WORKING PAPER

The Impact Of Voter Initiatives On Economic Activity

By

S. Brock Blomberg, Gregory D.Hess and Akila Weerapana

Wellesley College Working Paper 2001-07
August, 2001

Department of Economics
Wellesley College
Wellesley, Massachusetts 02481-8203

The Impact of Voter Initiatives on Economic Activity

S. Brock Blomberg
Wellesley College
Gregory D. Hess
Oberlin College
Akila Weerapana
Wellesley College *

JEL Codes: H1, H5, H8
Keywords: Growth, Initiatives, Voting

First Version: April 2000
This Version: August 2001

Abstract

Recent studies have claimed that states with initiative systems of legislation use this more direct form of democracy to improve productive resource allocation. This paper compares the economic performance of states with initiatives to states that do not have initiatives. We first construct a simple growth model to identify the channel through which initiatives play an important role in determining economic activity; we then test the implications of this model using data for the 48 contiguous United States over the years 1969-1986. Our findings suggest that states with initiative systems waste between 20 to 30 percent fewer resources than do non-initiative states resulting in better economic performance in terms of higher GDP growth and faster convergence.

*We thank Helen Alva and Karen Healer for excellent research assistance. Karen Healer's assistance was supported by an NSF-AIRE Summer Research Grant through Wellesley College. We also thank Douglas Holtz-Eakin for the use of his data set, and Paul Evans for his helpful comments. We are especially thankful to Frans van Winden and two anonymous referees for their insightful comments. Part of this paper was written while Gregory D. Hess was an academic consultant to the Federal Reserve Bank of Cleveland. The opinions expressed are those of the authors and do not necessarily reflect views of the Federal Reserve Bank of Cleveland or the Federal Reserve System. Address correspondence to Brock Blomberg, Department of Economics, Wellesley College, 106 Central Street, Wellesley, MA 02481.E-mail: sblomber@wellesley.edu, tel: (781) 283-2382, fax: (781) 283-2177.

1 Introduction

In a recent survey analyzing the convergence literature, Evans (1996, 1999) shows that U.S. states are converging to similar income levels with the gap diminishing at approximately an average of 14 percent per year. The result supports the notion that, while state economies are converging[1], there are still large differences in the levels of productivity and income across regions. We believe that some of these differences in economic outcomes can be explained by differences in political institutions across states. In this paper, we examine the impact of one such political institution, the state-wide voter initiative, on productive resource allocation and economic performance. We find that initiative systems play an important role in explaining why economic outcomes are so different across states.

There is a wide literature on the role played by political institutions in allocating resources. Barro (1990) shows that the rates of savings and growth chosen by consumers under a decentralized framework are sub-optimal when the voter does not recognize the externality associated with government expenditures: political institutions that enhance property rights and help internalize the externality move the economy towards the socially optimal rate of economic growth. Chang (1995) shows that income distribution and growth are endogenous outcomes of a political bargaining process: growth will then be affected by the political institutions in place that allow for bargaining to occur. Lobbying is another political institution that allows constituencies and government to communicate ideas regarding growth and government services: Mohtadi and Roe (1998) analyze the impact of lobbying for public goods and its impact on growth. Other examples of political institutions that affect economic outcomes include balanced budget requirements and capital budgeting requirements. Poterba (1994) shows that states with tight constitutional and statutory rules that make it more difficult to run deficits fiscally adjust faster to external shocks. Poterba (1995) finds that states with capital budgets (especially those which do not have pay-as-you-go financing

[1]See Durlauf and Quah (1998) for a recent summary of the literature.

practices) have more public capital investment than other states.

Although all these political institutions may be important, in this paper we restrict our focus to one particular political institution: the state-wide initiative. Initiatives are pieces of legislation that are placed before the electorate directly by voters rather than indirectly through voter elected representatives.[2] Such initiatives are employed by 23 of the 50 U.S. states to allow voters to over-ride decisions made by their representatives by *directly* changing policy.[3] The implementation of initiatives provides a natural experiment by allowing us to compare states where decisions are made solely by elected representatives to states in which voters are also directly allowed to make important policy changes (and perhaps even recall these same elected representatives).

The layout of the paper is as follows. Section II takes a brief look at the literature on the economic impact of initiatives. In Section III, we construct a simple growth model to identify the channel through which initiatives play an important role in determining economic activity. Section IV describes the data and methodology we use, and in Section V we use that data for the 48 contiguous United States over the years 1969-1986 to test whether states with more responsive institutions (i.e. those with initiatives) fare better in terms of resource allocation than those with less responsive institutions. Section VI concludes.

[2]Typically, in the United States, a certain number of signatures is required before the law can be placed before the voters. See Matsusaka (1995) for a table of the required signature percentages in the states that have adopted initiative systems.We also follow the definitions of Matsusaka & McCarty (1998) and focus only on voter initiated legislation instead of referenda, which are pieces of legislation initiated by representatives but requiring voter approval.

[3]The following states had an initiative system during the entire sample: Alaska, Arizona, Arkansas, California, Florida, Idaho, Illinois, Maine, Massachusetts, Michigan, Missouri, Montana, Nebraska, Nevada, North Dakota, Ohio, Oklahoma, Oregon, South Dakota, Utah, Washington and Wyoming. For adoption years see the data appendix. Initiatives are also used by roughly half of municipalities in the United States.

2 Literature Survey

The literature on the benefits and costs of initiatives has two main strands: work done on the United States by Matsusaka (1992, 1995) and Matsusaka & McCarty (1998) and work done on Switzerland by Pommerehne (1978), Feld & Kirchgassner (1997), Feld & Savioz (1997) and Feld & Matsusaka (2001). We draw upon both strands of the literature in this paper.

The central theme of this literature is that, in both the United States and in Switzerland, there is clear evidence that initiatives appear to improve the flexibility of resource allocation and lead to lower taxes and spending. According to Matsusaka (1995), there are three reasons why state initiatives improve resource allocation. First, the possibility of vote trading between legislators for sub-optimal projects is reduced by the threat of direct legislation. Second, the removal of agenda control by the legislature allows projects closer to the preferences of the median voter to appear on the ballot. Third, problems of imperfect information which may lead either to well- intentioned representatives implementing undesirable policies or to legislative shirking (Kalt and Zupan (1984, 1990)) are reduced when the public votes directly on legislation. Matsusaka (1995) analyzes the impact of initiatives over a 30 year period and concludes that initiatives are used to reduce tax burdens as well as to reduce overall state and local government spending. Interestingly, Matsusaka (1995) shows that underlying the decrease in spending is a substantial switching away from state level spending (a 12% average decrease) towards local level spending (a 10% average increase). Similarly, there is a switch away from state level taxation towards more targeted sources of revenue (charges and user fees). The results indicate that voters are moving away from fiscal policies that are redistributive and moving towards policies that are more closely tied to economic activity.

Matsusaka & McCarty (1998) point out that the possibility that initiatives have potential negative impacts as well. They show that in the case where there is an agency problem and imperfect information, an extreme interest group can use the threat of an initiative to force a moderate representative to enact legislation that deviates from the median voter's desired legislation. This can be important in understanding why fewer than half of the states have chosen to adopt initiative systems.

