia and aggregate shocks. Last, it is robust to

[4] We term these states *non-myopic* albeit they may have some myopia (i.e. some discrepancy in the polity-market discount rates). This term is, hence, used in relative terms. Non-myopic states are considered less myopic than the myopic group. We discuss this further in the empirical section.

considering different sample restrictions, specifications, and controls.

The next section reviews the related literature and places the current work within it. Section 3 presents a model that explains how economic growth may generate budget deficits via political impatience. The data and empirical findings are presented in Section 4. Section 5 performs robustness tests, corroborating the findings of Section 4. Section 6 concludes and the appendices present data and technical details.

2 Related literature

The literature offers a variety of explanations for observed patterns of sovereign debt. One explanation views the government budget as a common pool exploited by competing interest groups and the political failure resembles the market failure that prevails in the exploitation of common-pool resources (Weingast et al. 1981, Tornell and Lane 1999, Velasco 2000, Krogstrup and Wyplosz 2010).[5] Other explanations include debt as a strategic device (used by the incumbent to limit the range of policies that will be available when the opposite party resumes power), intergenerational redistribution motives, intra-generational distribution conflicts, and various forms of voters-politicians interaction (Persson and Svensson 1989, Alesina and Tabellini 1990, Persson and Tabellini 1999, Drazen 2000). These explanations extend to more local levels. Several studies look into the behavior of state debt, pointing at various economic and political determinants (Poterba 1994, Clingmayer and Wood 1995, Ellis and Schansberg 1999).

More related to our work are explanations based on political short-sightedness. Acharya and Rajan (2013) use political myopia to explain the paucity of defaults (myopic governments wish to avoid the ensuing short-term consequences). Aguiar et al. (2014) study the effects of government impatience when governments can inflate away some of the debt. Rieth (2014) examines how to constraint the borrowing of myopic governments. Empirical studies of the link between political time horizon and public debt include Roubini and Sachs (1989) and Grilli et al. (1991). The former constructed an indicator of political fragmentation in a group of OECD countries, based on the number of parties, and found that government tenure significantly affects public debt. The latter found that longer-lived governments have smaller deficits. Notably, this vast literature overlooked the potential role of economic growth in explaining debt. To the best of our knowledge, the present effort is the first to unravel a

[5] A strong common-pool effect (e.g., a small number of powerful interest groups under weak political and legal institutions) was shown by Tornell and Lane (1999) to adversely affect growth, explaining resource-curse like phenomena, such as a windfall that reduces growth rate.

potential channel that runs from growth to debt. Our analysis shows how economic growth may interact with political myopia to affect debt, thereby shedding light on an important consequence of political myopia. Unlike previous models on the myopia-debt nexus, in our setting political myopia is an endogenous outcome induced by reelection prospects and fiscal policies.

Also related is the literature on the fiscal effects of U.S. state institutions. Holtz-Eakin (1988) finds that gubernatorial line item veto power may affect state fiscal behavior under specific political circumstances. Knight (2000) shows that states with supermajority voting requirements have lower taxes. Wagner and Elder (2005) illustrate that states with rule-bound stabilization funds have lower expenditure volatility. Various studies show that the strictness of the balanced budget requirement affects states' general fund surplus (Bohn and Inman 1996, Crain 2003, Primo 2007). Crain (2003) finds that tax and expenditure limits affect states' spending differentially, depending on their income level. Crain and Crain (1998) indicate that baseline budgeting rules may affect state spending. Primo (2007) illustrates that states with automatic shutdown provisions spend less in per capita terms. Crain and Muris (1995) find that spending is more restrained and taxes are higher in states that have combined spending and tax committees. Crain (2003) and Kearns (1994) show that the length of the budget period matters for understanding state spending. Chen and Malhotra (2007) find that the size of the upper chamber is a positive predictor of state expenditure. Owings and Borck (2000) find that states with less professionalized legislatures have lower per capita government expenditures. Matsusaka (1995) shows that voter initiatives (direct democracy) leads to reduction in the size of state governments. Besley and Case (2003) and Erler (2007) show that states with legislative term limits have higher relative spending levels. Finally, Primo and Snyder (2010) estimate that spending in states with strong party organizations is relatively smaller.

In this work our focus is on institutional differences related to gubernatorial term limits, and their role in transmitting effects of economic growth to public debt. As part of the analysis, we account for the fiscal effects of the said institutional differences via state fixed effects. In addition, we examine how the interaction of each of them with economic growth affects public debt, and importantly how these interactions compare to our main result. As will be evident, the main result is robust to these additions, and exhibits the highest magnitude (in absolute value) among these channels.

Next is the literature on the political budget cycle. The latter pertains to the notion that electoral cycles may trigger corresponding budget cycles, unravelling a connection between political incentives and public debt. Earlier empirical and theoretical contributions to this literature is surveyed by Drazen (2001). More recent empirical studies provide cross-country evidence. Shi and Svensson (2006) find that government deficit rises in election years. Persson and Tabellini (2003) provide evidence that point at the existence of a political revenue cycle, rather than a budget one. Brender and Drazen (2005) argue that a political budget cycle is a feature of new democracies. De Haan and Klomp (2013) surveys additional related recent findings. In contrast to this literature, the present work examines variations in binding terms which include both election and non-election years, hence does not look into cycle-driven effects. In addition, in various specifications we control for election years (governor switches) and consequent cycle effects, more explicitly.

More generally, this literature highlights a puzzling pattern. On one hand incumbents tend to raise deficits in election years (Brender and Drazen 2005, Shi and Svensson 2006). On the other hand, higher deficits in election years are punished at the ballot box (Brender and Drazen 2008). Albeit testing a different empirical setting, to the extent that an election year represents a form of political myopia, our model provides a potential reconciliation for these opposing patterns. Incumbents may choose to increase deficits in election years in case the effect of their political short-sightedness dominates the one induced by the preferences of the electorate.

Finally, of special relevance to our work is the literature on the political agency problem, originated by Barro (1973), with more recent contributions made by Banks and Sundaram (1998), Coate and Morris (1995), and Besley and Burgess (2002) among others. In these models incumbents exert effort to undertake policies that may help them win the next elections; in case reelection is not possible this effort is abandoned and there is a social cost. The model presented in the next section is developed along the lines of the political agency framework. Our setting adds political myopia to this framework, focusing on the incumbent's view point while ignoring strategic interaction with voters. Specifically, in our setting, the effort exerted under the option of reelection gives rise to political myopia; when this effort is abandoned (lame-duck terms) the time horizons of the polity and the market do not differentiate. This perspective yields new predictions of the political agency problem for policies that draw heavily on future generations, such as public debt,[6] especially when interacted with economic growth which exacerbates the undesirable effects of myopia.

[6]Notably, it supports the view of Bernhardt et al. (2004), Sieg and Yoon (2017), and Smart and Sturm (2013), among others, by highlighting an additional channel via which term limits can be welfare improving from the perspective of voters.

This extends to papers that test the validity of the political agency problem by examining the effects of binding term limits on fiscal policies (Besley and Case 1995, 2003, List and Sturm 2006). Indeed, similar to Besley and Case (1995), our model accommodates higher taxes during lame-duck terms, but it bears a different (ambiguous) impact on debt as it depends on time preferences.[7] Moreover, public debt received little attention in other studies that examined the effects of term limits on fiscal policies.[8] Our empirical analysis exploits similar variations to test the implications of political myopia in the political agency problem.

3 A model of political myopia and debt

Reelection prospects vary widely across political systems. At one extreme, political terms are predetermined without reelection possibilities. At the other extreme, no constraints are imposed on reelection. In between lies a range of arrangements that differ in the type and severity of the reelection constraints imposed on incumbents. The purpose of the model developed below is to study how reelection prospects affect fiscal policy and the ensuing debt, and how economic growth interacts with this phenomenon.

3.1 Economic environment

The government finances its expenses by taxing and borrowing (other sources of government income can be added without affecting the results). Let $y(t)$ denote the average tax rate and $x(t)$ represent borrowing, both expressed as a share of national (or state) income. The budget at time t, expressed as a share of income, is $b(t) = y(t) + x(t)$ and the nominal budget is $b(t)e^{gt}$, where initial income is normalized at unity and g represents the long-run growth trend.[9] We focus on the executive branch due to its prominent budgetary role and

[7] As Besley and Case (1995) did not consider debt, their finding that in non-binding terms taxes and spending are lower leaves the impact on debt open.

[8] These include Crain and Oakley (1995), Johnson and Crain (2004), and Klein and Sakurai (2015). Two exceptions are Crain and Tollison (1992), and Nogare and Ricciuti (2011). The first examined the relationship of gubernatorial term limits and state deficits; however, their focus was on time inconsistencies and hence on the volatility of deficits. Nonetheless, we consider their suggested channel in the empirical analysis, finding it does not affect the main results. Using international data, Nogare and Ricciuti (2011) found no impact of term limits on government debt. Our model rationalizes this result, as it highlights the ambiguous effect that term limits may have on public debt.

[9] The growth rate g could be the average of fluctuating growth rates over different (historical) periods, but the assumption is that politicians plan as if this constant g will prevail in the future. The empirical analysis (next section) shows that the main results are robust to the length of the (historical) period based on which g is calculated.

the analysis is undertaken from the perspective of the incumbent.[10]

Borrowing (which can be negative if the economy is a net creditor) accumulates to form the outstanding debt $D(t)$ and the latter evolves in time according to

$$\dot{D}(t) = (r + h(d(t))D(t) + x(t)e^{gt}, \tag{3.1}$$

where r is the market rate of interest,

$$d(t) = D(t)e^{-gt} \tag{3.2}$$

is the debt-income ratio and $h(d)$ is the economy's risk premium. From (3.1) and (3.2) we obtain

$$\dot{d}(t) = (r + h(d(t)) - g)d(t) + x(t). \tag{3.3}$$

The risk premium $h(d)$ vanishes below some critical level d_c and increases above it at an increasing rate (for possible specifications, see Schmitt-Grohé and Uribe 2003):

$$h(d) = 0 \text{ for } d \leq d_c;\ h'(d) > 0 \text{ and } h''(d) \geq 0 \text{ for } d > d_c. \tag{3.4}$$

The marginal risk premium cost is

$$\psi(d) \equiv \partial(h(d)d)/\partial d = h(d) + h'(d)d. \tag{3.5}$$

Noting (3.4), $\psi(d)$ vanishes at $d \leq d_c$ and increases for $d > d_c$.

A bound $\bar{y} < 1$ on the tax rate induces the debt upper bound $\bar{d}$, satisfying

$$[r + h(\bar{d}) - g]\bar{d} = \bar{y}. \tag{3.6}$$

At $d(t) = \bar{d}$, the interest payments consume the maximal tax income and any debt above $\bar{d}$ will increase without bound.[11]

The incumbent's preferences while in office are represented by the (instantaneous) iso-elastic utility

$$u(b(t)e^{gt}) = \frac{[b(t)e^{gt}]^{1-\eta}}{1-\eta} = u(b(t))e^{-(\eta-1)gt}, \tag{3.7}$$

[10] We abstract from impacts of the legislative branch, which may involve checks and balances that restrict the set of feasible government policies. This point is further discussed and substantiated in the empirical analysis, in which various aspects of the relative budgetary bargaining power of the legislature are considered.

[11] Defaults are not allowed in this framework. This assumption is consistent with the intra-federal empirical analysis (next section), where a federal government regulates the default risk of state governments.

where η is the inverse of the itertemporal elasticity of substitution (or the relative risk aversion), assumed larger than one (see Hall 1988, for empirical evidence). As soon as political power is lost, the incumbent's utility, as perceived while in office, reduces to

$$u(\underline{b}e^{gt}) = u(\underline{b})e^{-(\eta-1)gt}, \tag{3.8}$$

where $\underline{b}$ is some minimal (e.g., non-discretionary) budget.[12] The incumbent's time preferences are represented by the (utility) discount rate $\rho > 0$, which also reflects the electorate's time preferences.

With T representing the time at which political tenure ends (it is assumed that politicians who leave office do not return), the incumbent's payoff is $\int_0^T \left[u(b(t))e^{-(\eta-1)gt}\right] e^{-\rho t}dt + \int_T^\infty \left[u(\underline{b})e^{-(\eta-1)gt}\right] e^{-\rho t}dt$, which can be expressed as

$$\int_0^T u(b(t))e^{-(\rho+(\eta-1)g)t}dt + \int_T^\infty u(\underline{b})e^{-(\rho+(\eta-1)g)t}d. \tag{3.9}$$

For incumbents that stand for reelection, T is a random variable with distribution that depends on the reelection prospects. For lame-duck incumbents (or when reelection is banned from the outset), T is a known date. We discuss these two cases in turn.

3.2 Reelection

Reelection prospects vary across political systems in a number of respects, most notably the maximal number of reelected terms allowed. It is expedient to consider the case of unlimited reelected terms. The framework developed for this case can shed light on intermediate political systems, with limited number of reelected terms, by appropriate restrictions on the effects of reelection.

The main difference between financing government spending by taxes versus borrowing is that the former is levied on current voters whereas the latter will be paid later on, by taxing future voters (to service the debt). For this reason, voters' attitude towards taxes and debt may differ, although they will dislike both forms of finance above what they perceive as reasonable tax or debt levels. This attitude affects voters' decisions in front of the ballot box, as documented by Brender and Drazen (2008).[13]

[12] The assumption that upon losing power the politician's utility drops to some lower bound (otherwise viewed as having "ego-rent" while in office) is common in the political agency literature (see, e.g., Besley and Case 1995, Maskin and Tirole 2004, List and Sturm 2006).

[13] Brender and Drazen (2008) find that tax cuts may be punished when undertaken in an election year. In the present work, however, we focus on term limits rather than election years.

Consequently, let $P(y(t), d(t))$ measure the electorate (e.g., median voter) support at time t for a tax policy $y(t)$ when the debt-income ratio is $d(t)$. In light of the above discussion, above certain tax and debt levels, $P_y \equiv \partial P/\partial y \leq 0$ and $P_d \equiv \partial P/\partial d \leq 0$.[14] Winning elections requires that the electorate support exceeds some threshold $\underline{P}$. The incumbent observes (via opinion polls) the noisy signal $\tilde{P}(y(t), d(t)) = P(y(t), d(t)) + \varepsilon$, where ε is a random (polling) error with the distribution $F_\varepsilon(\cdot)$. The incumbent, thus, evaluates the probability of losing power at time t (if elections were to be held at that time) by

$$m(y(t), d(t)) \equiv Pr\{\tilde{P}(y(t), d(t)) \leq \underline{P}\} = Pr\{P(y(t), d(t)) + \varepsilon \leq \underline{P}\} = F_\varepsilon(\underline{P} - P(y(t), d(t))). \tag{3.10}$$

With $m_z \equiv \partial m/\partial z = -F'_\varepsilon(\cdot)P_z$, $z = y, d$, we expect that $m_y \geq 0$ and $m_d \geq 0$ above certain tax and debt levels.