The results for the U.S. states in terms of the impact of initiatives on fiscal policies is confirmed for the case of Switzerland, another country where direct democracy is widely used. Although initiatives allow for direct democracy in both Switzerland and the United States, there are some differences in the systems of initiatives adopted in the two countries. As Feld & Matsusaka (2001) point out, mandatory referendums on fiscal policies are far more common in Switzerland than in the United States. The work of Feld & Kirchgassner (2000) shows that another important difference is that Switzerland has national initiatives that tackle important questions affecting the country as a whole : the role of the military, the use of nuclear energy etc. This type of initiative does not exist in the United States. Feld & Kirchgassner (2000) also provide a useful summary of studies on the fiscal impact of initiatives in Switzerland. The results include 14% lower expenditure in cities with direct government, lower tax evasion and 45% less public debt. Furthermore, there is evidence that provision of public goods is more efficient in cities with direct democracy as evidenced by a 20% smaller cost of garbage collection. Interestingly, Feld & Kirchgassner (2000) show that tax rates are higher in cities with direct government but they argue that the combined tax and expenditure results suggest that voters are more willing to pay for direct provision of public services. Since these are city level results, they are consistent with the findings in the U.S. data which also indicate a switch away from broad-based fiscal policies towards more targeted and localized policies. At the canton level (roughly equivalent to U.S. state level) Feld & Matsusaka (2001) find that cantons with direct democracy have about 17% lower spending than cantons without direct democracy.

Finally, the work that is most relevant for our paper is the work by Feld and Savioz (1997) who compare the economic performance of Swiss cantons that have direct democracy to cantons without direct democracy. Feld and Savioz (1997) find that cantons with initiatives have 5.4% higher output in the period 1984-1993 and almost 17% higher output in 1990. Both results are robust to various specification changes correcting for sample size, time period, endogeneity etc.

Our paper fits into this literature in two ways. First, in analyzing whether state-wide initiatives have led to improved economic growth, convergence and resource allocation for the U.S. we extend the work done by Matsusaka (1995) and others on the impact of voter initiatives on fiscal policy to cover the impact of initiatives on *economic activity.* Second, our results for the U.S., are consistent with the work done by Feld & Savioz (1997) on analyzing the impact of direct democracy on economic performance in Switzerland.

3 The Model

This section introduces a standard Ramsey-type growth model that incorporates the role of public capital following closely the work of Barro (1990). The purpose is to develop a political economy growth model, following in the lines of Blomberg (1996), that can be used to empirically investigate whether or not states with initiative systems of legislation employ public spending more productively, which in turn leads to enhanced economic activity.

The basic structure of the model is as follows. The infinitely-lived representative household consumer/producer maximizes

$$\int_0^\infty U(c_t)e^{nt}e^{-\rho t}dt$$

subject to the flow budget constraint

$$\dot{k}_t = (1-\tau)y_t - c_t - (\delta + n)k_t$$

Here n is the rate of growth of the representative household, ρ is the rate of time preference, δ is the rate of depreciation and τ the (flat) marginal tax rate. We also assume that the utility function takes on the following CRRA form $U(c_t) = \frac{c_t^{1-\sigma}-1}{1-\sigma}$.

The household produces output using inelastically supplied labor, private capital (K_t, which is accumulated through savings) and government capital (G_t, which is the flow of capital services provided by the government). The production function is[4]

$$Y_t = AK_t^{\alpha-\beta}L_t^{1-\alpha}G_t^{\beta}$$

A is the (constant) level of technology (TFP) in the economy.[5] For ease of exposition, government capital is assumed to depreciate completely so there is no stock/flow distinction for G and the government's budget is assumed to be balanced so that $G_t = \tau Y_t$. In per-capita terms, we have the following production function $y_t = Ak_t^{\alpha-\beta}g_t^{\beta}$ where lower case letters signify per-capita versions of upper case variables.

The Hamiltonian for the maximization problem faced by the representative household is

$$H_t = \left[\frac{c_t^{1-\sigma}-1}{1-\sigma}\right]e^{(n-\rho)t} + \mu(\dot{k}_t)$$

[4]This is consistent with a standard exposition where the share of broadly defined capital in output, α is assumed to be about 0.3. Here instead of a single broad definition of capital, we have decomposed it into public and private capital

[5]We assume that there is no technological progress for simplicity and also because technological transfers should equalize the growth rate of technology across states

The Euler equation that results from the maximization is

$$\frac{\dot{c}_t}{c_t} = \frac{1}{\sigma}\left[(1-\tau)MPK_t - (\rho+\delta)\right]$$

where MPK, the marginal product of capital, plays a critical role in illustrating the difference in economic outcomes between initiative states and non-initiative states.

Recall from Section 3 that one of the important stylized facts about initiative states was that they tended to shy away from broad-based taxation and spending decisions and instead adopted user charges and more localized spending. Therefore, in an initiative state, there is a close link between the taxes that an individual pays and the public services that she receives in exchange for that taxation. In contrast, an individual in a non-initiative state sees no such link between her taxes and the public services that she receives given that much of the tax revenue is being used for redistribution purposes.[6]

In other words, an individual in an initiative state, when making a choice to invest in capital for future production of output, recognizes that higher output will raise tax revenue and therefore increase the provision of useful public services by the government. In contrast an individual in a non-initiative state, when making a similar decision will treat the level of public services as being exogenous to her decision.[7]

Incorporating this distinction we get the following result: for the non-initiative state

[6] An alternative to our approach would be to explicitly model this redistribution through income inequality. In this case, we would need to explicitly allow for the heterogeneity of initial levels of capital within each state, which introduces three potential problems for empirically testing our theoretical work. First, it would require us to make an assumption as to the within state initial distribution of capital for each state. Second, it would make the model's solution intractible in closed form. Third, the controversy over which empirical measure of income inequality is appropriate (e.g. Gini coefficients, percentiles, etc...), would greatly lengthen the paper. However, it does remain an area of further research, although it is outside the scope of this paper.

[7] To put it yet another way, the non-initiative state will resemble the decentralized solution to the canonical model in Barro (1990) whereas the initiative state will resemble the planner's solution, and hence will be closer to the ideal.

the marginal product of capital will be

$$MPK_t = \frac{\partial y_t}{\partial k_t} = (\alpha - \beta)\left(\frac{y_t}{k_t}\right) \tag{1}$$

while in the initiative state the marginal product of capital will be

$$MPK_t \equiv \frac{\partial y_t}{\partial k_t} = (\alpha - \beta)\left(\frac{y_t}{k_t}\right) + \beta\left(\frac{y_t}{g_t}\right)\left(\frac{\partial g_t}{\partial k_t}\right) = (\alpha - \beta)\left(\frac{y_t}{k_t}\right) + \beta\left(\frac{y_t}{\tau y_t}\right)\tau\left(\frac{\partial y_t}{\partial k_t}\right)$$

This can be simplified to

$$\frac{\partial y_t}{\partial k_t} = \left(\frac{\alpha - \beta}{1 - \beta}\right)\left(\frac{y_t}{k_t}\right) \tag{2}$$

So the MPK will be higher for initiative states because government capital services are being directly targeted to those who are undertaking the most economic activity.

The Euler equation and the flow budget constraint along with the appropriate transversality condition provide a full characterization of the equilibrium of this model.

$$\begin{aligned}
\frac{\dot{c}_t}{c_t} &= \frac{1}{\sigma}\left[(1-\tau)\left(\frac{\partial y_t}{\partial k_t}\right) - (\rho + \delta)\right] \\
\dot{k}_t &= (1-\tau)y_t - c_t - (\delta + n)k_t \\
0 &= \lim_{t\to\infty} k \cdot exp\left(-\int_0^t [(1-\tau)MPK_v - \delta - n]\, dv\right)
\end{aligned}$$

The equilibrium to this system of equations can be analyzed using a standard phase diagram, as shown in Figure 1. In this diagram, the $\dot{c} = 0$ locus corresponds to

$$\frac{\partial y_t}{\partial k_t} = \left(\frac{\rho + \delta}{1 - \tau}\right).$$

Since the marginal product of capital is different in initiative and non-initiative states, as given in (1) and (2), we can show that in initiative states the $\dot{c}_t = 0$ locus corresponds to

$$k^* = \left[\left(\frac{\alpha-\beta}{1-\beta}\right) \cdot \left(\frac{D}{\rho+\delta}\right)\right]^{\frac{1-\beta}{1-\alpha}} \tag{3}$$

whereas in non-initiative states this locus corresponds to

$$k^* = \left[(\alpha-\beta) \cdot \left(\frac{D}{\rho+\delta}\right)\right]^{\frac{1-\beta}{1-\alpha}} \tag{4}$$

where $D = (1-\tau)(A\tau^{\beta})^{\frac{1}{1-\beta}}$. So the $\dot{c}_t = 0$ locus in initiative states lies to the right of the $\dot{c}_t = 0$ locus in non-initiative states.

In both initiative and non-initiative states, the $\dot{k}_t = 0$ locus corresponds to $c_t = s(1-\tau)y_t - (n+\delta)k_t$ which, since $y_t = Ak_t^{\alpha-\beta}g_t^{\beta}$ and $g_t = \tau y_t$, can be written as

$$c^* = s(1-\tau)A^{\frac{1}{1-\beta}}k^{\frac{\alpha-\beta}{1-\beta}}\tau^{\frac{\beta}{1-\beta}} - (n+\delta)k$$

The resulting steady state for either system of government occurs at the intersection of this $\dot{k}_t = 0$ locus and the appropriate $\dot{c}_t = 0$ locus. From Figure 1, we can see that the steady state capital stock associated with initiative states is higher than the steady state levels of the corresponding variables in non-initiative states. So states with initiative systems should have higher steady state levels of capital and output than non-initiative states, assuming that the (average) marginal tax rates are identical.

We can also show that states with initiative systems also have higher steady state consumption. From the $\dot{k}_t = 0$ locus, we can calculate that the Golden Rule level of consumption is at

$$k^{Gold} = \left[\left(\frac{\alpha-\beta}{1-\beta}\right) \cdot \left(\frac{D}{n+\delta}\right)\right]^{\frac{1-\beta}{1-\alpha}}$$

where D is as defined above. So the steady state under an initiative system (3) is closer to the Golden Rule than the steady state under a non-initiative system (4). Therefore, the initiative state has higher steady state consumption as well as higher steady state capital, indicating that better targeting of tax revenue to productive economic activity results in superior economic performance in states with initiative systems of government.

4 Data and Methodology

4.1 Deriving Regression Equations

The model in the previous section illustrated how better channeling of tax revenues into productive government spending enabled states with initiative systems of government achieve better economic outcomes. In this section, we will test the validity of the theory. First, we will derive a simpler Solow-Swan type exogenous savings version of the model presented in the previous section. This simpler model preserves the basic features of the Ramsey-type model and allows us to obtain regression equations for our empirical analysis as well.[8]

As before output is produced with capital, K_t, labor, L, and Government capital, G_t according to the production function

$$Y_t = AK_t^{\alpha-\beta}L^{1-\alpha}G_t^{\beta}$$

Now, consumption is just a constant fraction, $(1-s)$, of disposable income, $Y_t(1-\tau)$, where s is the rate of savings and τ is the constant rate of taxation. For analytical ease, we have

[8]The Ramsey version of the model is still important because it provides better micro-foundations for the differential impacts of public capital in initiative and non-initiative states assumed in the Solow-Swan version of the model.

assumed that the labor force is constant in size.[9] Capital accumulates according to:

$$\dot{K}_t = s(1-\tau)Y_t - \delta K_t$$

where $K_0 > 0$ is given. As before, private capital depreciates at rate δ and it is assumed that public capital, G_t depreciates completely.

We continue to assume that the government's budget is always in balance so that tax revenue = expenditure, i.e. $\tau Y_t = E_t$.[10] However, we allow for the possibility that a given amount of expenditure can translate into differential government capital services in initiative states vs. non-initiative states because of unobservable differences in the effectiveness in which states provide public capital services. This can be captured in a simple fashion by the following equation: $\phi E_t = G_t$ where a higher value of ϕ implies a greater provision of productive public goods by the government for a given amount of expenditure. In other words, states have a different production technology of public capital, with the parameter ϕ measuring the level of that technology. Combining, the two equations above, we get the equation for government capital services as being

$$G_t = \phi(\tau Y_t)$$

To identify the role of initiatives, we assume that all states are identical except for their ability to transform tax revenue into productive public capital.[11] Our hypothesis is that states without initiatives are not as efficient as those states with initiatives at getting elected representatives to spend resources on productive public goods. That is ϕ's for non-initiative

[9] In the empirical specification, we incorporate employment growth as an explanatory variable for output growth as would be suggested by the theory if labor growth were introduced to the model.

[10] Note that we are ignoring government spending on non-productive activities here. The model in the previous section showed that even when tax revenues are directed completely into productive government spending they will have differential impacts in initiative vs. non-initiative states

[11] In other words they have the same production parameters, A, α, β, savings rate, s, tax rate, τ. However, in the empirical work, we do remove individual effects for each state, although we demonstrate in Table 2a some results without individual effects removed.

states will be lower than that for initiative ones.

To see how this impacts *growth*, we derive the law of motion for output:

$$\gamma = \dot{Y}_t/Y_t = \left(\frac{\alpha - \beta}{1 - \beta}\right)[s(1-\tau)(Y_t/K_t) - \delta] \quad (5)$$

Re-arranging we get for each state:

$$\gamma = \left(\frac{\alpha - \beta}{1 - \beta}\right)\left[s(Y_t/K_t) - \frac{s}{\phi}(G_t/K_t) - \delta\right] \quad (6)$$

This equation forms the basis of our empirical investigation where we distinguish between productive and unproductive government spending and how state initiatives may affect this mix. The key contribution is that we can estimate ϕ, the effectiveness with which tax revenue is allocated to productive government capital, via this equation.[12] Our contribution to the issue of the 'productive' role of public capital is to test whether states with initiative systems have higher ϕs than do non-initiative states.

To see how this result impacts the *speed of convergence* and *level of output*, we can log-linearize the expression for the growth rate of output γ to get

$$\gamma = -\left(\frac{1-\alpha}{1-\beta}\right)\delta \ln\left[\frac{Y_t}{Y_t^*}\right] \quad (7)$$

where the steady state level of output is given by

$$Y^* = L\hat{A}^{\frac{1-\beta}{1-\alpha}}\left[\frac{s(1-\tau)}{\delta}\right]^{\frac{\alpha-\beta}{1-\alpha}} \quad (8)$$

[12]Note that ϕ is not the fraction of expenditure allocated to government capital. It is a measure of how productive a state's expenditure on government capital is. Since productivity of government capital is unobserved, ϕ can't be calculated directly from the data.

where $\hat{A} = [A(\tau\phi)^{\beta}]^{\frac{1}{1-\beta}}$. Notice that, all else equal, non-initiative states have lower levels of $\hat{A}$ and hence lower levels of output, $\frac{dY^*}{d\phi} > 0$. Even though the speed of β-convergence is the same for initiative and non-initiative states $(\left[\frac{1-\alpha}{1-\beta}\right]\delta)$, for a given level of output, since initiative states have higher steady state levels of output, they will grow faster.

In the next section we explore two empirical predictions from our theory. First, we estimate directly the parameters of the growth equation, including the efficiency with which tax revenues are used to fund productive government expenditures, ϕ. If the state initiative system allows voters to directly affect and discipline the allocation of public spending, then ϕ should be higher for initiative states and correspondingly lower for non-initiative states. Second, the theory also predicts that if non-initiative states do indeed allocate less government spending towards productive goods, they will have lower steady state levels of output as well as slower growth towards these steady state levels. Before presenting our empirical evidence on these two predictions, the following sub-section describes the data and methodology we employ.