Political hazard: accountability and myopia

With time measured continuously, $m(y(t), d(t))$ is interpreted as the hazard rate associated with T,[15] i.e., the probability of losing power immediately after t given $T > t$, and induces the political survival probability[16]

$$S(t) \equiv Pr\{T > t\} = e^{-\int_0^t m(y(\tau), d(\tau))d\tau}. \tag{3.11}$$

The distribution and density of T are, respectively,

$$F_T(t) \equiv 1 - S(t) \;\; \text{and} \;\; f_T(t) \equiv F'_T(t) = m(y(t), d(t))S(t). \tag{3.12}$$

Taking expectation of (3.9) with respect to T, using (3.11)-(3.12), gives the expected payoff

$$\int_0^\infty \left[u(b(t)) + m(y(t), d(t))\frac{u(\underline{b})}{\rho + (\eta - 1)g}\right] S(t)e^{-(\rho+(\eta-1)g)t}dt. \tag{3.13}$$

[14]This simplifying assumption is consistent with the empirical evidence in Brender and Drazen (2008), Besley and Case (1995), Klein and Sakurai (2015) and could be associated with how voters weigh current disposable income against future disposable income, where the former decreases with the tax rate and the latter decreases with debt. One may expect a negative interaction effect $P_{yd} \leq 0$, as voters are more susceptible to higher taxes at larger debt levels. Our main results, however, are independent of the signs of P_y, P_d and P_{yd}.

[15]While elections take place in discrete time intervals, politicians constantly check the public support for their policies and adjust actions accordingly.

[16]The hazard rate $m(t) \equiv m(y(t), d(t))$ satisfies $m(t)\Delta = Pr\{T \in (t, t + \Delta]|T > t\}$. For small Δ it gives $m(t) = f_T(t)/(1 - F_T(t))$, where $F_T(\cdot) \equiv 1 - S(t)$ and $f_T(\cdot) = F'_T(\cdot)$ are the distribution and density of T, respectively. Thus, $m(t) = -d\ln(1 - F_T(t))/dt$, which upon integrating from zero to t, using $F_T(0) \equiv 1 - S(0) = 0$, gives (3.11).

The optimal budget policy is the feasible $\{y(t), x(t), t \geq 0\}$ that maximizes (3.13) subject to (3.3) and (3.11) given the initial $d(0)$ and $S(0) = 1$. A feasible budget satisfies $y(t) \in [0, \bar{y}]$, $y(t) + x(t) \geq \underline{b}$ and $d(t) \in [\underline{d}, \bar{d}]$, where $\bar{d}$ is defined in (3.6) and $\underline{d} \leq 0$ is some (finite) lower bound on debt (as noted, negative debt means that the economy is a net creditor).

The discount factor associated with the expected payoff (3.13) is

$$S(t)e^{-(\rho+(\eta-1)g)t} = e^{-\int_0^t(\rho+(\eta-1)g+m(y(\tau),d(\tau)))d\tau}$$

and the corresponding discount rate is

$$\rho + (\eta - 1)g + m(y(t), d(t)). \tag{3.14}$$

In contrast, the electorate's discount rate is $\rho + (\eta - 1)g$. The reelection prospects, thus, increase the incumbent's discount rate by the hazard rate $m(y(t), d(t))$.[17] This modification affects in two ways: first, it turns (reelection-seeking) politicians more myopic (compared to their electorate); second, it turns the discount rate endogenous, as $m(\cdot)$ depends on the policy. These effects are related to two separate agency problems associated with reelection.

The first is the role of reelection in holding incumbents accountable to their electorate. The policy-dependence of $m(\cdot)$ induces such an accountability, as becomes apparent when observing the survival probability (3.11).[18] In effect, it motivates incumbents to implement fiscal policies that enhance political survival, thereby acting as a disciplining mechanism. Following Besley and Case (1995), we refer to this effect as "reputation-building." The second effect is due to the role of $m(\cdot)$ in increasing the incumbent's discount rate relative to that of the electorate, which gives rise to political myopia; we refer to it as the "political myopia" effect. Reelection, thus, induces reputation-building and gives rise to political myopia.

Economic growth and public debt

Not surprisingly, the myopia effect operates to increase debt.[19] The effect of reputation-building on debt, which shows up via the endogeneity of $m(y, d)$, is mixed: $m_y > 0$ motivates lower taxes (cf. (3.11)), which for the same budget implies larger borrowing and larger debt;

[17] In the terminology of Maskin and Tirole (2004), the reelection prospects turned the politician's time preferences "non-congruent" with those of the electorate.

[18] Accountability may not always be desirable, e.g., when it gives rise to "pandering" to public opinion (Maskin and Tirole 2004), and may include selection effects (Alt et al. 2011, Aruoba et al. 2015). Our focus here is on the disciplining effect of accountability.

[19] As noted, this is consistent with previous models of myopia and debt (e.g., Aguiar et al. 2014, Rieth 2014).

$m_d > 0$, on the other hand, encourages lowering the debt ((3.11) again). The overall impact of reputation-building on debt depends on the balance between these opposite effects. The effect of reelection prospects on debt is, thus, ambiguous.

It turns out, however, that economic growth exacerbates the myopia-debt nexus, leaning the overall impact toward more debt. To unravel this interaction we focus on the long run, exploiting the following property:

Proposition 1 *The optimal debt-income ratio process converges monotonically to a steady state from any initial debt.*

The proof is presented in Appendix A. The proposition allows focusing attention on the long-run effects of economic growth on debt via the effect of g on the optimal steady-state debt.

In a steady state $d(t)$ remains constant, hence also $x(t)$ and $y(t)$ stay put. Let $\hat{x}(d)$ and $\hat{y}(d)$ denote the steady states of x and y when debt is constant at the (not necessarily optimal) value d. The steady-state survival probability (3.11) is $e^{-m(\hat{y}(d),d)t}$ and the expected payoff (3.13) evaluated at a (not necessarily optimal) steady state d reduces to

$$\hat{W}(d) = \frac{u(\hat{y}(d) + \hat{x}(d)) + m(\hat{y}(d), d)u(\underline{b})/(\rho + (\eta - 1)g)}{\rho + (\eta - 1)g + m(\hat{y}(d), d)}. \tag{3.15}$$

From (3.3),

$$\hat{x}(d) = -(r + h(d) - g)d \tag{3.16}$$

and it is verified in Appendix B that $\hat{y}(d)$ satisfies

$$m(\hat{y}(d), d) = r - (\rho + \eta g) + \psi(d) + m_d(\hat{y}(d), d)/m_y(\hat{y}(d), d). \tag{3.17}$$

The optimal steady-steady debt is denoted $\hat{d}$ and the long-run effect of growth on debt is evaluated by the effect of g on $\hat{d}$. It is verified in Appendix B that an internal, optimal steady state $\hat{d} \in (\underline{d}, \bar{d})$ satisfies

$$u'(\hat{y}(\hat{d}) + \hat{x}(\hat{d})) = m_y(\hat{y}(\hat{d}), \hat{d}) \left(\hat{W}(\hat{d}) - \frac{u(\underline{b})}{\rho + (\eta - 1)g} \right), \tag{3.18}$$

where $\hat{W}(d)$, $\hat{x}(d)$ and $\hat{y}(d)$ are defined in (3.15), (3.16) and (3.17), respectively. Equation (3.18) defines $\hat{d}$, provided it admits a feasible solution in $(\underline{d}, \bar{d})$. As $\hat{x}(\cdot)$, $\hat{y}(\cdot)$, $\hat{W}(\cdot)$ and $u(\underline{b})/(\rho + (\eta - 1)g)$ vary with g, so does $\hat{d}$ and we indicate this relation by $\hat{d}(g)$.

Figure 1 depicts $\hat{d}(g)$ under the linear

$$h(d) = \delta_0 + \delta_1 d, \quad m(d) = \mu_0 + \mu_1 y + \mu_2 d \tag{3.19}$$

and the parameter values of Table 1 with $\mu_0 = 0.15$, $\mu_1 = 0.1$ and $\mu_2 = 0.01$, assuming that Ramsey's (1928) condition $r = \rho + \eta g$ is satisfied.[20] The parameters μ_1 and μ_2 measure the effects taxes and debt on the political hazard rate, which, as discussed above, stem from the political support function.[21] The parameter μ_0 represents exogenous (institutional) factors affecting reelection prospects, interpreted also as limits on the number of reelected terms. Specifically, a larger μ_0 reflects less restrictions on reelection possibilities.

Table 1: Parameter values.

Parameter	Value
η	2
ρ	0.03
$\underline{b}$	0.1
δ_0	0
δ_1	0.1

The values $\eta = 2$ and $\rho = 0.03$ are well within commonly used ranges (see, e.g., Dasgupta 2008). The value $\delta_0 = 0$ ensures that the risk premium becomes effective only above the critical debt level, where the latter is set at zero. The value $\delta_1 = 0.1$ means that above the critical debt level, a 10 percent increase in the debt-income ratio increases the interest rate at which the government can borrow by one percent.

The positive effect of growth on long-run debt is evident, revealing that long-run debt increases with the growth rate g. Notably, The positive effect of g on $\hat{d}$ was found to hold over a wide range of parameter values (including different μ_2/μ_1 ratios, representing different relative effects of tax and debt on the hazard rate), and to increase with μ_0.

[20]The linear specifications in (3.19) are made for convenience. Below we illustrate the main insights analytically in the context of a simple model with an exogenous tax rate.

[21]For the purposes of the numerical illustration we assume $\mu_1 > \mu_2$, reflecting voters' greater lack of contentment from tax increases relative to debt increases. Nonetheless, as we note below, the numerical results are robust to changes in the values, and relative magnitudes, of these parameters.

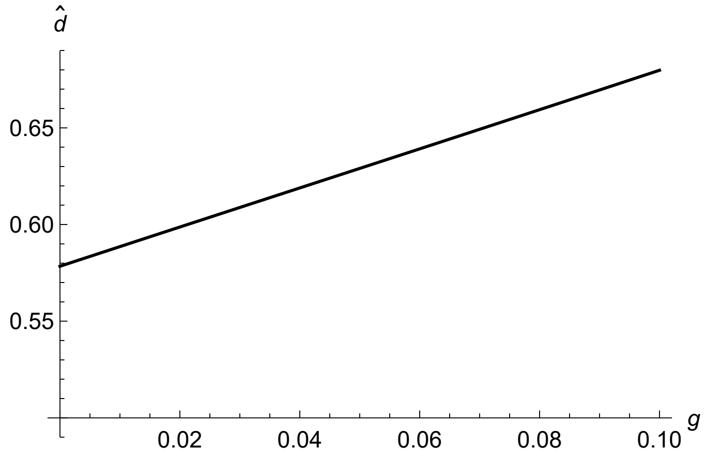

Figure 1: long-run debt $\hat{d}$ as a function of g under the parameter values of Table 1 and the hazard rate $m(y,d) = 0.15 + 0.1y + 0.01d$, assuming that Ramsey's condition $r = \rho + \eta g$ holds.

Accountability vs. myopia

To gain insight on the processes underlying the effect of g on $\hat{d}$, it is expedient to consider the case in which the tax rate $y(t)$ is constant, say at y_0, and only borrowing $x(t)$ is subject to decision. In this case, the hazard rate depends only on d, so the reputation-building effect operates to decrease debt while the myopia effect operates to increase debt. Notably, g may affect $\hat{d}$ via both reputation-building and myopia. As in this case the myopia and reputation building affect $\hat{d}$ in opposite directions, the analysis reveals more clearly which effect dominates in the presence of growth.

As before the upper bound $\bar{d}$ satisfies (3.6), yet with y_0 replacing $\bar{y}$. We verify in Appendix C that the optimal steady state $\hat{d}$ is characterized in this case by:

Proposition 2 *Suppose $y(t) = y_0$. Then, a locally stable, optimal steady state $\hat{d} \in (\underline{d}, \bar{d})$ must be a root of*

$$L(d) = u'(y_0 + \hat{x}(d))\,(\rho + \eta g - r + m(d) - \psi(d)) + m_d(d)\left(\frac{u(\underline{b})}{\rho + (\eta - 1)g} - \hat{W}(d)\right) \quad (3.20)$$

at which $L'(d) < 0$. If no such root exists in $(\underline{d}, \bar{d})$, then $\hat{d} = \bar{d}$ or $\hat{d} = \underline{d}$ if $L(\bar{d}) \geq 0$ or $L(\underline{d}) \leq 0$, respectively.

Now, $L(\cdot)$ depends on g directly and via the dependence of $\hat{x}(\cdot)$ and $\hat{W}(\cdot)$ on g,[22] hence can be denoted as $L(d;g)$. For internal steady states $\hat{d} \in (\underline{d}, \bar{d})$, Proposition 2 implies $L(\hat{d};g) = 0$ and induces the relation $\hat{d}(g)$, allowing investigating the effect of g on $\hat{d}$.

Figure 2 depicts $\hat{d}(g)$ under the linear $h(\cdot)$ and $m(\cdot)$ of (3.19) and the parameter values of Table 1 with $\mu_0 = 0.15$ and $\mu_2 = 0.01$, assuming that Ramsey's (1928) rule, $r = \rho + \eta g$, holds. The positive effect of growth on long-run debt is once again apparent. This result suggests that while reputation-building induces the incumbent to decrease debt while political myopia encourages to increase debt, the latter effect is exacerbated in the presence of economic growth, producing the positive impact of growth on long-run debt depicted in Figure 2. Simplifying further, assuming that the hazard is independent of debt, reveals the underlying intuition for this result.

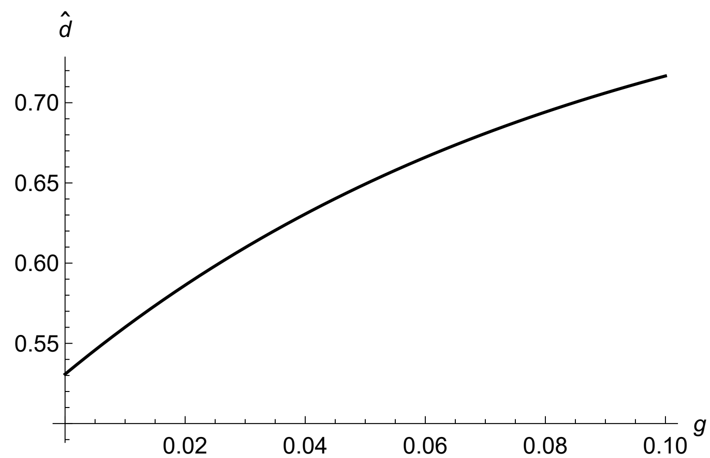

Figure 2: $\hat{d}(g)$ under a constant $y = y_0 = 0.4$, the hazard $m(d) = 0.15 + 0.01d$, and the parameter values of Table 1.