4.2 Data

In this section, we provide a brief description of the data employed in our empirical section. The data on initiatives is taken from Matsusaka (1995) and the data on public and private capital is from Holtz-Eakin (1993) and has been used extensively in the literature. The data set for Public and Private State capital is originally from Aschauer (1989) and Munnell (1990). Annual population figures for each state are taken from the Bureau of the Census.

The original Holtz-Eakin (1993) data set contains a variety of measures of public and private capital, employment and Gross State Product for the 48 contiguous United States over the years 1969-1986. We choose to use his broadest measure of public capital which includes such things as utilities, roads, education, etc...., although the results are robust to modifications of the definition of public capital. The data for which states have an initiative system (and for what time periods) is from Matsusaka (1995).[13]

Table 1 presents the empirical regularities of the data for the time period 1969-1986. We partition the data by whether or not the state has an initiative system, IN (initiative) and NI (non-initiative), respectively. Column 1 states the variable of interest while columns 2 through 4 provide the relevant statistics (mean, standard deviation and median) for states with initiatives and columns 5 through 7 provides the relevant statistics for states without initiatives. There are five key findings here which distinguish initiative states from non-initiative ones. First, across the entire sample as well as some selected years presented (1969, 1978 and 1986) productivity per worker, Y/L, is higher in initiative states than non-initiative ones. Second, initiative states have accumulated higher stocks of the productive inputs. The results in the table show that both private capital per worker, K/L, and public capital per worker, G/L, are higher in initiative states as compared to non-initiative states. Third, growth of aggregate output is higher in initiative states, although the growth of output per worker and output per-capita is higher in non-initiative states. This indicates that the gap between initiative and non-initiative states is widening in terms of the levels of output but narrowing in terms of output-per worker and output-per capita due to higher growth in employment and population.[14] Finally, as demonstrated in the lower panel of the table, initiative states allocate a larger fraction of their resources to public capital and have a lower output to capital (i.e. higher capital to output) ratios.

This naturally leads to the main research question with regards to initiative systems: does the increased ability of initiative states to provide productive public capital services have a discernible impact on output growth?[15]

[13] See the Data Appendix for more specific details about the series.

[14] Note that this is only the raw data: in the next section we will determine is non-initiative states have higher GDP per capita growth rates after controlling for differences in characteristics between states.

[15] The general question of whether public capital is 'productive' has been exhaustively debated in the literature: e.g. Aschauer (1989), Munnell (1990), and Holtz-Eakin (1993). Balmesada (1994), Gramlich (1994) and Sturm (1998) summarize the literature with the view that for some states public capital improves

5 Empirical Analysis

5.1 Results on Growth

In this section we attempt to gain a measure of the economic consequences of state initiatives for economic growth. The simple model we presented above provides some clues. First, we can directly estimate a measure of productive government spending using an empirical counterpart to expression (6). Second, we can infer the rates of convergence from equation (7). To answer our first question, consider the growth equation (6) from the previous section. An empirical relationship consistent with this equation is:

$$\Delta \ln(Y_t) = \theta_0 + \theta_1 \cdot (Y/K)_t + \theta_2 \cdot (G/K)_t \tag{9}$$

where, according to the theory, $\theta_0 = -\delta\left(\frac{\alpha-\beta}{1-\beta}\right) < 0$, $\theta_1 = s\left(\frac{\alpha-\beta}{1-\beta}\right) > 0$ and $\theta_2 = -\theta_1/\phi$ The specification points to a key feature for interpreting the role of public infrastructure on growth: the more that state tax revenue is spent on productive rather than unproductive spending the more that government spending will crowd out private capital and lower the rate of growth. One can gain an empirical measure of ϕ from estimates of θ_1 and θ_2, namely θ_1/θ_2. The model predicts states with initiative systems will be better able to monitor public spending and will therefore be able to channel a larger fraction of spending towards productive purposes meaning $\theta_2^{IN} > \theta_2^{NI}$ or $\phi^{IN} > \phi^{NI}$. In the limiting case, initiative states can deliver all expenditure to productive activities so $\phi^{IN} \rightarrow 1$, so that $\theta_1^{IN} = -\theta_2^{IN}$.

To test these implications, and to control for other omitted features which may be important, we specify our empirical relationship as:

$$\Delta \ln(Y_t) = \theta_0 + \theta_1 \cdot (Y/K)_t + \theta_2 \cdot (G/K)_t + \theta_3 \cdot (G/K)_t \cdot NI_t + \beta \cdot X_t + \epsilon_t. \tag{10}$$

productivity, while for others it does not.

If states with initiatives are better at monitoring public spending towards more productive uses, then $\theta_3 < 0$. We can also extract ϕ^I and ϕ^{NI} as $\phi^I = -\theta_1/\theta_2$ and $\phi^{NI} = -\theta_1/(\theta_2 + \theta_3)$. Hence, we can also test whether initiative states devote all public spending to productive activities $\theta_1 = -\theta_2$. For additional control variables in our empirical specification, we include lagged employment growth $(\Delta \ln(L_{t-1}))$, and individual and time fixed effects in all specifications.[16] We also report some results including additional control variables such as lagged investment growth $(\Delta \ln(I_{t-1}))$ and lagged output growth $(\Delta \ln(Y_{t-1}))$. The table reports the number of observations, $N \times T$, the adjusted r-squared, $\overline{R}^2$, the Durbin-Watson statistic, DW, and the significance level for rejecting the hypothesis that $\theta_1 = -\theta_2$.

Column (I) of Table 2a reports estimates of the base specification (9). The estimated coefficients are all statistically significant at below the .01 level.[17] The results presented in Column (II) of Table 2a also provide our estimate θ_3. Recall that if non-initiative states devote a larger fraction of their resources to wasteful expenditure, then θ_3 will be negative for the term (G/K).

The estimation results indicate that, indeed, this is the case. First, the coefficient on $(G/K) \cdot NI$ is negative and statistically different from zero at below the .05 level of significance. Second, the magnitude of the coefficient is relatively large. As reported in the p-value row, for initiative states one can only reject the hypothesis that $\theta_1 = -\theta_2$ at the .58 level or above. The value of ϕ for initiative states is $\phi^{IN} = -\frac{\theta_1}{\theta_2} = 0.91$ in contrast to the value of ϕ for non-initiative states, which is $\phi^{NI} = -\frac{\theta_1}{\theta_2+\theta_3} = 0.75$. In other words, non-initiative states are only approximately 82% as effective as initiative states in providing

[16] We use lagged employment growth in the regressions because of endogeneity concerns about contemporaneous employment growth. We also reject the null that individual-level effects are adequately modeled using a random effects model versus a fixed effects model at all conventional significance levels using the Hausman specification test. For example, in the baseline case we obtain a χ^2_{18} statistic of 62.18 that the coefficients are not systematically different from one another resoundingly rejecting the hypothesis that a random effects model better characterizes the data.

[17] The magnitudes of the coefficients are also reasonable. For example, θ_0 is approximately 0.05 while θ_1 is approximately 0.20. So $-\theta_1/\theta_0 = s/\delta$ will equal 5, which is consistent with a value of $\delta = .05$ and a savings rate of 0.25, which are not unreasonable parameter values for a model of this type.

productive capital services[18], or in other words approximately 20 percent more government expenditures is wasted in non- initiative states as compared to initiative states. The results in columns (III) and (IV) of Table 2a imply similar values for ϕ for both initiative and non-initiative states. In column (III) we remove the state and time specific effects, and although the magnitudes of the coefficients fall, the implied values of ϕ are similar, $\phi^{IN} = 1.00$ and $\phi^{NI} = 0.77$.[19] In column (IV) we include extra regressors that are typically good predictors of output growth, namely lagged investment growth and lagged output growth: the results are unaffected with implied values of $\phi^{IN} = 0.84$ and $\phi^{NI} = 0.66$.[20]

5.1.1 Regressions With Per-Capita Variables

An alternative to the empirical relationship (10) would be to re-write the growth equation in per-capita terms. The law of motion for per-capita output is

$$\gamma_y = \dot{y}_t/y_t = \left(\frac{\alpha - \beta}{1 - \beta}\right)[s(1-\tau)(Y_t/K_t) - (\delta + n)] \tag{11}$$

An alternative empirical relationship consistent with this equation would be one given in per capita terms including population growth as a right hand side variable:

$$\Delta \ln(y_t) = \theta_0 + \theta_1 \cdot (Y/K)_t + \theta_2 \cdot (G/K)_t + \theta_3 \cdot (G/K)_t \cdot NI_t + \theta_4 \cdot \Delta \ln(N_t) + \beta \cdot X_t + \epsilon_t. \tag{12}$$

Column (I) of Table 2b reports estimates of the base specification (12). The estimated

[18] $\left(\frac{\phi_{NI}}{\phi_{IN}}\right) = \left(\frac{0.75}{0.91}\right) = 0.82$

[19] Note, however that the adjusted R-squared falls dramatically when we exclude state and year fixed effects. This is most likely because of the importance of national economic cycles and unobserved differences among states in explaining economic performance.

[20] The results from a panel data regression with a lagged dependent variable and individual fixed effects as regressors may not be consistent, especially with a small sample (Baltagi (1995)); we therefore used an instrumental variables estimation in Column IV with $(\Delta \ln(L_{t-2}))$ and $(\Delta \ln(N_{t-2}))$ as instruments. We are grateful to an anonymous referee for bringing this point to our attention.

coefficients on G/K and Y/K are both statistically significant at below the .01 level. The results presented in Column (II) of Table 2b shows that coefficient on $(G/K) \cdot NI$ continues to be negative and statistically different from zero at below the .05 level of significance with magnitudes similar to Table 2a. In this case, the value of ϕ for initiative states is $\phi^I = -\frac{\theta_1}{\theta_2} = 1.31$ in contrast to the value of ϕ for non-initiative states, which is $\phi^{NI} = -\frac{\theta_1}{\theta_2+\theta_3} = 0.87$. So non-initiative states are only 2/3rds as effective as initiative states in providing productive public capital services. In other words, approximately 33% percent more government expenditures are wasted in non- initiative states as compared to initiative states.

5.1.2 Robustness Checks

In order to ascertain the robustness of our results, we tried a variety of alternative specifications. The results are reported in the columns of Table 2c). We report the results of the following five specifications. Column I) allows for the possibility of political variables influencing state business cycles by including a percent vote for the Democratic candidate in the previous election (DEM_{t-1}).[21] Column II) controls for differences in the level of human capital (measured as spending on high school education) across states (H). Column III) includes geographic regional dummy variables, interacted with G/K, as alternative explanatory variables (due to concerns about possible clustering of initiative states in the West). Column IV) includes a dummy variable for capital budgeting states (CAPBUD), interacted with G/K to see if the effect we were picking up was attributable to some feature of states other than whether they had representative or direct democracy.[22] Finally, column V) controls for differences in taxes by including a dummy variable (HIGHTAX) for the 20 states with the highest per-capita tax burden. The results indicate that political variables, human capital, regional dummies or the size of government do not change the magnitude or the

[21] See Blomberg and Hess (2001) for example.

[22] We thank an anonymous referee for bringing this alternative specification to our attention.

significance of the strong negative relationship between states that do not have initiatives and economic growth. In other words, none of these factors increase the efficiency with which public goods are provided in the same way that initiatives seem to do.

5.2 Results on Convergence

The results in Tables 2a & 2b suggest that non-initiative states devote approximately 20 - 30 percent of their government spending on wasteful expenditure. However, the theoretical model has an additional implication. As can be seen from the expression for the steady state level of Y, equation (8), since non-initiative states have lower $\phi's$, they will have lower steady state levels of output, because $d\hat{A}/d\phi > 0$. Therefore, since the non-initiative states' steady state values for output are lower, for any log-level of current output, non-initiative states will converge slower to their steady states. The following specification captures this broad feature:

$$\Delta \ln(Y_t) = a_0 + a_1 \cdot NI_t + a_2 \ln(Y_{t-1}) + a_3 \ln(Y_{t-1}) \cdot NI_t + \beta \cdot X_t + \upsilon_t \tag{13}$$

According to the theory, non-initiative states should have slower convergence, suggesting that $a_3 > 0$. Table 3a provides empirical estimates of expression (13). As before, for additional control variables in our empirical specification, we include lagged employment growth ($\Delta \ln(L_{t-1})$), and individual and time fixed effects in all specifications. We also report some results including additional control variables such as lagged investment growth ($\Delta \ln(I_{t-1})$) and lagged output growth ($\Delta \ln(Y_{t-1})$).

Column (I) of Table 3a presents the estimates of the base specification (13), when we do not distinguish between initiative and non-initiative states, i.e. $a_1 = a_3 = 0$. The estimated coefficients are all statistically significant at below the .01 level, and the null hypothesis that $a_2 = 0$, which involves a Dickey-Fuller type distribution, can be rejected at below the .01 level. These results imply convergence across U.S. states consistent with the literature (e.g. see Evans 1998). These estimates of the rate of convergence translate into a speed of convergence equal to 7 percent as reported in the row labeled SADJ. Next, we turn our attention to analyzing the differences in these parameters due to initiative systems. Column (II) of Table 3a presents these results by allowing a_3 to be estimated. Recall the hypothesis is that a_3 should be positive meaning non-initiative states converge at slower rates than initiative states. This is confirmed by the results reported in this column.[23] As reported below, the speed of convergence falls from 8 percent for initiative states versus 5.5 percent for non-initiative states. Further robustness checks are presented in column (III) where we include extra regressors that are typically good predictors of output growth, namely investment growth and lagged output growth: the results are unaffected.

5.2.1 Results With Per-Capita Variables

An alternative to the empirical relationship (13) would be to specify the convergence equation in per-capita terms as

$$\Delta \ln(y_t) = a_0 + a_1 \cdot NI_t + a_2 \ln(y_{t-1}) + a_3 \ln(y_{t-1}) \cdot NI_t + a_4 \Delta \ln(N_t) + \beta \cdot X_t + \upsilon_t \quad (14)$$

Results of this specification are provided in Table 3b. The results Column I of Table 3b imply convergence in per-capita growth rates at a rate of about 10% across U.S. states (as reported in the row labeled SADJ), which is consistent with the literature (e.g. see Evans 1998). In Column II of Table 3b, we analyzing the differences in per-capita convergence rates due to initiative systems. The speed of convergence falls from 14 percent for initiative states to 7 percent for non-initiative states.

[23]The hypothesis that $a_2 + a_3 < 0$ can still be rejected at conventional levels of statistical significance using a Dickey-Fuller table.

5.2.2 Robustness Checks

As before, in order to ascertain the robustness of our results in Table 3a, we tried the same array of alternative specifications. The results are reported in the columns of Table 3c). None of these alternative estimation techniques affect our results, as can be seen by the results reported in Table 3c.

6 Conclusion

This paper investigates whether political institutions in the form of state-wide initiatives are employed by voters to affect the allocation of government resources towards more productive purposes. We constructed a simple growth model in which initiatives can play an important role in determining the resource allocation of public capital and found that initiatives can lead state economies closer to their optimal allocations. We then tested the implications of this model using U.S. state-level data from 1969-1986. Our findings suggest states with initiatives waste about 20-30% fewer resources and converge to their steady-states about a third faster than do non-initiative states.

References

[1] **Aschauer, David**, "Is Public Expenditure Productive?," *Journal of Monetary Economics*, June 1989, 177-200.