Myopia without accountability

The case in which $m_d = 0$, where the hazard is constant $m(d) = \mu_0$, is instructive because the reputation-building effect vanishes and only the myopia effect prevails. In this case, $L(d)$,

[22]Notice that when $y(t) = y_0$, $m(\hat{y}(d), d)$ reduces to $m(d)$ and $\hat{W}(d)$, defined in (3.15), becomes

$$\hat{W}(d) = \frac{u(y_0 + \hat{x}(d)) + m(d)u(\underline{b})/(\rho + (\eta - 1)g)}{\rho + (\eta - 1)g + m(d)}.$$

defined in (3.20), specializes to

$$L(d) = u'(y_0 - \hat{x}(d))\,(\rho + \eta g - r + m(d) - \psi(d))$$

and Proposition 2 implies (assuming for simplicity $\underline{d} = d_c = 0$)

$$\hat{d} = \begin{cases} 0 & \text{if } \rho + \mu_0 \leq r - \eta g \\ \psi^{-1}(\rho + \mu_0 + \eta g - r) \in (0, \bar{d}) & \text{if } r - \eta g < \rho + \mu_0 < r - \eta g + \psi(\bar{d}) \\ \bar{d} & \text{if } \rho + \mu_0 \geq r - \eta g + \psi(\bar{d}) \end{cases}. \tag{3.21}$$

Notice that (3.4) ensures that $\psi(d)$ is increasing above the critical debt $d_c = 0$, so $\psi^{-1}(\cdot)$ is well defined and increasing over $[0, \bar{d}]$. The internal steady-state (the middle line of (3.21)) is

$$\hat{d}(g) = \psi^{-1}(\rho + \mu_0 + \eta g - r) \in (0, \bar{d}) \tag{3.22}$$

and the properties of $\psi(d)$ ensure that $\hat{d}'(g) = \eta\psi^{-1\prime}(\rho + \mu_0 + \eta g - r) > 0$, implying that growth increases long-run debt. Moreover, Condition (3.4) indicates when the properties of $\psi(d)$ imply that $\hat{d}'(g)$ increases with μ_0, i.e., that the positive effect of growth on debt is exacerbated (magnified) by the extent of myopia.

In addition, under Ramsey's (1928) rule, $r = \rho + \eta g$ and an internal steady state $\hat{d} \in (\underline{d}, \bar{d})$ reduces to

$$\hat{d} = \psi^{-1}(\mu_0) \in (0, \bar{d}).$$

Thus, in this case $\hat{d}$ is solely due to myopia (μ_0) and is independent of g.[23] However, growth exacerbates the insolvency prospects by decreasing the debt-income ratio $\bar{d}$ at which the government becomes insolvent. To see this, rewrite (3.6), with $\bar{y} = y_0$ and $r = \rho + \eta g$, as

$$h(\bar{d}) - y_0/\bar{d} = g(1 - \eta) - \rho.$$

Because $h(\cdot)$ is increasing for $d > d_c = 0$, the relation above implies that $\bar{d}$ decreases in g (recalling that $\eta > 1$). A larger growth rate, thus, reduces $\bar{d}$, implying that a smaller level of political impatience is needed for the government to drive its country to insolvency. It is possible, for example, that the same government will drive a growing economy to insolvency but will maintain the ceteris-paribus stagnating economy perfectly solvent.

The explanation rests on the dual role of η in valuing future relative to current expenditures. On the one hand, growth increases the (riskless) interest rate from ρ to $\rho + \eta g$,

[23]In this case growth affects debt via its effect on the interest rate r but not directly.

thereby increasing the price of borrowing from future generations. On the other hand, a larger η reduces the intertemporal elasticity of substitution $(1/\eta)$, providing incentive to borrow against the future in order to smooth intertemporal expenditures. When $\eta > 1$, the intertemporal elasticity of substitution $(1/\eta)$ is relatively small and the expenditure-smoothing motive dominates. An alternative explanation rests on the role of η as a measure of aversion to intergenerational inequality. Growth means that future generations will be richer, and high aversion to intergenerational inequality (high η) induces redistribution from (wealthier) future generations to the present. Such a redistribution, in the form of borrowing, pushes the economy towards the insolvency brink.

3.3 No reelection

This case refers to the situation in which reelection is banned from the outset. The main difference from the previous (unlimited reelection) case, is that here we have a sequence of governments with preferences that may differ from one another. Comparing with the results of the reelection case requires assuming that preferences are the same across governments (the discussion below points out situations where this assumption holds and when it is violated). This assumption allows us to consider the long run and find that the only difference from the previous case is that $m(\cdot)$ no longer exists. In the absence of $m(\cdot)$, its disciplining forces, inducing incumbents to be (fiscally) accountable to their electorate, no longer operate. The vanishing $m(\cdot)$ also eliminates the myopia effect. Under these circumstances, our model does not give rise to debt buildup and consequently growth does not affect public debt. The discussion below considers a few caveats.

3.4 Discussion

The analysis highlights a number of interesting consequences of reelection vis-à-vis economic growth and debt. The desire to enhance political survival induces upon reelection-seeking incumbents a measure of fiscal accountability as well as turns them more myopic (relative to their electorate): the former effect on debt is mixed and the latter effect is positive. The interaction with economic growth tends to exacerbate the debt consequences of these effects. A possible explanation of the myopia-growth nexus draws on the economic situation of future generations: as growth improves the wellbeing of future generations, it motivates redistribution from the future to the present, justifying more borrowing and larger debt.

When reelection is not possible, incumbents may not worry about reputation-building, and are also not myopic. In the absence of reputation-building, y may be higher compared to the case of reelection (as in Besley and Case 1995), and without myopia there is no debt buildup to interact with growth. The analysis, thus, illustrates how the impact of g on $\hat{d}$ may vary with the extent of reelection prospects.

The model delivers two key predictions. First, economic growth may increase public debt when there is a discrepancy between the discount rates of the polity and that of the electorate. Second, this effect may intensify with the width of the discrepancy. Importantly, the latter has empirically testable implications because it means that variations in the extent of polity-market discrepancies are useful for examining the effects of economic growth on public debt, even when some discrepancy exist for all observations in the sample. We exploit this property in the empirical analysis presented next.

We close this section by pointing out a few aspects, overlooked by our model. The efficacy of myopia in affecting fiscal policy and the ensuing debt depends also on factors such as party control, exogenous constraints on the ability of governments to exercise discretion, as well as post-office considerations such as maintaining one's legacy and reputation (see discussion in Besley and Case 1995). Political party, which continues to exist after the governor is gone, may enforce its agenda and hence affect the fiscal policies of incumbents. The bargaining power and experience of the executive branch (especially compared to those of the legislative branch) may affect the extent to which fiscal policies can be implemented, regardless of term limits. Finally, governors may have plans for life after governorship, e.g., they may care about their legacy, a particular interest group or the strength of their political party, which can affect their preferences during their lame-duck term.[24] We account for these considerations in the empirical analysis below.

4 Empirical analysis

The above model explains how economic growth may increase public debt under political myopia. Moreover, it shows that this tendency is enhanced with the extent of myopia. In this section we provide empirical evidence in support of these properties. We do so by using a U.S. state-level analysis that exploits cross-state institutional differences affecting the extent of political myopia to estimate the heterogeneous effects of aggregate national TFP shocks

[24] When the post-office legacy motive dominates, the assumption that the sequence of lame-duck incumbents share the same preferences, considered in the no-reelection scenario, is plausible. When loyalty to interest groups or the party dominates, this assumption may not hold.

on changes in states' public debt. We first describe the data, methodology, and identification assumptions; then present the empirical results.

4.1 Data and methodology

We examine a panel of U.S. states over the period 1963-2007.[25] An intra, cross-state, U.S. perspective is appealing for our purposes for several reasons. First, while presenting a relatively homogenous environment, U.S. states provide constitutionally-entrenched differences in gubernatorial term limits that affect the extent of political myopia via variations in reelection prospects; in addition, these myopia-affecting institutional differences are representative of varying degrees of μ_0 in the model. Second, irrespective of states' balance budget rules, there is considerable cross-state variation in states' public debt and changes thereof. Third, an intra-U.S. setting, where each state is a relatively small player, enables regarding aggregate national TFP shocks as plausibly exogenous to states' changes in public debt. Similarly, in such a setting whereby states are essentially price takers, r is taken as given, consistent with the theoretical setting. These three features allow identifying the causal link running from TFP shocks (growth) to debt accumulation via political myopia (reelection prospects). We discuss each of these components in more detail.

The extent of political myopia, which as stated in Section 3 stems from the short time horizon of politicians relative to ordinary market participants, depends on gubernatorial term limits. The latter provides considerable institutional variation across U.S. states. In 14 states governors can be reelected indefinitely,[26] while the remaining states have some restriction on the number of eligible terms.[27] Importantly, there is no concurrent cross-state variation in term lengths, fixing the level of government durability.[28]

Our main conjecture, following the model, is that having no restriction on the option to reelect increases the time rate of discount of politicians due to their reputation-building behavior. Conversely, facing some restrictions, which at some point limit the option to

[25] We restrict the analysis to pre-2008 data to exclude the potential biasing effects of the post-2007 recession. The earliest year for which regional (state-level) accounts are available is 1963, marking the start year of the sample period.

[26] These states are CT, IA, ID, IL, MA, MN, ND, NH, NY, TX, UT, VT, WA and WI.

[27] There are various restrictions. For instance, some states require waiting a full term, following two consecutive terms, before becoming an eligible candidate again (e.g., NJ and NM). Other states grant eligibility for eight out of sixteen years (e.g., MT, WY). In another group candidates are eligible for two consecutive terms only (e.g. CA, CO).

[28] With the exception of NH and VT, which have shorter, two-year terms. The analysis captures this difference via the state fixed effects, yet we in addition note that results are robust to the exclusion of these two states.

reelect, decreases the time rate of discount of politicians as they have no incentive to exert efforts to maintain a political reputation. Consequently, these restrictions may on one hand exacerbate the effort-related political agency problem (by exerting no effort), but on the other hand lead to less myopic politicians that may put more weight on their legacy, and the wellbeing of future generations.[29] Therefore, these constitutionally-entrenched differences in reelection prospects provide plausibly exogenous cross-state variation in the extent of political myopia.[30] In the initial analysis we, hence, divide the sample into two groups of states based on their implied political myopia level. The group that represents the relatively myopic governments includes the aforementioned 14 states.[31] Notably, none of the states switched between groups over the course of our sample period; hence, the division remains constant and is therefore not susceptible to endogenous changes.[32]

Thereafter, in the main analysis we add a time dimension to this measure by accounting directly for governors' last terms.[33] In effect, this measure represents the proportion of years within the inspected time interval in which the governor was not in his/her last term.[34] Hence, the closer its value is to 1, the greater is the extent of political myopia. In the group of states that have no gubernatorial term limits this measure takes the value of 1 in all cases. However, in the group of states that have some restrictions this measure provides variation both across states as well as within them, having a mean of 0.62 and a standard deviation of 0.37. This is illustrated in Figure 3, which presents the distribution of this measure across U.S. states.

This measure, hence, exploits the full extent of (the cross-sectional and time) variation related to state differences in gubernatorial term limits. Importantly, this variation is based on the exogenous institutional differences. This is also the case in instances where values are relatively high (e.g. close to 1), despite having some term restrictions. In such cases gover-

[29] Following Crain and Tollison (1992), an alternative view can be that having term restrictions may manifest time inconsistency effects. If, for instance, the incumbent realizes that he/she can be replaced in an upcoming election by a candidate from the opposing party, he/she may increase deficit while still in office in an attempt to affect political outcomes in the following term. We address this option in a later sub-section, illustrating that it does not affect the main results.

[30] As noted, this variation equivalently represents differences in the extent of reputation-building behavior, as political myopia and reputation-building are essentially two sides of the same coin.

[31] We consider also other divisions to test the robustness of the empirical results vis-à-vis this division.

[32] While there have been changes in term limit restrictions throughout our sample period, they occurred only within the group that includes the states that face some term restrictions.

[33] This approach is reminiscent of that adopted by Besley and Case (1995, 2003), and List and Sturm (2006) among others.

[34] The role of time intervals in the empirical design, described briefly in Section 1, is further outlined below in the discussion over the estimated model.

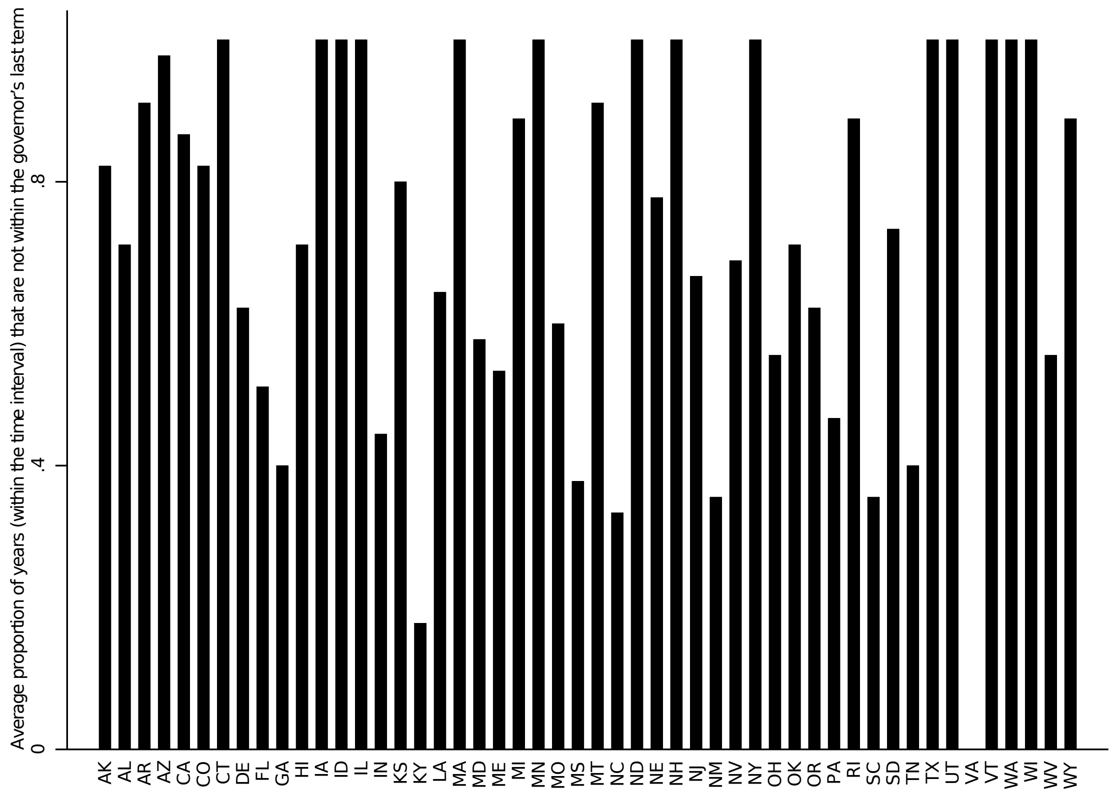

Figure 3: The proportion of years within the main panel's 5-year intervals that the governor is not in his/her last term, averaged over the period 1963-2007. Source: National Governors Association.

nors keep having opportunities to be reelected because they do not make it to a lame-duck term, and hence get replaced beforehand. While this may be evident of unsuccessful policy implementation, it does not affect the hypothesis tested. This is based on the assumption that myopia-related behavior alters specifically with reelection prospects.[35]

In addition, note that in the model myopia was measured via (continuous) term lengths and re-election prospects. The empirical counterpart maps to the model by holding term lengths constant, while changing the extent of term limits. Similar to the model, reelection prospects are not a feature of a binary choice. Term limits present restrictions but enable some extent of reelection, as illustrated by the variation in our main measure across states with some term restrictions. This, in turn, strengthens the observation that in this empirical

[35]Nonetheless, we account for governor budgetary experience in the analysis.

application we examine variations in the extent of (positive) polity-market discrepancies consistent with the framework dictated by the model.