[2] **Balmaseda, Manuel**, "Product Function Analysis of Rate of Return on Public Capital," *mimeo*, Northwestern, October 1994.

[3] **Baltagi, B.H.**, *Econometric Analysis of Panel Data*, John Wiley and Sons, New York et. al. 1995.

[4] **Barro, Robert**, "Government Spending in a Simple Model of Endogenous Growth," *Journal of Political Economy*, October, 1990, S103-25.

[5] **Blomberg, S. Brock** "Growth, Political Instability and the Defence Burden" *Economica*, November 1996.

[6] **Blomberg, S. Brock and Gregory D. Hess** "Is the Political Business Cycle for Real?" *Journal of Public Economics*, Forthcoming 2001.

[7] **Chang, Roberto** "Political Party Negotiations, Income Distribution and Endogenous Growth" *Federal Reserve Bank of Atlanta; Working Paper 95-3* June 1995.

[8] **Durlauf, Steven and Danny Quah**, "New Empirics of Economic Growth," *NBER Working Paper 6422*, 1998.

[9] **Evans, Paul**, "Do Economies Converge? Evidence from a Panel of U.S. States" *Review of Economics and Statistics* 78, August 1996, 384-388.

[10] **Evans, Paul**, "Income Dynamics in Regions and Countries" in Gregory D. Hess and Eric van Wincoop, eds., *Intranational Macroeconomics*, Cambridge University Press, New York, forthcoming 2000.

[11] **Feld, Lars P. and Kirchgassner, Gebhard** "Direct Democracy, Politcal Culture and the Outcome of Economic Policy: a Report on the Swiss Experience" ," *European Journal of Political Economy*, 16, 2000, 287-306.

[12] **Feld, Lars P. and Matsusaka, John G.** "Budget Referendums and Government Spending: Evidence from Swiss Cantons ," *mimeo*, University of Southern California, February 2001

[13] **Feld, Lars P. and Savioz, Marcel R.** "Direct Democracy Matters for Economic Performance: An Empirical Investigation," *Kyklos*, 50, 1997, 507-38.

[14] **Gramlich, E.M.**, "Infrastructure Investment: a Review Essay," *Journal of Economic Literature*, 1994, 1176-1196.

[15] **Holtz-Eakin, Douglas**, "State-Specific Estimates of State and Local Government Capital," *Regional Science and Urban Economics*, 1993, 185-209

[16] **Huberman, Gur** "Home Bias in Equity Markets: International and Intranational Evidence," in Gregory D. Hess and Eric van Wincoop, eds., *Intranational Macroeconomics*, Cambridge University Press, New York, forthcoming 1999.

[17] **Jones, L., Manuelli, R. and Rossi, P.** "Optimal Taxation in Models of Endogenous Growth" *Journal of Political Economy*, 101 (June 1993): 485-517.

[18] **Kalt, Joseph P. and Mark Zupan**, "Capture and Ideology in the Economic Theory of Politics," *American Economic Review*, June 1984, 279-300

[19] **Kalt, Joseph P. and Mark Zupan**, "The Apparent Ideology of Behavior of Legislature: Testing for Principal-Agent and Slack in Political Institutions," *Journal of Law of Economics*, April 1990, 103-31.

[20] **Levitt, Steven**, "Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime," *American Economic Review*, June 1997, 270-90.

[21] **Lucas, Robert**, "On the Mechanics of Economic Development," *Journal of Monetary Economics*, June 1988, 3-42.

[22] **Matsusaka, John G.** "Economics of Direct Legislation" *Quarterly Journal of Economics*, 107 (May 1992): 541-571.

[23] **Matsusaka, John G.** "Fiscal Effects of the Voter Initiative: Evidence from the Last 30 Years" *Journal of Political Economy*, 103 (June 1995): 587-623.

[24] **Matsusaka, John G. and Nolan McCarty** "Political Resource Allocation: Benefits and Costs of Voter Initiatives" *mimeo*, 1998.

[25] **Mohtadi, Hamid and Roe, Terry** "Growth, Lobbying and Public Goods" *European Journal of Political Economy* 14:3 1998 453 - 473.

[26] **Munnell, Alicia**, "How does Public Infrastructure Affect Regional Economic Performance," in *Is There a Shortfall in Public Capital*, 1990, Federal Reserve Bank of Boston.

[27] **Poterba, James M.** "State Responses to Fiscal Crisis: The Effects of Budgetary Institutions and Politics" *Journal of Political Economy*, 102 (August 1994): 799-821.

[28] **Poterba, James M.** "Capital Budgets, Borrowing Rules, and State Capital Spending" *Journal of Public Economics* 56 (February 1995): 165-187.

[29] **Sturm, J.E.**, *Public Capital Expenditure in OECD Countries: The Causes and Impact of the Decline in Public Capital Spending*, Cheltenham, 1998, Edward Elgar.

Data Appendix

The data from Holtz-Eakin (1993) provides information about state level capital stocks for the 48 contiguous states: Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin and Wyoming. The remaining two states: Alaska and Hawaii as well as the District of Columbia are excluded from the sample. Of these 48 states, 22 have voter initiatives. Data on the year in which each of these states adopted the initiative is given in Matsusaka (1995) and is replicated in the table below.

Voter Initiatives in the United States
1969-1986

Initiative States	Year Adopted	Initiative States	Year Adopted
Arizona	1910	Montana	1906
Arkansas	1909	Nebraska	1912
California	1911	Nevada	1904
Colorado	1910	North Dakota	1914
Florida	1978	Ohio	1912
Idaho	1912	Oklahoma	1907
Illinois	1970	Oregon	1902
Maine	1908	South Dakota	1898
Massachusetts	1918	Utah	1900
Michigan	1908	Washington	1912
Missouri	1908	Wyoming	1968

Notes: All information in this table was obtained from Table 1 of Matsusaka (1993).