Concerning public debt, virtually all states issue debt to finance expenditures, regardless of existing balanced budget rules (Krol 1997). Importantly, there is a large cross-state variation in debt levels. The distribution of real public debt per capita across states for our sample period is plotted in Figure 4.[36] The range is quite wide, going from as low as about $370 to higher than $5000. The average real public debt per capita is approximately $1240, with a standard deviation of $945. We exploit this variation in the analysis. In addition, in Figure 5 we plot the annual averages of real public debt per capita along our sample period for the two state-groups. Notably, the figure does not point at a clear relationship between reelection prospects and public debt, as the theoretical analysis suggest.[37]

Regarding effects of TFP shocks (growth) on public debt, the extensive literature that examines the opposite direction (i.e., the effect of debt on growth) indicates clearly that a direct empirical test of such effects may suffer from an endogeneity bias (see, e.g., Reinhart et al. (2012)). To address this identification issue we use aggregate national TFP shocks as a proxy for state-level growth. The underlying assumption is that each state is sufficiently small for its debt to have an effect on aggregate national shocks.[38] The latter, however, affects state level growth, as we discuss below. In addition, examining such shocks enables comparing their different effects across the two state-groups more effectively, as the national shocks are common to both.

For the main analysis we adopt the annual aggregates of the utilization-adjusted TFP shocks series of Fernald (2014), which builds on the measure of purified technology improvements constructed by Basu et al. (2006). This series presents a state-of-the-art measure of the aggregate U.S. Solow-residual under factor utilization, constructed via aggregates of industry-level technology changes. The mean shock, in its natural logarithm form, is 0.62 with a standard deviation of 0.13, representing both increases and decreases in technology changes during our sample period. Despite being at the national level, these TFP shocks

[36]As illustrated in Figure 4, AK is an outlier with an average debt per capita that is more than twice that of the state with the second highest average level (CT). We show that the main results hold also when AK is excluded from the sample.

[37]Recall that the group of states with some term restrictions (called the non-myopic group) exhibits both political myopia and reputation-building behaviors, whereas the groups of states with no term restrictions (called the myopic group) exhibits neither. As the theoretical analysis notes, because political myopia and reputation-building are pro-cyclical yet affect debt in opposite directions, the overall effect of reelection prospects on debt is ambiguous.

[38]Realizing that some of the states represent a non-trivial share of the U.S. economy, we show in a later sub-section that the main results are robust to the exclusion of the largest states; namely, CA, NY, and TX.

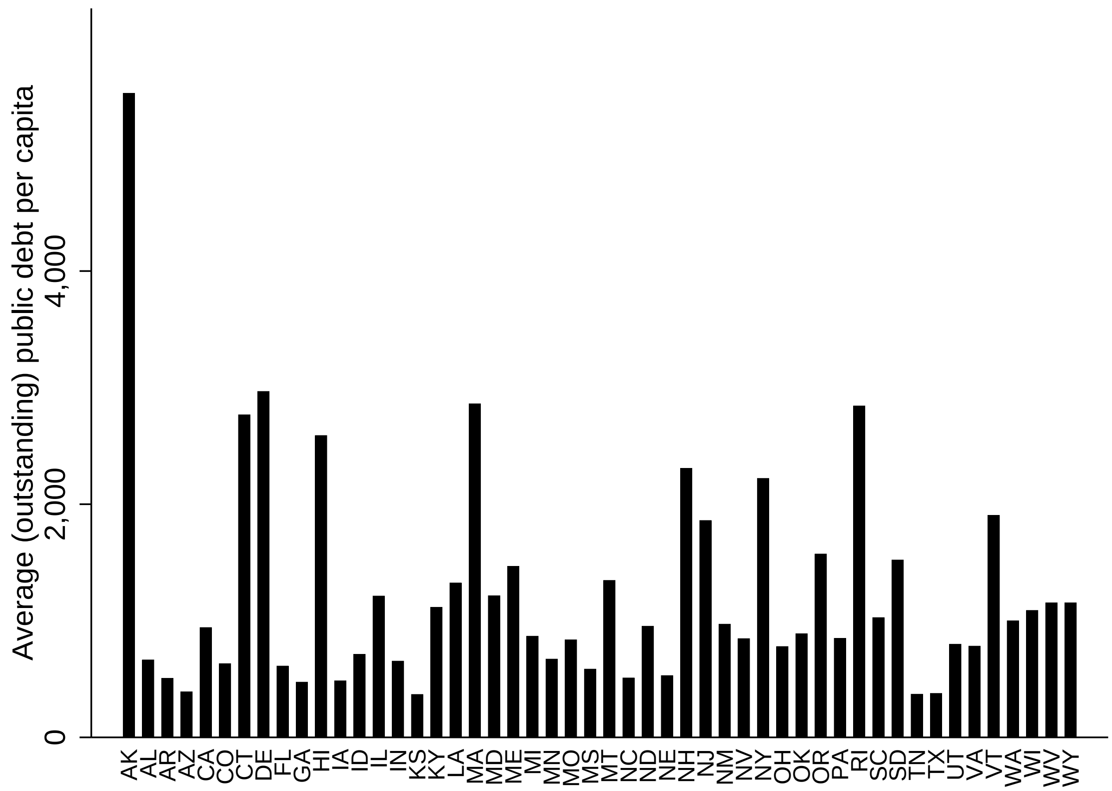

Figure 4: Average (outstanding) real public debt per capita across U.S. states over the period 1963-2007. Source: U.S. Census Bureau.

are expansionary in all states, especially when averaged over multiple years as is done in the analysis described below.[39] Importantly, there is no systematic differential effect of such TFP shocks across the two state-groups of political myopia. Evidence for the latter two points are presented in the Appendix, where we examine the association of the aggregate TFP shocks with economic growth at both the aggregate level as well as across myopia state-groups.

To summarize, our empirical strategy estimates the differential effects of aggregate, common TFP shocks on the changes in states' public debt, across state-levels of political myopia. The two main underlying assumptions are that the political myopia division is plausibly ex-

[39]There is some disagreement in the literature on the contemporaneous effects of these shocks. Basu et al. (2006) document contractionary effects, whereas Christiano et al. (2004) report expansionary patterns. Nonetheless, there is a relatively wide consensus on their non-contemporaneous expansionary effects. For instance, Basu et al. (2006) indicate that the expansionary effects of technology improvements is apparent for approximately three years past the shock.

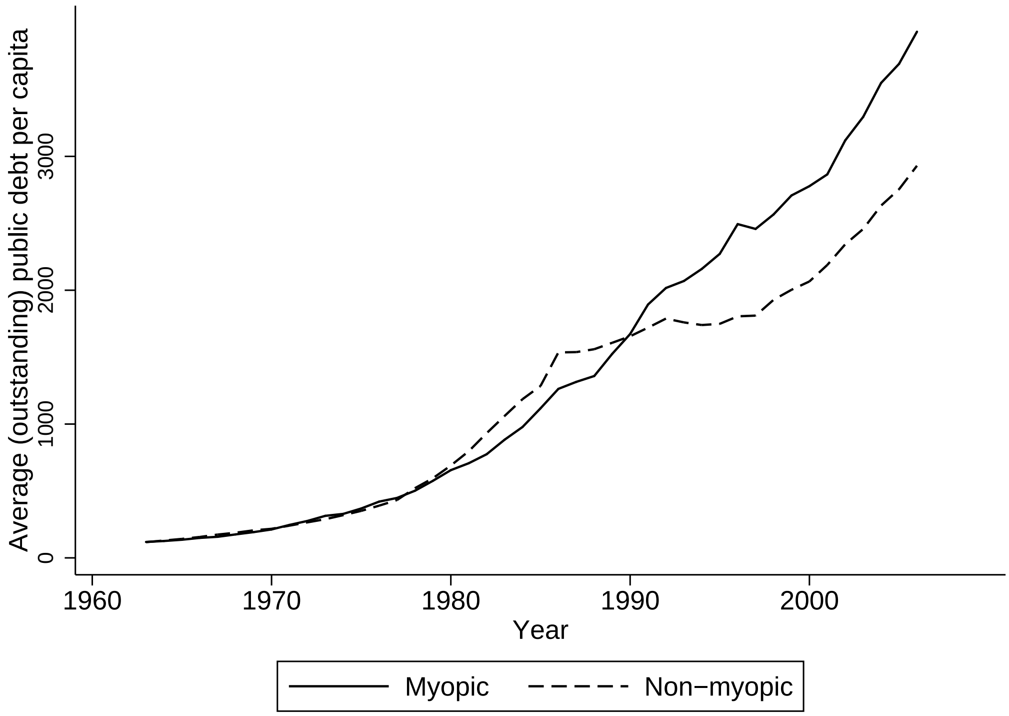

Figure 5: Average (outstanding) public debt per capita of myopic and non-myopic U.S. state governments over the period 1963-2007. The averages are over 5-year intervals and are plotted every 5 years, beginning in 1963 up to 2003. Myopic governments are defined as those with no restrictions on the number of governors' terms and include CT, IA, ID, IL, MA, MN, ND, NH, NY, TX, UT, VT, WA, WI. Non-myopic are the remaining states, from which AK is excluded due to its special fiscal circumstances. Source: U.S. Census Bureau.

ogenous, given its constitutionally-entrenched roots, and that each state on its own is too small to manipulate national TFP changes via its public debt or other means. Given the plausible exogeneity of these two main measures we estimate the effect of its interaction on states' public debt using a panel fixed-effects framework.

To that end, we estimate different versions of the following baseline specification, for state i at time period t:

$$\Delta debtN_{i,\Delta(t-1,t)} = \alpha + \beta(debtN)_{i,t-1} + \gamma(tfp * myopic)_{i,t} + \delta(myopic)_{i,t} + \theta(\ln gspN)_{i,t-1} + \upsilon_t + \eta_i + \epsilon_{i,t}; \quad (4.1)$$

where $\Delta debtN_{i,\Delta(t-1,t)}$ denotes change in the average real outstanding public debt per capita between times $t-1$ and t;[40] $debtN$ denotes the level version of real outstanding public debt per capita, to capture convergence;[41] tfp denotes the aggregate TFP shocks; *myopic* is initially a dummy variable that captures the 14 states considered to have relatively myopic governments, and thereafter in the main analysis it is the continuous myopia measure that captures the proportion of years in the time interval that are within the governor's last term; $\ln gspN$ is the natural logarithm of real GSP per capita which controls for basic income differences and state heterogeneity.[42] The latter enters with a lag to mitigate related endogeneity concerns. Finally, υ and η are time and state fixed effects, respectively, controlling for time and state invariant phenomena such as changes in the oil price or cross-state institutional differences (an option we analyze further in the following section).

Notice that tfp is not included in (4.1) as it is absorbed by the time fixed effects (υ). Similarly, in the initial cases *myopic* has no time variation (as it represents a binary index) and hence is absorbed by the state fixed effects (η). We also examine, however, specifications where υ (tfp) is excluded (included) to observe the average effect. Standard errors are clustered by state in all specifications. The data Appendix outlines the variables and their sources. Table A1 provides descriptive statistics for the complete sample; Table A2 does the same for the politically myopic (Panel A) and politically non-myopic (Panel B) state-groups separately. Our focus is on the coefficient γ; namely, the differential effect of aggregate TFP shocks, across myopia levels, on changes in states' real per capita public debt.

Finally, the time period t in the analysis ought to be explained. In the benchmark analysis we consider t to represent 5-year intervals. This means that within the panel's sample, 1963-2007, we have 9 time observations each representing the averages of each of the said variables within the corresponding time interval. We do so given that our hypothesis relates to medium-term political processes that are expected to take effect during several years. A 5-year interval ensures that there is at least one state-election within each interval, and that elected governors have at least one year to create changes in their states' public debt. In a later sub-section we show that the main results are not sensitive to the choice of time-interval.

[40]Given the said link between TFP shocks and GSP, we focus on per capita terms. Unlike normalizing by GSP, the denominator in this case is less responsive to TFP shocks, which provides a better focus on the changes in debt. Nonetheless, we show later that the main results hold as well when the dependent variable is normalized by GSP.

[41]Results are qualitatively similar when this variable is excluded.

[42]We consider the intra-U.S. environment to be relatively homogenous, and hence keep the inclusion of further, potentially endogenous controls to a minimum, assuming the bulk of relevant cross-state heterogeneity is captured via income differences.

4.2 Benchmark results

We estimate various forms of Equation (4.1); the results are reported in Table 2.[43] We start with examining the association of TFP shocks and changes in public debt in the average state. To do so, we exclude *myopic* and its interaction with tfp, together with v, and include tfp, focusing on the estimated coefficient of the latter. Results appear in Column 1. TFP shocks do not appear to be correlated with changes in the debt of the average state. Hence, for the average state an economic boom is not strongly associated with changes in its debt.

Table 2: Baseline results; 1963-2007 (5-year intervals)

Dependent variable: Change in the average real state debt per capita, Δ(t-1,t)	(1)	(2)	(3)	(4)	(5)	(6)
		Myopia: state division		Myopia: last term		
	No myopia	Baseline	Myopia and non-myopia	Myopia	Baseline	Restricted sample: Non-myopia
TFP	865.35					
	(1154.03)					
Myopia				-227.36	-3097.71***	-2785.67**
				(150.14)	(888.74)	(1109.79)
Myopic * TFP		3683.73***	5127.85***		4506.87***	4022.76**
		(1008.87)	(1354.36)		(1347.43)	(1726.29)
Non-Myopic * TFP			1268.41			
			(981.34)			
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	No	Yes	Yes	Yes
R-squared	0.38	0.44	0.42	0.42	0.47	0.43
Observations	400	400	400	400	400	288

Notes: Standard errors are robust, clustered by state, and appear in parentheses for independent variables. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance. All regressions include an intercept, and control for the natural logarithm of real per capita GSP in t-1 and the level version of the dependent variable in t-1. Sample includes the 50 U.S. states and covers the period of 1963-2007 in 5-year intervals. Dependent variable is the change in the average real state debt per capita between time t-1 and t. 'TFP' denotes purified technology improvements. 'Myopic' in Columns 2-3 is a dummy variable that captures the states with no restrictions on the number of governors' terms; namely: CT, IA, ID, IL, MA, MN, ND, NH, NY, TX, UT, VT, WA, WI. 'Non-myopic' includes the remaining the states. 'Myopic' in Columns 4-6 is the proportion of years (within the time interval) in which the governor is not in his/her last term. For further information on variables see data Appendix.

Next, we include political myopia. We start by adopting the discrete version of *myopic*, with which we undertake an initial inspection through the simple cross-sectional division in political time horizon. Having no time variation, *myopic* enters the specification interacted

[43]To keep exposition to minimum, only the coefficients of interest are reported throughout the analysis. We do note, however, that the estimated βs point at convergence in all cases of the empirical analysis.

with tfp, together with the time fixed effect υ. We focus on the coefficient γ. The results in Column 2 indicate that it is positive and significant. A plausibly exogenous, expansionary shock increases deficit more strongly in the relatively politically myopic states, consistent with the key prediction of the theoretical analysis. The magnitude is non-trivial. The estimated γ in this case suggests that over the course of five years, a one standard deviation positive TFP shock induces an increase of approximately \$494 in real per capita public debt in the politically myopic states relative to the non-myopic states.[44]

To observe this more clearly, in Column 3 we estimate the following variation of Equation (4.1):

$$\Delta debtN_{i,\Delta(t-1,t)} = \alpha + \beta(debtN)_{i,t-1} + \gamma(tfp * myopic)_{i,t} + \lambda(tfp * non-myopic)_{i,t} + \delta(\ln gspN)_{i,t-1} + \eta_i + \epsilon_{i,t}; \quad (4.2)$$

where $non - myopic$ is a dummy that captures the states not included in $myopic$. The inclusion of both is enabled via the exclusion of tfp and υ. This case illustrates the divergent reactions of the myopic and non-myopic states to the aggregate shock; it is equivalent to estimating the portion that each state-group accounts for in the total, average reaction. Due to the exclusion of the time effects, the magnitudes of the estimates of γ and λ are larger (though their interpretation is less clear). However, γ is positive and significant while λ is non-significant, explaining the source of the observed relative difference.

Next, we consider the main, continuous version of *myopic* (which remains to be the one used in the analyses that follow). The main difference with the previous cases is that now *myopic* has time variation and hence is not absorbed by the state fixed effects. Thus, as a first step, in Column 4 we exclude the interaction term of *myopic* and tfp from Equation (4.1), and examine the direct effect of myopic on debt (δ). This estimation yields a non-significant coefficient on *myopic*, supporting the theoretical insight that the effect of reelection prospects (*myopic*) on changes in public debt is ambiguous because it includes two pro-cyclical conflicting effects, namely reputation-building and political myopia.

Column 5 examines how economic growth interacts with this phenomenon. This specification follows the one estimated in Column 4, with the interaction term of interest, namely $tfp * myopic$, included. Column 5, therefore, represents our preferred, benchmark specification, which in effect follows the one outlined in Equation (4.1). The results indicate that

[44] A one standard deviation increase in tfp (0.134) multiplied by the estimated γ in Column 2 (3683.73) is 493.62.

the direct effect of *myopic* is, once again, ambiguous.[45] On the other hand, γ is positive and precisely estimated, supporting the prediction that the effect of economic growth on public debt via reelection prospects is strictly positive. To interpret the magnitude, over the course of five years, a one standard deviation increase in tfp induces an increase of \$604 in real per capita debt, in states with no term limits (where *myopic* takes the value of 1).[46]

Last, we test the applicability of the mechanism in the relatively non-myopic states. As discussed earlier, the continuous nature of *myopic* provides ample variation across states that have values that are less than 1. This enables testing whether similar patterns are observed in the absence of the relatively myopic states. Hence, in Column 6 we restrict the sample to the (36) states that were included previously in the $non-myopic$ dummy. Interestingly, the estimated δ and γ are similar in sign and significance to those estimated in Column 5, yet with a relatively lower magnitudes. Importantly, they lead to similar qualitative conclusions.

5 Robustness tests

The previous sub-section laid out the benchmark, main results. Next, we test the robustness of these to the main aspects of the empirical design. We consider various competing explanations, time interval lengths, time periods, measures of political myopia and aggregate shocks, and specifications of the empirical model.

5.1 Political mechanisms

The main analysis examines the effects of growth on debt via political myopia. The latter, however, represents one dimension of institutional differences. This sub-section explores the role of other potential political mechanisms in this, and their effect on our main one. As in the main analysis, the description and sources of the additional measures considered in this part are outlined in the Appendix; Table A1 and A2 provide descriptive statistics. Results appear in Table 3. All estimations follow the baseline specification (Column 4, Table 2). Importantly, all cases include an interaction of the inspected measure with tfp, to test its effect on our interaction term of interest.

[45]Notice that $\frac{d(\Delta debtN)}{d(myopic)} = \delta + \gamma * tfp$. For the estimated δ (-3097.71) and γ (4506.87), this derivative can be positive or negative depending on the extent of tfp, which ranges from 0.38 to 0.85. For instance, if $tfp = 0.38$, $\frac{d(\Delta debtN)}{d(myopic)} < 0$; however, if $tfp = 0.85$, $\frac{d(\Delta debtN)}{d(myopic)} > 0$.

[46]A one standard deviation increase in tfp (0.134) multiplied by the estimated γ in Column 5 (4506.87) is 603.92.

First, we consider the role of the governor's party affiliation. Besley and Case (1995) and Persson and Svensson (1989) indicate that party affiliation is an important indicator for whether a binding term limit affects the fiscal behavior of governors. To test that, we add an indicator for the party affiliation of the governor. The indicator takes the value 0 (1) if the governor is affiliated with Republican (Democratic) Party; otherwise, it takes the value 0.5. The results in Column 1 indicate that γ is similar to that estimated in the baseline case; the main effect is, hence, robust to the inclusion of this channel.

Second, in the model we assume that it is the head of the executive branch that holds the primary budgeting power; conversely, the legislative branch provides a system of checks and balances. Nonetheless, the latter possesses strong bargaining powers, and hence in cases where the executive and legislative branches do not align governors may find it more challenging to raise debt. To address that we add a measure for this alignment: the fraction of legislators that have a common party affiliation with the governor.[47] Results are presented in Column 2. The estimated γ maintains its magnitude, sign, and significance, indicating that the main result is observed when controlling for the relative strength of the legislature.

Third, we touch on additional relevant aspects of the legislative branch. Owings and Borck (2000) indicate that legislative professionalism is important for understanding state budgets. In addition, Kousser and Phillips (2012) note that part-time legislatures may increase the budgetary bargaining power of governors. Both points may affect our proposed mechanism. To address them, we add a measure of the average real annual salary of legislators.[48] The results in Column 3 show that γ holds its stability.

Fourth, we dig deeper into the role of the bargaining power of the governor. More experienced governors are expected to be more established and hence possess relatively stronger budgetary bargaining power (Kousser and Phillips (2012)). To account for that we add a measure that captures the number of budgets that the governor has overseen.[49] Results appear in Column 4; the estimated γ remains qualitatively similar. Importantly, this suggests that the patterns we observe are not dependent on governors' quality.

Fifth, we address an alternative potential mechanism. Crain and Tollison (1992) suggest that states' debt may be affected by a time inconsistency effect where the governor in office may wish, for instance, to inherit a larger deficit to its successor in case he/she expects a party switch. We test the robustness of the main result to this potential channel in two ways. First,

[47]NE is excluded, due to its non-partisan legislature.
[48]This data series is available from 1971, excluding the first time interval.
[49]If a governor leaves and comes back, the budgets he/she oversaw in the past are also counted.

in Column 5 we control for state electoral competition, via the standard Ranney measure of electoral competitiveness (Ranney (1976)).[50] Second, in Column 6 we add a measure of the number of switches in the party affiliation of the governor within each time interval. The estimated positive and significant γ in both cases indicate that the main result is robust to this channel.

Sixth, we consider the consequences of a divided government. Kraus et al. (2013) find that under a divided government the executive branch presents a more conservative revenue (and hence, debt) forecasts. Alt and Lowry (2013) show that divided governments are less able to react to revenue shocks that lead to budget deficits. A divided government may also touch on additional factors that may affect the main result, such as for instance the existence of automatic shutdown provisions. Primo (2007) argues that such provisions may increase the budgetary bargaining power of the legislature, which may be applicable in case the executive and legislative branches are controlled by different parties. To address this, we add a binary indicator for whether the government is divided.[51] This indicator takes the value 1 in case the governorship and the two chambers of legislature are not controlled by the same party. The result in Column 7 shows that the main result remains to hold under this addition.

Seventh, we examine the role of political ties between the governor and the state's representatives in the U.S. Congress. Hodler and Raschky (2014) show that political ties between a region and the ruler may lead to regional favoritism. Knight (2002) illustrates that states' political placement in Congress (e.g. representatives heading central committees) affects the amount and nature of federal support they receive. Hence, the extent to which the governor is politically aligned with state representatives in the U.S. Congress may affect his/her fiscal behavior. To address this, we include a measure that gives the extent to which state representatives in the U.S. Congress are affiliated with the same party as the governor. The measure is computed as the interaction of the fraction of years (within the time interval) that the governor is affiliated with the Democratic Party and the average share (within the time interval) of state representatives in the U.S. Congress that are affiliated with the Democratic Party. A higher (lower) measure points at stronger ties via the Democratic (Republican)

[50]This measure varies between 0.5 and 1, with higher values representing higher levels of competitiveness. We employ a four-year moving average of it. Note that NE is excluded from the sample due to its non-partisan legislature.

[51]NE is excluded, due to its non-partisan legislature.

Table 3: Political channels; 1963-2007 (5-year intervals)

Dependent variable: Change in the average real state debt per capita, Δ(t-1,t)	(1) Governor's party affiliation	(2) Legislator-Governor party match	(3) Legislature salary	(4) Budgets passed	(5) Ranney Index	(6) Governor's party switches	(7) Divided government	(8) Congress-Governor party match	(9) All channels
Myopic * TFP	4336.33***	4439.01***	4352.27***	4291.58***	4063.83***	4506.98***	3619.69**	4561.39**	3752.59**
	(1238.86)	(1335.384)	(1384.18)	(1230.38)	(1394.65)	(1344.51)	(1644.82)	(1728.57)	(1521.76)
GovParty * TFP	-1224.51								-3280.97
	(1163.86)								(1714.92)
LegParty * TFP		-24.5							-45.11
		(37.27)							(70.69)
LegSalary * TFP			14.98						15.11
			(10.73)						(14.84)
Budgets * TFP				310.62					100.99
				(262.96)					(264.44)
Ranney * TFP					2527.27				-2817.52
					(5790.11)				(16273.72)
ParSwitch * TFP						770.665			1212.75
						(3325.35)			(2367.65)
DivGvt * TFP							-2138.01		-3487.46
							(2202.09)		(2296.86)
ConParty * TFP								5666.21**	7242.17**
								(2616.28)	(2626.99)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.43	0.42	0.49	0.42	0.42	0.42	0.42	0.54	0.56
Observations	400	392	350	400	392	400	392	400	343

Notes: Standard errors are robust, clustered by state, and appear in parentheses for independent variables. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance. All regressions include an intercept, and control for the natural logarithm of real per capita GSP in t-1, the level version of the dependent variable in t-1, and the independent measures of the interaction terms included. Sample includes the 50 U.S. states and covers the period of 1963-2007 in 5-year intervals. In Columns 2, 5, 7, 9 NE is excluded. In Columns 3 and 9 the first time interval (1963-1968) is excluded. Dependent variable is the change in the average real state debt per capita between time t-1 and t. 'TFP' denotes purified technology improvements. 'Myopic' is the proportion of years (within the time interval) in which the governor is not in his/her last term. Other controls include: 'GovParty': the party with which the governor is affiliated; 'LegParty': the fraction of legislators that have a common party affiliation with the governor; 'LegSalary': real average legislator salary (available from 1971); 'Budgets': the number of budgets that the governor passed; 'Ranney': Ranney Index of Electoral Competition; 'DivGvt': an indicator for whether state government is divided. 'ConParty': the extent to which the state's congress representatives are affiliated with the same party as the governor; 'ParSwitch': the number of party switches within the time interval. For further information on variables see data Appendix.

party. Results appear in Column 8; γ remains to hold as in the benchmark cases. Interestingly, the coefficient on the interaction of this measure with tfp is positive and precise as well; facing economic growth, stronger ties with the Congress via the Democratic Party increases public debt.

Last, we include these different political controls, and their interaction with tfp, in one specification. This is a relatively demanding case due to the potential multi-collinearity. Nonetheless, the results in Column 9 indicate that γ remains to hold in its sign and significance, albeit with a relatively lower magnitude.

5.2 Heterogeneous institutions

Additional potential political mechanisms relate to cross-state institutional differences. Gubernatorial term limits represents one such difference; however, U.S. states present additional institutional differences that may be pivotal for our analysis. We consider the cross-sectional differences in the institutional settings that have been shown in previous research to affect states' fiscal behavior, as outlined in Section 2. While such differences are captured via the state fixed effects, we look into the role of their interaction with tfp; first, to examine their effect on our interaction term of interest, and second to estimate the role of economic growth in the level effects observed in previous research. The descriptions and cross-sectional state divisions of each of the institutional differences mentioned below are outlined in the data Appendix, together with their sources. Results appear in Tables 4-5. Each column addresses a separate institutional difference,[52] and follows the benchmark specification (Column 4, Table 2) with the interaction of tfp with an indicator for the institutional difference included.