Figure 1: Phase Diagram

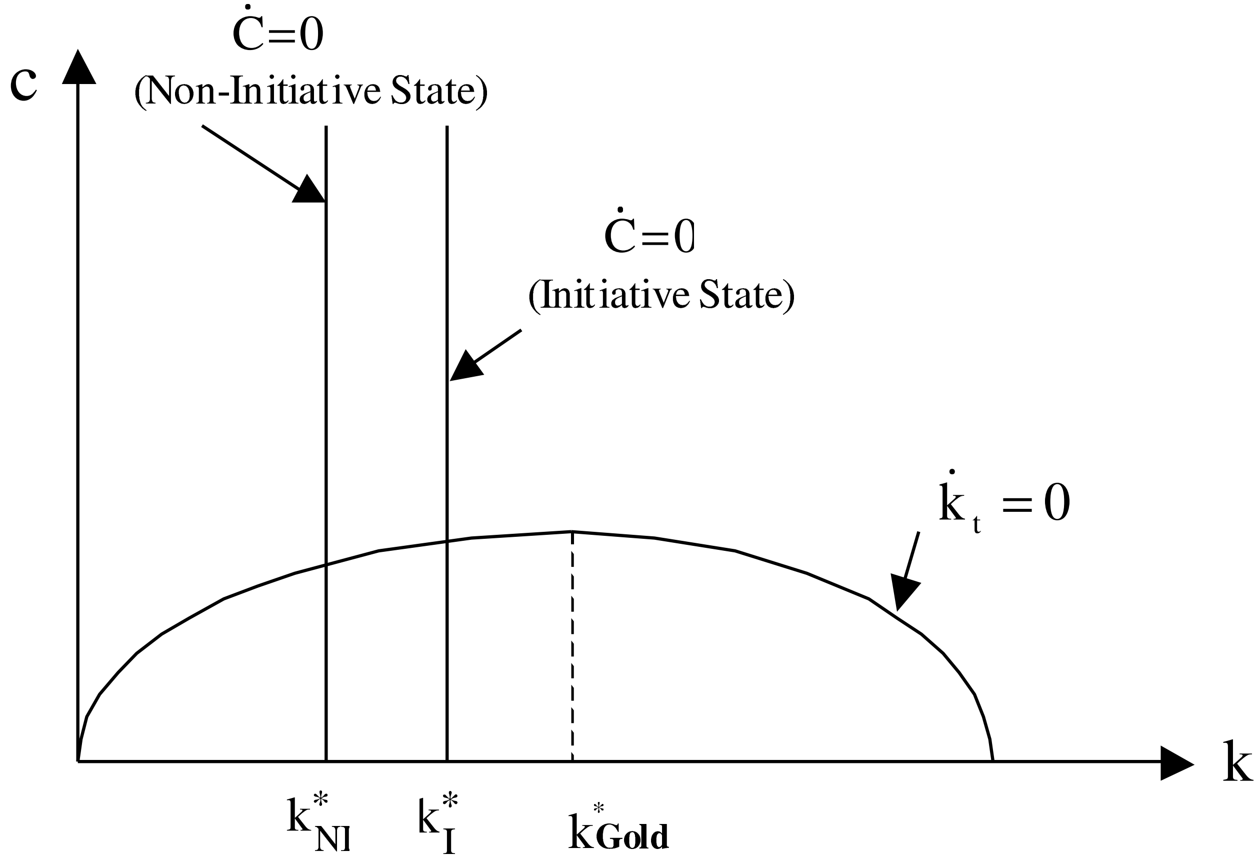

Table 1: Empirical Regularities
1969-1986 Sample Statistics

		Initiative States				Non-Initiative States			
Data	*Sample*	*Obs.*	*Mean*	*Std.Dev.*	*Median*	*Obs.*	*Mean*	*Std.Dev.*	*Median*
Y/L	*ALL*	387	\$37,768	\$8,638	\$35,853	477	\$34,240	\$6,668	\$33,107
Y/L	1969	21	\$37,497	\$12,573	\$34,999	27	\$32,468	\$8,159	\$30,978
Y/L	1978	22	\$37,400	\$7,423	\$35,467	26	\$34,152	\$6,186	\$33,021
Y/L	1986	22	\$39,163	\$6,825	\$37,901	26	\$37,020	\$4,705	\$35,871
K/L	*ALL*	387	\$53,957	\$29,860	\$44,023	477	\$42,648	\$17,909	\$37,228
K/L	1969	21	\$52,874	\$33,192	\$41,360	27	\$38,786	\$19.933	\$31,747
K/L	1978	22	\$50,436	\$25,703	\$42,759	26	\$41,904	\$16,688	\$37,852
K/L	1986	22	\$55,298	\$33,414	\$44,389	26	\$45,248	\$18,452	\$38,794
G/L	*ALL*	387	\$19,728	\$5,631	\$18,034	477	\$16,602	\$3,135	\$16,406
G/L	1969	21	\$20,653	\$6,524	\$19,412	27	\$15,956	\$3,242	\$15,881
G/L	1978	22	\$18,407	\$4,650	\$16,703	26	\$16,325	\$2,823	\$16,082
G/L	1986	22	\$19,366	\$6,885	\$16,931	26	\$15,844	\$3,616	\$15,152
Y/N	*ALL*	387	\$11,619	\$2,921	\$11,155	477	\$10,865	\$2,197	\$10,561
K/N	*ALL*	387	\$16,276	\$8,850	\$13,596	477	\$13,233	\$4,716	\$11,993
G/N	*ALL*	387	\$5,960	\$1,399	\$5,611	477	\$5,234	\$910	\$5,106
ΔY	*ALL*	366	0.031	0.045	0.036	450	0.029	0.039	0.033
$\Delta(Y/L)$	*ALL*	366	0.004	0.026	0.005	450	0.009	0.022	0.011
$\Delta(Y/N)$	*ALL*	366	0.016	0.043	0.023	450	0.019	0.037	0.025
G/Y	*ALL*	387	0.525	0.115	0.502	477	0.492	0.087	0.492
Y/K	*ALL*	387	0.795	0.228	0.784	477	0.880	0.239	0.853
G/K	*ALL*	387	0.408	0.114	0.412	477	0.433	0.139	0.417

Notes: All data was obtained from Holtz-Eakin (1993). Y is gross state product, K is the private capital stock, L is employment, N is population and G is the broad measure of public capital.

$$\Delta \ln(Y_t) = \theta_0 + \theta_1 \cdot (Y/K)_t + \theta_2 \cdot (G/K)_t + \theta_3 \cdot (G/K)_t \cdot NI_t + \beta \cdot X_t + \epsilon_t$$

Table 2a: Levels Growth Regression 1969-1986

Variable	(I)	(II)	(III)	(IV)
$Const$	-0.052^a	-0.052^a	0.011^c	-0.030
	(0.020)	(0.020)	(0.006)	(0.046)
Y/K	0.190^a	0.190^a	0.043^a	0.172^a
	(0.025)	(0.026)	(0.009)	(0.047)
G/K	-0.232^a	-0.209^a	-0.044^b	-0.205^a
	(0.030)	(0.033)	(0.018)	(0.045)
$(G/K) \cdot NI$		-0.046^b	-0.009	-0.054^b
		(0.022)	(0.007)	(0.026)
$\Delta \ln(L_{t-1})$	0.276^a	0.269^a	0.184^a	0.064
	(0.067)	(0.067)	(0.046)	(0.261)
$\Delta \ln(INV_{t-1})$				-0.036
				(.046)
$\Delta \ln(Y_{t-1})$				0.230
				(0.302)
$N \times T$	768	768	768	768
$\overline{R}^2$	.652	.653	.046	.684
$p - value$	0.149	0.581	0.915	0.389

Notes: robust standard errors are presented in parentheses. [a], [b] and [c] represent statistical significance at the .01, .05 and .10 levels, respectively. $N \times T$ is the number of panel observations, $\overline{R}^2$ is the adjusted r-squared, and p-value refers to the level of significance for rejecting the hypothesis that $\theta_1 = -\theta_2$. All specifications include time and individual fixed effects, excluding the results reported in column (III). The results in column (IV) are from an instrumental variables regression using $(\Delta \ln(L_{t-2}))$ and $(\Delta \ln(N_{t-2}))$ as instruments.

$$\Delta \ln(y_t) = \theta_0 + \theta_1 \cdot (Y/K)_t + \theta_2 \cdot (G/K)_t + \theta_3 \cdot (G/K)_t \cdot NI_t + \theta_4 \cdot \Delta \ln(N_t) + \beta \cdot X_t + \epsilon_t$$

Table 2b: Per-Capita Growth Regression 1969-1986

Variable	(I)	(II)	(III)	(IV)
$Const$	-0.065^a	-0.066^a	-0.008	0.024
	(0.019)	(0.019)	(0.006)	(0.044)
Y/K	0.179^a	0.179^a	0.048^a	0.118^a
	(0.025)	(0.024)	(0.009)	(0.039)
G/K	-0.176^a	-0.137^a	-0.036^b	-0.116^a
	(0.030)	(0.031)	(0.017)	(0.041)
$(G/K) \cdot NI$		-0.068^a	-0.001	-0.071^a
		(0.020)	(0.006)	(0.023)
$\Delta \ln(N)$	0.293	0.369	0.217	0.507
	(0.259)	(0.259)	(0.141)	(0.323)
$\Delta \ln(L_{t-1})$	0.006	-0.021	-0.022	-0.486^b
	(0.083)	(0.084)	(0.046)	(0.206)
$\Delta \ln(INV_{t-1})$				-0.048
				(.042)
$\Delta \ln(y_{t-1})$				0.591^a
				(.218)
$N \times T$	768	768	768	768
$\overline{R}^2$	.633	.636	.042	.609
$p - value$	0.902	0.192	0.311	0.303