We examine the roles of the following cross-state institutional differences: baseline budgeting rules; strict balanced budget requirements; semi-annual budgeting; debt limitations; direct democracy; legislature term limits; line item veto requirement; state party strength; rules of the budget stabilization fund; supermajority vote requirement; tax and expenditure limitations; state upper chamber size; combined tax and spending committees in the legislature.[53] Results appear in Columns 1-13, examining each of these cases, respectively.

[52]Given that each case examines different cross-sectional variations the concurrent inclusion of them leaves relatively little identifying variation.

[53]As noted, see Section 2 for a more detailed description of each of the mentioned differences.

Table 4: Heterogeneous institutions - Panel A; 1963-2007 (5-year intervals)

Dependent variable: Change in the average real state debt per capita, Δ(t-1,t)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline budget	BB strictness	Biennial budget	Debt limit	Direct democracy	Legislature term limit	Line item veto
Myopic * TFP	5000.12***	3214.99***	4232.19***	4379.01***	4416.15***	4348.91***	4646.24***
	(1432.02)	(1150.46)	(1279.88)	(1304.07)	(1283.54)	(1327.26)	(1313.04)
Baseline * TFP	2234.11						
	(1343.6)						
Strict * TFP		-587.26**					
		(241.23)					
Biennial * TFP			-1448.61				
			(994.5)				
DebtLimit * TFP				-2226.18*			
				(1194.59)			
DirDem * TFP					498.58		
					(1503.57)		
LegLimit * TFP						1024.48	
						(901.23)	
ItemVeto * TFP							-1695.08
							(1163.45)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.42	0.44	0.42	0.42	0.42	0.42	0.45
Observations	400	400	400	400	400	400	400

Notes: Standard errors are robust, clustered by state, and appear in parentheses for independent variables. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance. All regressions include an intercept, and control for the natural logarithm of real per capita GSP in t-1, the level version of the dependent variable in t-1, and the independent measures of the interaction terms included. Sample includes the 50 U.S. states and covers the period of 1963-2007 in 5-year intervals. Dependent variable is the change in the average real state debt per capita between time t-1 and t. 'TFP' denotes purified technology improvements. 'Myopic' is the proportion of years (within the time interval) in which the governor is not in his/her last term. State institutional heterogeneities include: 'Baseline': baseline budgeting rules; 'Strict': strict balanced budget requirements; 'Biennial': semi-annual budget; 'DebtLimit': debt limitations; 'DirDem': direct democracy (voter initiative); 'LegLimit': legislature term limits; 'ItemVeto': line item veto. For further information on variables see data Appendix.

Table 5: Heterogeneous institutions - Panel B; 1963-2007 (5-year intervals)

Dependent variable: Change in the average real state debt per capita, Δ(t-1,t)	(8) Party strength	(9) Rainy day fund	(10) Super-majority voting	(11) Tax and spending limits	(12) Chamber size	(13) Combined committees
Myopic * TFP	4498.61***	4564.52***	4409.01***	4477.48***	4543.51***	4468.36***
	(1300.47)	(1369.18)	(1296.7)	(1354.59)	(1362.19)	(1288.89)
ParStrength * TFP	2538.96**					
	(1183.33)					
StabFund * TFP		362.11				
		(1102.76)				
Supermajority * TFP			-564.34			
			(1247.32)			
TaxLimit * TFP				330.29		
				(1466.69)		
Chamber * TFP					-79.62	
					(67.35)	
Combined * TFP						2221.48
						(1448.77)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.42	0.42	0.42	0.42	0.42	0.42
Observations	400	400	400	400	400	400

Notes: Standard errors are robust, clustered by state, and appear in parentheses for independent variables. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance. All regressions include an intercept, and control for the natural logarithm of real per capita GSP in t-1, the level version of the dependent variable in t-1, and the independent measures of the interaction terms included. Sample includes the 50 U.S. states and covers the period of 1963-2007 in 5-year intervals. Dependent variable is the change in the average real state debt per capita between time t-1 and t. 'TFP' denotes purified technology improvements. 'Myopic' is the proportion of years (within the time interval) in which the governor is not in his/her last term. State institutional heterogeneities include: 'ParStrength': party strength; 'StabFund': rules of the budget stabilization fund; 'Supermajority': supermajority vote requirement; 'TaxLimit': tax and expenditure limitations; 'Chamber': chamber size of the state Senate; 'Combined': combined tax and spending committees in the legislature. For further information on variables see data Appendix.

Interestingly, in all cases γ is positive, significant, and with similar (stable) magnitude. In the case of strict balanced budget requirements its magnitude drops by about a quarter, yet its other properties remain qualitatively similar. The interactions of each of the indicators with tfp show interesting patterns in three cases: strict balanced budget requirements, state debt limits, and state party strength. States with strict balanced budget requirements decrease debt when facing economic growth; so do states with debt limitations. Conversely, states with relatively strong local parties increase debt under positive TFP shocks. Notably, the magnitudes (in absolute value) are no more than half of that estimated for our main interaction term.

5.3 Time intervals

The benchmark analysis examined the case of 5-year time intervals, based on the notion that effects of myopia on political agendas may sink-in, and hence be observed, over the course of several years. A key question is whether, and to what extent, the main results are dependent on this. Are differential effects of expansionary shocks viewed over shorter time spans? Are they also applicable over longer time horizons? To test this, we examine the main specification as per Equation (4.1), illustrated via Column 4 of Table 2, under different time intervals.

Specifically, we test the cases of 1-year, 3-year, 8-year, 10-year, and 15-year intervals, representing both relatively shorter and significantly larger time spans. The results of each are presented in Columns 1-5 of Table 6, respectively. All cases follow the benchmark specification; in each, the variables are averaged over the corresponding time interval (t).

The estimated γ in each case remains positive and significant, suggesting that the main patterns observed are not sensitive to the choice of the time interval. Interestingly, its magnitude increases with the length of the time interval. For instance, focusing on the 15-year case, the magnitude is more than double that estimated under the 5-year, benchmark case. Despite examining average shocks and outcomes, the magnitude of the effects of aggregate shocks on the deficit of politically myopic states increases with the time horizon examined, suggesting that the preferences of politicians are also dependent on the more general, long term trend. In addition, these patterns suggest that the main result is not driven by business cycle phenomena, but rather by longer term growth patterns. Importantly, they also support the model's adoption of a long-run growth trend.

Table 6: Different time intervals; 1963-2007

Dependent variable: Change in the average real state debt per capita, Δ(t-1,t)	(1) 1-year intervals	(2) 3-year intervals	(3) 8-year intervals	(4) 10-year intervals	(5) 15-year intervals
Myopic * TFP	2003.98**	2991.95***	6637.38***	7527.29***	11023.37***
	(863.24)	(930.01)	(1789.03)	(2083.95)	(3372.33)
State fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.19	0.42	0.56	0.69	0.82
Observations	2150	700	250	200	100

Notes: Standard errors are robust, clustered by state, and appear in parentheses for independent variables. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance. All regressions include an intercept, and control for the natural logarithm of real per capita GSP in t-1 and the level version of the dependent variable in t-1. Sample includes the 50 U.S. states and covers the period of 1963-2007 in different intervals (as outlined in each regression). Dependent variable is the change in the average real state debt per capita between time t-1 and t. 'TFP' denotes purified technology improvements. 'Myopic' is the proportion of years (within the time interval) in which the governor is not in his/her last term. For further information on variables see data Appendix.

5.4 Time periods

The main analysis estimates the average effect over the period 1963-2007, net of time invariant effects related to specific time intervals. Nonetheless, previous research indicate that the fiscal effects of term limits and additional related budgeting institutions have changed over the course of our sample period (Besley and Case 1995, 2003). To test the implications of this on our main result, we divide the sample period to four quartiles of equal size, each covering a quarter of the observations of the complete sample.

Results appear in Table 7. Each column refers to a separate time period, presented in chronological order. Each case follows the baseline specification, as per Column 4 of Table 2. Given the relatively smaller sample size examined in each estimation we put more emphasis on interpreting magnitudes rather than significance. The results indicate that the magnitude of γ increases over time; starting well below the average, its increase becomes steeper in the second half of the sample period. Interestingly, its positive sign is maintained across periods.

5.5 Myopia and aggregate shocks

In this sub-section we test whether the main results are robust to different measures of political myopia and aggregate shocks. Results appear in Table 8. Starting with the former, we proxy for political myopia via a relatively more direct measure: the number of governor

Table 7: Different time periods (5-year intervals)

Dependent variable: Change in the average real state debt per capita, Δ(t-1,t)	(1) 1963-1977	(2) 1973-1987	(3) 1983-1997	(4) 1993-2007
Myopic * TFP	1050.2	2031.6	4806.36	5901.29
	(736.64)	(2845.33)	(8464.48)	(3880.74)
State fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
R-squared	0.83	0.81	0.88	0.86
Observations	100	100	100	100

Notes: Standard errors are robust, clustered by state, and appear in parentheses for independent variables. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance. All regressions include an intercept, and control for the natural logarithm of real per capita GSP in t-1 and the level version of the dependent variable in t-1. Sample includes the 50 U.S. states and covers different periods, as outlined in each Column. Dependent variable is the change in the average real state debt per capita between time t-1 and t. 'TFP' denotes purified technology improvements. 'Myopic' is the proportion of years (within the time interval) in which the governor is not in his/her last term. For further information on variables see data Appendix.

switches within a given time interval. Consistent with the perspective taken in the benchmark analysis, less switches are considered a manifest of political myopia, as the latter is required to maintain a position in office continuously. To mitigate the potential endogeneity of this measure to changes in states' public debt, we consider a state group-division that is based on the average number of switches in a given time-interval, over the whole sample period (1963-2007). The distribution of this sample-average across states is presented in Figure 6, going from a high of approximately 1.2 switches (NJ), to as low as 0.2 switches (MI, NY). The *myopic* measure in this case is a dummy variable that captures the states whose average is below the overall mean.[54] The results under this measure appear in Columns 1-2 (Table 8), examining cases with and without time dummies under the benchmark specification (Column 4, Table 2), following the outlined division. The results on the interaction term of interest, in both cases, remain to hold in sign, significance, and magnitude.

Moving to aggregate shocks, the main analysis considered aggregate changes in TFP, as these are documented to be strongly associated with economic growth. To test whether the main results are specific to this measure we examine an alternative proxy of aggregate shocks in the U.S. economy: Narrative-based defense news shocks, derived from Ramey and Zubairy (2017). This series focuses on changes in government spending that are linked to political and military events, providing unanticipated, and plausibly exogenous aggregate

[54]This group includes the following 18 states: CA, CO, GA, HI, IA, IL, ME, MI, MT, NC, ND, NV, NY, OH, RI, UT, VT, and WY.

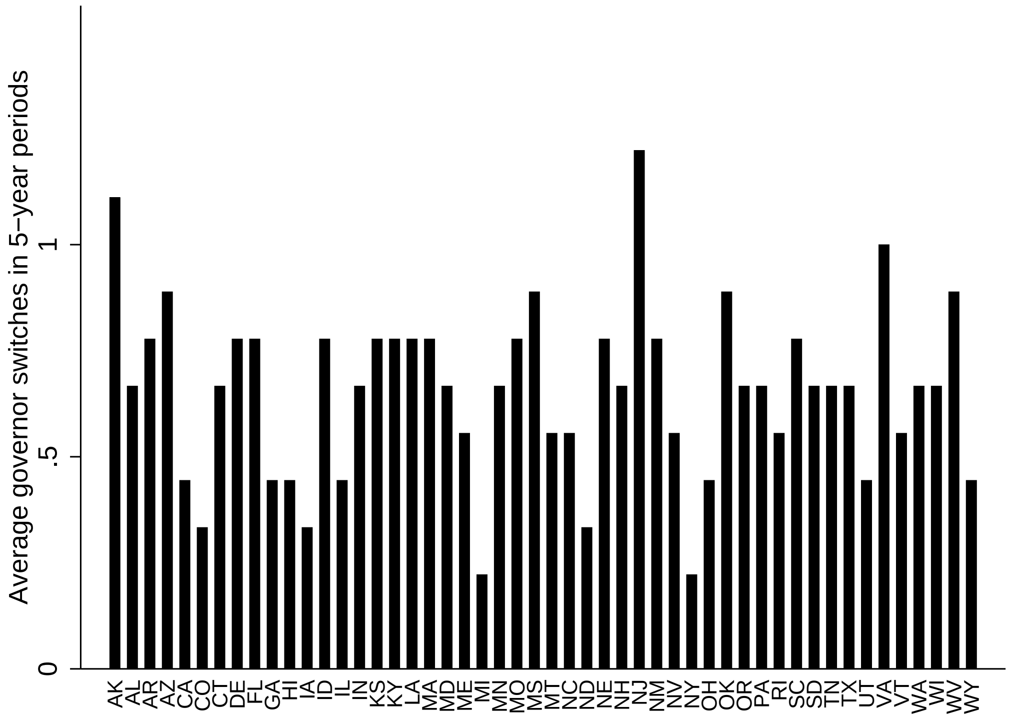

Figure 6: Number of governor switches within the main panel's 5-year intervals, averaged over the period 1963-2007. Source: National Governors Association.

demand shocks. We consider these shocks for robustness as on one hand they are different in nature from TFP changes, yet on the other hand they are linked to states' changes in output in a similar manner when measured under longer time intervals.

Indeed, similar to the case of technology improvements, these shocks can be contemporaneously contractionary to the average state, especially as they are narrative-based. However, within a medium-term time interval, averaged over 5-years, they are expansionary and show similar association to states' growth patterns as those reported under the TFP case. We provide evidence for this in the Appendix, illustrating the positive association with the growth rates of states in both myopia groups, with no observable systematic difference between the two.

The results using this measure are presented in Columns 3-4 (Table 8). These estimations follow the same specifications used in Column 1-2 of the same table, with the exceptions of using this measure in lieu of tfp, and the baseline (continuous) *myopic* measure. Both cases yield qualitatively similar results, as the estimated γ is positive and significant.

Table 8: Different measures of time preference and aggregate shocks; 1963-2007 (5-year intervals)

	(1)	(2)	(3)	(4)
Dependent variable: Change in the average real state debt per capita, Δ(t-1,t)	Number of governor switches		Defense shocks	
TFP	76.79			
	(1138.35)			
Myopic * TFP	3321.89***	3351.79***		
	(1016.03)	(1030.14)		
Defense			-1.91*	
			(0.99)	
Myopic * Defense			2.79**	2.47**
			(1.15)	(1.11)
State fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	No	Yes
R-squared	0.41	0.44	0.39	0.42
Observations	400	400	400	400

Notes: Standard errors are robust, clustered by state, and appear in parentheses for independent variables. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance. All regressions include an intercept, and control for the natural logarithm of real per capita GSP in t-1 and the level version of the dependent variable in t-1. Sample includes the 50 U.S. states and covers the period of 1963-2007 in 5-year intervals. Dependent variable is the change in the average real state debt per capita between time t-1 and t. 'TFP' denotes purified technology improvements. 'Defense' denotes narrative defense shocks. 'Myopic' (Columns 1-2) is a dummy variable that is 1 for states in which the average number of governor switches within each time interval is below the mean; these include CA, CO, GA, HI, IA, IL, ME, MI, MT, NC, ND, NV, NY, OH, RI, UT, VT, WY. In Columns 3-4 'Myopic' is the proportion of years (within the time interval) in which the governor is not in his/her last term. For further information on variables see data Appendix.

5.6 Additional tests

We undertake various additional robustness tests to the main specification. Results of this sub-section appear in Table 7. With the exception of specific additions, discussed separately in each test, we follow the main specification, as per Column 4 of Table 2, in all cases. First, throughout the analysis the dependent variable is in per capita terms. The large population differences across states can inflate the cross-state variation in it. To test whether this affects the patterns observed, in Column 1 we consider a GSP-normalized dependent variable, where states' outstanding debt is divided by their GSP. The estimated γ indicates that the main effect remains to hold.

Second, the benchmark aggregate shocks we examine builds on the measure constructed by Basu et al. (2006). The time frame the latter examined is 1949-1996. To test whether our analysis is consistent with their time frame and measure, we restrict the sample to pre-1997 years. Results appear in Column 2. The main effect remains to hold; interestingly, its magnitude increases by about 25%. Put together with the results presented previously on the different time periods, it is apparent that the main effect is more strongly observed during the mid-1980s to the late-1990s.

Third, we make two (separate) additions to the model. First, we add state-specific time trends (Column 3), and second we follow a two-way clustering method where standard errors are assumed to be correlated within states and years (Column 4). The former case contributes to controlling for time trends that may be specific to certain states which could, in turn, affect public debt (for instance, continuous divergent changes in local prices and wages). The latter takes a more conservative perspective on the measure of the standard errors and preciseness of the estimates. The results in both cases indicate that the main effect is maintained.

Fourth, we examine two (separate) sample restrictions. First, we exclude Alaska from the sample (Column 5). Second, we exclude California, New York, and Texas from the sample (Column 6). The first exclusion tests the sensitivity of the main result to the exclusion of the relatively extreme per capita debt values of Alaska, manifested via its sparse population as observed in Figure 4. The second exclusion tests the robustness of the key results to the exclusion of the three largest states. The latter provides a more careful examination of the previously discussed assumption that states are essentially price takers that do not alter aggregate national technological trends. The estimated γs of both cases, which are similar to that estimated in the benchmark case, indicate that results are neither driven by extreme debt values, nor by potential endogeneity of the largest states.

Last, we test the role of state tax rates. The model suggests that tax policies are relevant for understanding the effects of growth on debt, as they may represent a key choice variable. Hence, we consider average state tax rates, calculated as the ratio of state tax revenues to GSP. Thus, in Column 7 we add average tax rates to the specification. The estimated γ remains stable in its significance, sign, and magnitude, indicating that main result is robust to controlling for this choice variable.

Table 9: Robustness tests; 1963-2007 (5-year intervals)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GSP normalization	Pre-1997	State-specific time trends	Two-way clustering	AK excluded	CA, NY, and TX excluded	Average tax rates
Dependent variable:	Change in the average GSP share of state debt, Δ(t-1,t)	Change in the average real state debt per capita, Δ(t-1,t)	Change in the average real state debt per capita, Δ(t-1,t)	Change in the average real state debt per capita, Δ(t-1,t)	Change in the average real state debt per capita, Δ(t-1,t)	Change in the average real state debt per capita, Δ(t-1,t)	Change in the average real state debt per capita, Δ(t-1,t)
Myopic*TFP	0.08***	5757.12***	4312.47***	4506.86**	4008.79***	4623.49***	4211.68***
	(0.02)	(2020.07)	(1264.39)	(1470.51)	(1311.9)	(1362.25)	(1321.52)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.41	0.45	0.44	0.42	0.4	0.43	0.42
Observations	400	300	400	400	392	376	400

Notes: Standard errors are robust, clustered by state in Columns 1-3 and 5-7, and by state and year in Column 4, and appear in parentheses for independent variables. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance. All regressions include an intercept, and control for the natural logarithm of real per capita GSP in t-1 and the level version of the dependent variable in t-1. Sample includes the 50 U.S. states (except in Column 5, where AK is excluded, and Column 6, where CA, NY, and TX are excluded), and covers the period of 1963-2007 (Columns 1, 3-7) or 1963-1996 (Column 2), in 5-year intervals. Dependent variable is the change in the average real state debt per capita (GSP share of state debt) between time t-1 and t (in Column 1). Column 3 includes in addition state-specific time trends. Column 7 includes in addition average tax rates. 'TFP' denotes purified technology improvements. 'Myopic' is the proportion of years (within the time interval) in which the governor is not in his/her last term. For further information on variables see data Appendix.

6 Conclusion

Previous research on the debt-growth nexus examined causal channels that run from debt to growth. In this work we examined the reverse route by showing that economic growth may increase national debt. We constructed a political economy model in which reputation-building behavior induces politicians to have a shorter time horizon than that of market participants. The model showed that this discrepancy gives rise to a budget deficit bias that is reinforced by economic growth in a magnitude that intensifies with the width of the discrepancy.

To put these predictions to empirical testing, we undertook a state-level analysis using a panel of the 50 U.S. states for the period 1963-2007. An intra-U.S., cross-state perspective enabled examining a relatively homogenous environment where each state is too small to affect national trends, and differences in political myopia (reelection prospects) could be captured via institutional differences in gubernatorial term limits. Our two key identification assumptions rested on the (exogenous) constitutionally-entrenched cross state differences affecting the extent of political myopia, and the plausible exogeneity of national TFP shocks to states' deficit behavior.

Under these circumstances we examined the effects of TFP shocks on changes in states' debt across states' myopia levels. The results corroborated the theoretical predictions. Positive TFP shocks increase the deficit in cases in which reelection is possible, and more generally in states with no term restrictions relative to the remaining states. The analysis revealed that these patterns are robust, persistent, and economically meaningful.

The results shed light on the interaction of political myopia and economic growth. Myopic politicians exploit the features of public debt based on political incentives. This work suggested that they may similarly exploit the features of economic growth. Myopia, however, represents a specific characteristic of political agents. Examining whether additional aspects of political incentives may shape the way that growth-based surpluses are handled by political agents is left for future research.

Appendix

A Proof of Proposition 1

Proof. A feasible budget policy $\{y(t), x(t), t \geq 0\}$ satisfies $y(t) \in [0, \bar{y}]$, $x(t) + y(t) \geq \underline{b}$ and $d(t) \in [\underline{d}, \bar{d}]$. The optimal policy is the feasible policy that maximizes

$$\int_0^\infty \left(u(y(t) + x(t)) + m(y(t), d(t)) \frac{u(\underline{b})}{\rho + (\eta - 1)g} \right) S(t) e^{-(\rho + (\eta-1)g)t} dt \qquad \text{(A.1)}$$

subject to

$$\dot{d}(t) = (r + h(d) - g)d(t) + x(t) \qquad \text{(A.2)}$$

and

$$\dot{S}(t) = -m(y(t), d(t))S(t), \qquad \text{(A.3)}$$

given $d(0)$ and $S(0) = 1$, where (A.3) follows from (3.11) and it is recalled that $u(q) = q^{1-\eta}/(1-\eta)$ with $\eta > 1$. As perceived from the initial time, the expected payoff at time $t_0 \geq 0$, discounted to t_0 given $T > t_0$, is

$$\int_{t_0}^\infty \left(u(y(\tilde{t}) + x(\tilde{t})) + m(y(\tilde{t}), d(\tilde{t})) \frac{u(\underline{b})}{\rho + (\eta - 1)g} \right) S(\tilde{t}|t_0) e^{-(\rho + (\eta-1)g)(\tilde{t} - t_0)} d\tilde{t}, \qquad \text{(A.4)}$$

where, noting (3.11) and using Bayes' rule,

$$S(\tilde{t}|t_0) \equiv Pr\{T > \tilde{t}|T > t_0\} = e^{-\int_{t_0}^{\tilde{t}} m(y(\tau), d(\tau))d\tau}, \ \tilde{t} \geq t_0. \qquad \text{(A.5)}$$

With $t = \tilde{t} - t_0$, $S(\tilde{t}|t_0) = S(t)$ and the expected payoff (A.4) reduces to (A.1). It follows that the budget problem (A.1)-(A.3) applies at any future date t_0, conditional on $T > t_0$ (i.e., that the political term has not been terminated by t_0).

We follow the arguments of Tsur and Zemel (2014), with the modifications needed to account for $S(t)$ as an additional state. We first show that $d^*(t)$ is monotonic. Suppose otherwise – e.g., that $d^*(t)$ increases and then decreases. Then there exist $t_1 < t_2$ such that $d^*(t_1) = d^*(t_2)$ while $\dot{d}^*(t_1) > 0$ and $\dot{d}^*(t_2) < 0$. But $d^*(t_1) = d^*(t_2)$ implies that the budget problem at time t_1 given $T > t_1$ is identical to the budget problem at time t_2 given $T > t_2$, hence the optimal policies at t_1 and t_2 must be identical, contradicting $\dot{d}^*(t_1) > 0$ and $\dot{d}^*(t_2) < 0$ (if the optimal policy is not unique, at least one optimal d process must be monotonic). Since the debt process is bounded, the monotonic $d^*(t)$ process must converge to a steady state. ∎

B Verifying Condition (3.18)

The current-value Hamiltonian of the budget problem, accounting for the discount rate $\rho + (\eta - 1)g$ and suppressing the t argument for convenience, is

$$H = [u(y + x) + m(y, d)\bar{u}]\, S + \lambda[(r + h(d) - g)d + x] - \gamma m(y, d)S,$$

where

$$\bar{u} \equiv \frac{u(\underline{b})}{\rho + (\eta - 1)g} \tag{B.1}$$

and λ and γ are the current-value costates of d and S, respectively. Necessary conditions (for an interior optimum) include:

$$u'(y + x) = m_y(y, d)(\gamma - \bar{u}), \tag{B.2}$$

where $u'(q) = q^{-\eta}$ and $m_z = \partial m/\partial z$, $z = y, d$,

$$u'(y + x) = -\lambda/S, \tag{B.3}$$

$$\dot{\lambda} - (\rho + (\eta - 1)g)\lambda = -m_d(y, d)\bar{u}S - \lambda[r - g + \psi(d)] + \gamma m_d(y, d)S, \tag{B.4}$$

where $\psi(d)$ is defined in (3.5), and

$$\dot{\gamma} - (\rho + (\eta - 1)g)\gamma = -\left[u(y + x) + m(y, d)\bar{u}\right] + \gamma m(y, d). \tag{B.5}$$

At an optimal steady state $\hat{d}$, $y(t) = \hat{y}(\hat{d})$ and $x(t) = \hat{x}(\hat{d})$ remain constant, hence (B.3) implies that $\hat{\lambda}(t)/\hat{S}(t)$ stays put as well and we denote it by $\widehat{\lambda/S}$. Noting (3.11), $\hat{S} = e^{-m(\hat{y}(\hat{d}),\hat{d})t}$ and the value function (the expected payoff under the optimal policy) obtains the form

$$\hat{W}(\hat{d}) = \frac{u(\hat{y}(\hat{d}) + \hat{x}(\hat{d})) + m(\hat{y}(\hat{d}), \hat{d})\bar{u}}{\rho + (\eta - 1)g + m(\hat{y}(\hat{d}), \hat{d})}, \tag{B.6}$$

as indicated in (3.15).

Now, $d(\hat{\lambda}/\hat{S})dt = 0$ implies $\dot{\hat{\lambda}}/\hat{S} - \widehat{\lambda/S}(\dot{\hat{S}}/\hat{S}) = 0$, which upon invoking (A.3) gives

$$\dot{\hat{\lambda}}/\hat{S} = -(\widehat{\lambda/S})m(\hat{y}(\hat{d}), \hat{d}), \tag{B.7}$$

where (B.2) and (B.3) imply

$$-\hat{\lambda}/\hat{S} \equiv -\widehat{\lambda/S} = m_y(\hat{y}(\hat{d}), \hat{d})\left(\hat{\gamma} - \bar{u}\right). \tag{B.8}$$

Thus, (B.7) can be expressed as

$$\dot{\hat{\lambda}}/\hat{S} = \left(\hat{\gamma} - \bar{u}\right) m_y(\hat{y}(\hat{d}), \hat{d}) m(\hat{y}(\hat{d}), \hat{d}). \tag{B.9}$$

From (B.4) we obtain

$$\dot{\hat{\lambda}}/\hat{S} = -(\widehat{\lambda/S})\left[r - (\rho + \eta g) + \psi(\hat{d})\right] + m_d(\hat{y}(\hat{d}), \hat{d})\left(\hat{\gamma} - \bar{u}\right), \tag{B.10}$$

where (cf. (3.5)) $\psi(d) = h(d) + h'(d)d$. Using (B.8), (B.10) gives

$$\dot{\hat{\lambda}}/\hat{S} = \left(\hat{\gamma} - \bar{u}\right)\left(m_y(\hat{y}(\hat{}), \hat{d})\left[r - (\rho + \eta g) + \psi(\hat{d})\right] + m_d(\hat{y}(\hat{d}), \hat{d})\right). \tag{B.11}$$

Equations (B.9) and (B.11), then, imply

$$m(\hat{y}(\hat{d}), \hat{d}) = r - (\rho + \eta g) + \psi(\hat{d}) + m_d(\hat{y}(\hat{d}), \hat{d})/m_y(\hat{y}(\hat{d}), \hat{d}), \tag{B.12}$$

verifying (3.17).

By integrating (B.5) from t to infinity, using the transversality condition that the present-value Hamiltonian vanishes asymptotically, one verifies that the costate $\gamma(t)$ equals the value function (i.e., the expected payoff under the optimal policy) at time t (see Zemel 2015). At an optimal steady state d, thus,

$$\hat{\gamma} = \hat{W}(\hat{d}).$$

Condition (B.2) then implies

$$u'(\hat{y}(\hat{d}) + \hat{x}(\hat{d})) = m_y(\hat{y}(\hat{d}), \hat{d}) \left(\hat{W}(\hat{d}) - \bar{u}\right), \tag{B.13}$$

verifying (3.18).