Notes: robust standard errors are presented in parentheses. ^{a}, ^{b} and ^{c} represent statistical significance at the .01, .05 and .10 levels, respectively. $N \times T$ is the number of panel observations, $\overline{R}^2$ is the adjusted r-squared, and p-value refers to the level of significance for rejecting the hypothesis that $\theta_1 = -\theta_2$. All specifications include time and individual fixed effects, excluding the results reported in column (III). The results in column (IV) are from an instrumental variables regression using $(\Delta \ln(L_{t-2}))$ and $(\Delta \ln(N_{t-2}))$ as instruments.

$$\Delta \ln(Y_t) = \theta_0 + \theta_1 \cdot (Y/K)_t + \theta_2 \cdot (G/K)_t + \theta_3 \cdot (G/K)_t \cdot NI_t + \beta \cdot X_t + \epsilon_t$$

Table 2c: Robustness Checks 1969-1986

Variable	(I)	(II)	(III)	(IV)	(V)
$Const$	-0.042	0.246^b	-0.057^a	-0.103^a	-0.033
	(0.034)	(0.101)	(0.020)	(0.031)	(0.031)
Y/K	0.198^a	0.180^a	0.187^a	0.190^a	0.194^a
	(0.026)	(0.025)	(0.026)	(0.026)	(0.026)
G/K	-0.223^a	-0.171^a	-0.234^a	-0.147	-0.099^c
	(0.033)	(0.034)	(0.041)	(0.108)	(0.057)
$(G/K) \cdot NI$	-0.036^c	-0.058^a	-0.048^c	-0.043^b	-0.048^b
	(0.021)	(0.023)	(0.024)	(0.021)	(0.022)
$\Delta \ln(L_{t-1})$	0.255^a	0.251^a	0.263^a	0.266^a	0.255^a
	(0.068)	(0.068)	(0.068)	(0.068)	(0.067)
Dem_{t-1}	0.001^a				
	(0.000)				
$\ln(H)$		-0.042^a			
		(0.011)			
$SouthRegion \cdot (G/K)$			0.140^a		
			(0.051)		
$WestRegion \cdot (G/K)$			0.070		
			(0.053)		
$CAPBUD \cdot (G/K)$				-0.067	
				(0.101)	
$HighTax \cdot (G/K)$					-0.145^a
					(0.050)
$N \times T$	768	768	768	768	768
$\overline{R}^2$	.653	.657	.654	.653	.657
$p-value$	0.433	0.791	0.263	0.692	0.105

Notes: robust standard errors are presented in parentheses. ^{a}, ^{b} and ^{c} represent statistical significance at the .01, .05 and .10 levels, respectively. $N \times T$ is the number of panel observations, $\overline{R}^2$ is the adjusted r-squared, and p-value refers to the level of significance for rejecting the hypothesis that $\theta_1 = -\theta_2$. All specifications include time and individual fixed effects.

$$\Delta \ln(Y_t) = a_0 + a_1 \cdot NI_t + a_2 \ln(Y_{t-1}) + a_3 \ln(Y_{t-1}) \cdot NI_t + \beta \cdot X_t + \upsilon_t$$

Table 3a: Convergence Regression 1969-1986

Variable	(I)	(II)	(III)
$Const$	0.794^a	0.904^a	0.995^a
	(0.174)	(0.180)	(0.180)
NI		-0.318^a	-0.306^b
		(0.144)	(0.143)
$\ln(Y_{t-1})$	-0.073^a	-0.082^a	-0.092^a
	(0.016)	(0.017)	(0.017)
$\ln(Y_{t-1}) \cdot NI$		0.026^b	0.025^b
		(0.013)	(0.012)
$\Delta \ln(L_{t-1})$	0.520^a	0.503^a	0.380^a
	(0.064)	(0.064)	(.088)
$\Delta \ln(INV_{t-1})$			0.039
			(0.043)
$\Delta \ln(Y_{t-1})$			0.115^c
			(.063)
$SADJ(I)$	.073	.082	.092
$SADJ(NI)$		.055	.067
$N \times T$	768	768	768
$\overline{R}^2$	.624	.626	.629

Notes: See Table 2a. SADJ is the speed of adjustment. All specifications include time and individual fixed effects.

$$\Delta \ln(y_t) = a_0 + a_1 \cdot NI_t + a_2 \ln(y_{t-1}) + a_3 \ln(y_{t-1}) \cdot NI_t + a_4 \ln(N_t) + \beta \cdot X_t + \upsilon_t$$

Table 3b: Per-Capita Convergence Regression 1969-1986

Variable	(I)	(II)	(III)
$Const$	0.948^a	1.333^a	1.739^a
	(0.285)	(0.310)	(0.326)
NI		-0.643^a	-0.711
		(0.171)	(0.182)
$\ln(y_{t-1})$	-0.100^a	-0.139^a	-0.183^a
	(0.031)	(0.033)	(0.035)
$\ln(y_{t-1}) \cdot NI_t$		0.069^a	0.076^a
		(0.019)	(0.020)
$\Delta \ln(N)$	0.879^a	0.890^a	0.945^a
	(0.189)	(0.188)	(0.210)
$\Delta \ln(INV_{t-1})$			0.015
			(0.039)
$\Delta \ln(y_{t-1})$			0.160^b
			(.052)
$SADJ(I)$	.100	.139	.183
$SADJ(NI)$	.100	.070	.106
$N \times T$	768	768	768
$\overline{R}^2$	.607	.614	.617
DW			

Notes: SADJ is the speed of adjustment. All specifications include time and individual fixed effects.

$$\Delta \ln(Y_t) = a_0 + a_1 \cdot NI + a_2 \ln(Y_{t-1}) + a_3 \ln(Y_{t-1}) \cdot NI + \beta \cdot X_t + v_t$$

Table 3c: Robustness Checks 1969-1986

Variable	(I)	(II)	(III)	(IV)	(V)
$Const$	0.845^a	1.198^a	1.466^a	1.436^a	0.997^a
	(0.186)	(0.206)	(0.305)	(0.291)	(0.192)
NI	-0.299^b	-0.358^b	-0.564^a	-0.370^a	-0.316^b
	(0.144)	(0.143)	(0.217)	(0.141)	(0.144)
$\ln(Y_{t-1})$	-0.082^a	-0.067^a	-0.086^a	-0.116^a	-0.089^a
	(0.017)	(0.018)	(0.030)	(0.024)	(0.017)
$\ln(Y_{t-1}) \cdot NI$	0.025^b	0.029^b	0.048^a	0.032^a	0.026^b
	(0.013)	(0.012)	(0.019)	(0.012)	(0.013)
$\Delta \ln(L_{t-1})$	0.503^a	0.447^a	0.496^a	0.464^a	0.468^a
	(0.064)	(0.066)	(.064)	(.088)	(.065)
Dem_{t-1}	0.001				
	(0.001)				
$\ln(H)$		-0.055^a			
		(0.018)			
$SouthRegion \cdot \ln(Y_{t-1})$			-0.033		
			(0.015)		
$WestRegion \cdot \ln(Y_{t-1})$			0.009		
			(0.024)		
$CAPBUD \cdot \ln(Y_{t-1})$				0.043^a	
				(.016)	
$HighTax \cdot \ln(Y_{t-1})$					0.025^b
					(0.013)
$SADJ(I)$	.082	.067	.086	.116	.089
$SADJ(NI)$	.057	.038	.038	.079	.062
$N \times T$	768	768	768	768	768
$\overline{R}^2$	.658	.664	.661	.663	.660

Notes: SADJ is the speed of adjustment. All specifications include time and individual fixed effects.