C Proof of Proposition 2

Proof. When the tax rate is constant, the budget problem (with obvious change in notation) is similar to that considered in Tsur and Zemel (2016), and the proof follows from their Properties 3-4, with $L(\cdot)$ taken from Equation (3.4b) (op. cit. p. 643). ■

D Panel data

We use an annual-based state-level panel that covers the 50 U.S. states over the period of 1963-2007. Unless otherwise specified, the panel is based on 5-year intervals; real terms are in 2009 prices. Descriptive statistics for all variables appear in Tables A1 and A2.

Variable definitions

Real state debt per capita: Real state (outstanding) debt, divided by state population. Source: U.S. Bureau of Economic Analysis.

GSP share of state debt: State (outstanding) debt, divided by GSP. Source: U.S. Census Bureau.

Myopia: The proportion of years (within the time interval) in which the governor is not in his/her last term. Source: National Governors Association.

Change in the average real state debt per capita, Δ(t-1,t): The change between the average real state debt per capita in times $t-1$ and t. Source: U.S. Census Bureau.

Change in the average GSP share of state debt, Δ(t-1,t): The change between the GSP share of state debt in times $t-1$ and t. Source: U.S. Census Bureau.

Real GSP per capita: Real GSP, divided by state population. Source: U.S. Census Bureau.

Governor switches: The number of Governor switches (a change of governor) within each time interval. Source: National Governors Association.

Party switches: The number of switches in the affiliated party of the governor within each time interval. Source: Marty and Grossman (2016).

Party affiliation of governor: An indicator for the party of the governor; 0 = Republican, 1 = Democrat, 0.5 = non-major party governor. Source: Marty and Grossman (2016).

Democratic representatives in the U.S. lower house: The average number of Democratic representatives in the lower house during the inspected time interval. Source: Marty and Grossman (2016).

Democratic representatives in the upper house: The average number of Democratic representatives in the upper house during the inspected time interval. Source: Marty and Grossman (2016).

Legislator-governor party match: The fraction of legislatures that have a common party affiliation with the governor. NE is excluded. Source: Marty and Grossman (2016).

Budgets overseen: The number of budgets that the governor has overseen. If a governor leaves and comes back, the budgets he/she oversaw in the past are also counted. Source: Marty and Grossman (2016).

Ranney Index: Ranney measure of electoral competitiveness (Ranney (1976)). Four-year moving average. Varies between 0.5 and 1; higher values representing higher levels of competitiveness. NE is excluded. Source: Marty and Grossman (2016).

Divided government: A binary indicator for whether the two chambers of legislature and governorship are not all controlled by the same party; 0 = same party controls all three institutions. NE is excluded. Source: Marty and Grossman (2016).

Legislator salary: Real legislator salary (available from 1971). Source: Marty and Grossman (2016).

Average tax rates: GSP share of tax revenues. Source: U.S. Census Bureau.

Congress-governor party match: The extent to which the state U.S. Congress representatives are affiliated with the same party as the governor. Computed as the interaction of the fraction of years (within the time interval) that the governor is affiliated with the Democratic Party and the average share (within the time interval) of U.S. Congress members that are affiliated with the Democratic Party.

TFP shocks: National level utilization-adjusted TFP shocks, in natural logarithm form, aggregated to an annual level. Source: Fernald (2014), building on the series of purified technology improvements of Basu et al. (2006).

Defense shocks: National level defense news shocks. Source: Ramey and Zubairy (2017).

State heterogeneity in political institutions

Governor term limits: States are divided based on a binary variable that is 1 for states that have no restrictions on the number of governors' terms, and 0 otherwise. The former group includes: CT, IA, ID, IL, MA, MN, ND, NH, NY, TX, UT, VT, WA, WI. Source: National Governors Association.

Governor switches: States are divided based on a binary variable that is 1 for states in which the average number of governor switches within each time interval is below the overall mean, and 0 otherwise. The former group includes: CA, CO, GA, HI, IA, IL, ME, MI, MT, NC, ND, NV, NY, OH, RI, UT, VT, WY. Source: National Governors Association.

Baseline budgeting rules: States are divided based on a binary variable that is 1 for states that use current services baseline, and 0 if they use last year's dollar budget as a baseline. The former group includes: AR, AZ, CT, CO, DE, HI, ME, MA, NV, NC, OH, PA, VT, VA, WV, WY. Source: Crain and Crain (1998).

Biennial budget: States are divided based on a binary variable that is 1 for states that have an annual budget, and 0 if they have a biennial budget. The former group includes: AR, HI, IN, KY, ME, MN, MT, NE, NV, NH, NC, ND, OH, OR, TX, VA, WA, WI, WY. Source: Kearns (1994).

Strict balanced budget requirements: Cross-sectional measure of strict balanced budget requirements based on the Stringency Index of ACIR (1987). The index is a number between 1 (low stringency) and 10 (high stringency).

Debt limitations: States are divided based on a binary variable that is 1 for states that have debt limitations, and 0 otherwise. The latter group includes: AR, CT, DE, FL, HI, IL,

LA, MA, MD, MI, MT, NC, NH, NY, NV, OK, PA, TN, VT. Source: ACIR (1987).

Direct democracy: States are divided based on a binary variable that is 1 for states that have voter initiatives, and 0 otherwise. The former group includes: AK, AR, AZ, CA, CO, FL, ID, IL, MA, ME, MI, MO, MT, NE, NV, ND, OH, OK, OR, SD, UT, WA, WY. Source: Matsusaka (1995).

Legislator term limits: States are divided based on a binary variable that is 1 for states that have no legislator term limits, and 0 otherwise. The former group includes: AK, AL, CT, DE, GA, HI, IA, ID, IL, IN, KS, KY, MA, MD, MN, MS, NC, ND, NH, NJ, NM, NY, OR, PA, RI, SC, TN, TX, UT, VA, VT, WA, WI, WV, WY. Source: National Conference of State Legislatures.

Line item veto: States are divided based on a binary variable that is 1 for states that have gubernatorial line item veto, and 0 otherwise. The latter group includes: HI, IN, ME, NC, NH, NV, RI, VT. Source: ACIR (1987).

Party strength: States are divided based on a binary variable that is 1 for states with relatively stronger parties based on the Mayhew Index (Mayhew (1986)), and 0 otherwise. The latter group includes: CT, DE, IL, KY, MD, MO, NJ, NY, OH, PA, RI, WV. Source: Primo and Snyder (2010).

Rules of the budget stabilization fund: States are divided based on an indicator that is 0 for states that have no stabilization fund, 1 for states that have such a fund with relatively lax rules, 2 for states that have such a fund with relatively strict rules (strict deposit and withdrawal rules). The first group includes: AL, AR, MT, OR. The latter group includes: AZ, IN, MI, VA. Source: Wagner and Elder (2005).

Supermajority vote requirement: States are divided based on a binary variable that is 1 for states that have supermajority vote requirement, and 0 otherwise. The former group includes: CA, DE, FL, GA, LA, MS, SD. Source: ACIR (1987).

Tax and expenditure limitations: States are divided based on a binary variable that is 1 for states that have tax and expenditure limitations, and 0 otherwise. The former group includes: AK, AZ, CA, CO, HI, ID, LA, MI, MT, NV, OR, RI, SC, TN, TX, UT, WA. Source: ACIR (1987).

Chamber size: Cross-sectional measure of states' upper chamber size. Source: National Conference of State Legislatures.

Combined committees: States are divided based on a binary variable that is 1 for states that have combined tax and expenditure committees, and 0 otherwise. The former group includes: AK, AL, CA, FL, HI, KS, KY, MA, ME, NJ, NY, OK, SC, TN, WI, WV. Source: ACIR (1987).

Table A1: Descriptive statistics, all sample

	Mean	Std. Dev.	Min.	Max.
Real state debt per capita	1242.51	945.61	368.37	5525.41
Myopic	0.72	0.45	0	1
GSP share of state debt	0.03	0.03	0.00	0.21
Change in the average real state debt per capita, Δ(t-1,t)	71.92	186.25	-1449.85	2483.50
Change in the average GSP share of state debt, Δ(t-1,t)	0.001	0.005	-0.05	0.09
Real GSP per capita	31281.08	10951.71	11351.48	110865.70
Governor switches	0.66	0.57	0	4
Party switches	0.53	0.50	0	2
Democratic representatives in the U.S. lower house	4.68	5.57	0	33
Democratic representatives in the U.S. upper house	0.99	0.75	0	2
TFP shocks (national-level)	0.62	0.13	0.38	0.85
Defense shocks (national-level)	27.65	164.28	-507.60	739.30
Party affiliation of governor	0.55	0.49	0	1
Legislator-governor party match	55.11	20.76	0	100
Number of budgets passed by governor	2.79	2.62	0	15
Ranney Index	0.85	0.12	0.51	1
Divided government	0.23	0.42	0	1
Legislator salary ($ thousands)	55.81	47.02	0	254.94
Average tax rates	0.06	0.02	0.02	0.34

Notes: See Appendix for detailed description of variables and state-divisions.

Table A2: Descriptive statistics, state divisions

	Panel A: Politically myopic states				Panel B: Politically non-myopic states			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
Real state debt per capita	1428.27	872.04	377.56	2861.73	1177.24	973.01	368.37	5525.41
Myopic	1	0	1	1	0.62	0.37	0	1
GSP share of state debt	0.04	0.03	0.00	0.18	0.03	0.03	0.00	0.21
Change in the average real state debt per capita, $\Delta(t-1,t)$	85.92	180.10	-1355.48	1837.45	66.47	188.36	-1449.85	2483.50
Change in the average GSP share of state debt, $\Delta(t-1,t)$	0.002	0.004	-0.03	0.03	0.001	0.005	-0.05	0.09
Real GSP per capita	32859.31	10761.98	13896.47	67342.32	30667.32	10966.69	11351.48	110865.70
Governor switches	0.58	0.52	0	2	0.69	0.58	0	4
Party switches	0.53	0.50	0	1	0.53	0.50	0	2
Democratic representatives in the lower house	5.43	6.46	0	20	4.38	5.18	0	33
Democratic representatives in the upper house	0.93	0.78	0	2	1.01	0.73	0	2
Party affiliation of governor	0.49	0.50	0	1	0.58	0.49	0	1
Legislator-governor party match	51.23	17.46	0	100	56.66	21.75	0	100
Number of budgets passed by governor	2.89	2.81	0	15	2.76	2.55	0	15
Ranney Index	0.89	0.09	0.57	1	0.84	0.12	0.5	1
Divided government	0.29	0.45	0	1	0.20	0.40	0	1
Legislator salary ($ thousands)	60.22	50.81	0.21	204.72	54.08	45.37	0	254.94
Average tax rates	0.062	0.01	0.03	0.11	0.064	0.02	0.02	0.34

Notes: See Appendix for detailed description of variables and state-divisions.

E TFP shocks, defense news, and economic growth

Let us examine the association of the measures of TFP shocks and defense news, discussed in the text and used in the main analysis, with states' economic growth. To do so, we estimate three variations of Equation (4.1) for each of the two measures. These variations are outlined in the following equations:

$$\ln gspNg_{i,\Delta(t-1,t)} = \alpha + \beta(\ln gspN)_{i,t-1} + \gamma(X)_t + \eta_i + \epsilon_{i,t} \tag{E.1}$$

$$\ln gspNg_{i,\Delta(t-1,t)} = \alpha + \beta(\ln gspNg)_{i,t-1} + \gamma(X * myopic)_{i,t} + \lambda(X * non - myopic)_{i,t} + \eta_i + \epsilon_{i,t} \tag{E.2}$$

$$\ln gspNg_{i,\Delta(t-1,t)} = \alpha + \beta(\ln gspNg)_{i,t-1} + \gamma(X * myopic)_{i,t} + \upsilon_t + \eta_i + \epsilon_{i,t}; \tag{E.3}$$

These equations use the same notation as described in the main text, with the exception of $\ln gspNg$ which denotes the rate of change in real per capita GSP, and X that denotes either the TFP or defense shocks. Using the same sample, and 5-year intervals (t), as in the main analysis, we focus on γ in Equation (E.1), γ and λ in Equation (E.2), and γ in Equation (E.3). Results appear in Table A3. Columns 1-3 (4-6) follow these three cases for TFP shocks (defense news).

The interpretation of the results of both measures is similar. Following the first specification, γ is positive and significant in both Columns 1 and 4, indicating TFP shocks and defense news are positively associated with states' economic growth. Similar results are provided in Columns 2 and 5, which importantly show that the magnitude is approximately the same for the myopic and non-myopic groups. To better observe that there is no differential effect of TFP and defense shocks across myopia groups, we notice that in Columns 3 and 6 γ is not significant.

Hence, we conclude that both the TFP shocks and defense news measures are positively associated with states' economic growth, and that this effect is not statistically differentiable between the two state-groups.

Table A3: Utilization-adjusted TFP shocks, defense shocks, and growth; 1963-2007 (5-year intervals)

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Change in the average real GSP per capita, Δ(t-1,t)	TFP, and growth	Myopic VS. non myopia: Both	Myopia VS. non-myopia: Relative	Defense, and growth	Myopic VS. non myopia: Both	Myopia VS. non-myopia: Relative
Real state GSP per capita (t-1)	-0.54***	-0.54***	-0.51***	-0.17***	-0.17***	-0.51***
	(0.04)	(0.04)	(0.04)	(0.02)	(0.02)	(0.04)
TFP	1.04***					
	(0.11)					
Myopic*TFP		1.09***	0.06			
		(0.1)	(0.07)			
Non-Myopic*TFP		1.02***				
		(0.11)				
Defense				0.0002**		
				(0.0001)		
Myopic*Defense					0.0002**	0.00007
					(0.0001)	(0.0001)
Non-Myopic*Defense					0.0002**	
					(0.0001)	
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	No	Yes	No	No	Yes
R-squared	0.39	0.39	0.5	0.18	0.18	0.5
Observations	400	400	400	400	400	400

Notes: Standard errors are robust, clustered by state, and appear in parentheses for independent variables. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance. All regressions include an intercept. Sample includes the 50 U.S. states (Columns 1 and 4), the 'Myopic' states (Column 3), or the 'Non-myopic' states (Column 4), and covers the period of 1963-2007 in 5-year intervals. Dependent variable is the change rate in the average real GSP per capita between time t-1 and t. 'TFP' denotes purified technology improvements. 'Defense' denotes narrative defense shocks. 'Myopic' is a dummy variable that captures the states with no restrictions on the number of governors' terms; namely: CT, IA, ID, IL, MA, MN, ND, NH, NY, TX, UT, VT, WA, WI (the 'Myopic' states). 'Non-myopic' states are the remaining ones. For further information on variables see data Appendix.

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