

Bureaucracy, Infrastructure, and Economic Growth: Evidence from U.S. Cities During the Progressive Era

By JAMES E. RAUCH*

Recent analyses of economic policy-making in less-developed countries (LDC's) have stressed that the individuals who make up the state apparatuses can to some extent act independently, rather than responding passively to voters or interest groups as is assumed in much of the political-economy literature. Such a state might be expected to exhibit the "predatory" behavior predicted by writers such as Deepak Lal (1988), as each state functionary seeks to implement regulations on private-sector economic activity that will maximize the bribes he can extract. Indeed, such purely rent-seeking states are observed in LDC's. A good example is Zaire, of which President Mobutu has stated "holding any slice of public power constitutes a veritable exchange instrument, convertible into illicit acquisition of money or other goods" (Crawford Young, 1978 p. 172). What is remarkable is that some LDC governments do *not* act as predators. In East Asia, for example, the Korean and Taiwanese states have worked hand in glove with the private sector to promote investment and enhance the capacity of private

firms to enter international markets (Alice Amsden, 1989; Robert Wade, 1990), earning these governments the moniker "developmental states."

In his comparative analysis of the role of the state in the development of several LDC's, Peter B. Evans (1992) argues that professionalization of the state bureaucracy is a necessary (though not sufficient) condition for a state to be "developmental." He suggests a set of measurable state characteristics that can be used in empirical analysis to quantify bureaucratic professionalization or "Weberianism." These include the percentage of bureaucratic positions that are filled by civil-service exam rather than political appointment, the percentage of those taking the civil-service exam who pass it, and the average length of tenure in a given government department (evidence of stable career-building as opposed to rent-seeking opportunism). The potential impact of Weberian bureaucracy on economic development is twofold. On the one hand, the negative effect the state can have on growth by taxing the returns to private investment could be lessened by minimizing the implicit taxation caused by rent-seeking. On the other hand, the positive role that the state can play in providing complementary inputs for the private sector could be enhanced, since the long gestation periods of infrastructural projects are well suited to bureaucrats pursuing career-building within the government departments overseeing the projects. Several empirical considerations (described in the next paragraph) led me to defer investigation of the former hypothesis to future work and focus on the latter hypothesis here.

During the Progressive Era in the United States (roughly the first two decades of the 20th century), a wave of municipal reform transformed the governments of many cities.

*Department of Economics, University of California, San Diego, La Jolla, CA 92093, and NBER. I thank Jaesun Noh and Norman Norin for outstanding research assistance, Paula Lee for data entry, and M. Craig Brown for supplying data on municipal government reform. Discussions with Nathaniel Beck, Amy Bridges, Steven Erie, Stephan Haggard, Valerie Ramey, and participants in the Russell Sage Working Group on Ideas, Institutions, and Economic Growth were very helpful. Earlier drafts of this paper were presented at the University of California, Davis, the National Bureau of Economic Research Summer Institute Workshop on Economic Growth, Columbia University, the North American Meetings of the Regional Science Association, and the UCLA Center for American Politics and Public Policy. Financial support was provided by NSF grant no. SES91-21217 and the Russell Sage Foundation. I am responsible for any errors.

Broadly speaking the reforms can be seen as attempts to move away from predatory to more Weberian state characteristics. In this paper I investigate the potential positive impact of these reforms on city growth through the mechanism of increased allocation of government budgetary resources to long-gestation-period investments such as road and water systems. I believe that these events in the history of U.S. *cities* provide a natural experiment that allows me to avoid two problems characteristic of cross-country empirical work on the political economy of growth and development.¹ A nearly universal problem in this literature is that the policy variable determined by the theory expounded in the paper is unobserved.² Frequently the theories suggest that a characteristic of the state or the society at large affects a rate of explicit or implicit taxation through a political decision-making process, and that this rate of taxation in turn affects the rate of long-run economic growth. Data on the rate of taxation in question, however, are never presented. By examining the share of municipal expenditure allocated to investment in infrastructure, for which data are available, I avoid this first problem. The second problem with this work is that the empirical analysis is either purely cross-sectional or does not use the time-series variation in the data to control for unobserved cross-sectional characteristics that could influence the dependent variable and be correlated with the state or social characteristics of interest.³ My natural experiment allows me to avoid this problem by

generating variation in my selected state characteristics over time. To my knowledge the present paper is unique in this literature by virtue of having both an observed policy variable *and* a fully utilized panel structure.

The plan for the remainder of this paper is as follows. Section I sketches a model of political decision-making, infrastructure investment, and economic growth in cities. The second section describes the construction of the data set that is used to test the model. Section III gives results, and Section IV concludes.

I. Bureaucracy, Infrastructure, and Growth in Cities

In this section I sketch the formal model developed in Rauch (1994) of the effects of a stylized reform on the allocation of city expenditure and on city growth. The extent to which actual reforms matched the stylized reform will be discussed at the beginning of the next section. The mechanism of growth is modeled very simply so that attention can be focused on the political decision-making process. Investment in new infrastructure is assumed to generate city growth by providing a complementary input that attracts investment of private capital in traded goods industries (manufacturing), creating jobs which in turn attract migrants from a surrounding agricultural hinterland. A national capital market and productivity in the agricultural hinterland fix the return to private capital and the wage rate, respectively. Employment, the private capital stock, and output (manufacturing value-added) then all grow at the same rate as the stock of infrastructure.

City politicians can obtain benefits from both the inputs to the municipal production process and its outputs. Examples of benefits from the former would be patronage jobs and kickbacks, while examples of benefits from the latter would be voter satisfaction with municipal services and enhanced prestige and power from city growth generated by new infrastructure. In the model below the decision concerning allocation of expenditure to production of different outputs is driven by the benefits these

¹Use of city, state, or regional data to make inferences about the mechanisms of economic growth has become increasingly popular, as exemplified by work such as Robert J. Barro and Xavier Sala-i-Martin (1992), Edward L. Glaeser et al. (1992), and Rauch (1993a,b). One reason for this popularity is that explanatory power is enhanced, because localities within a single country differ from each other along many fewer dimensions than do countries themselves.

²Exceptions have begun to appear very recently, including Alberto Alesina and Roberto Perotti (1993) and Alex Cukierman et al. (1993).

³A notable exception is J. Bradford De Long and Andrei Shleifer (1993).

outputs yield. To disentangle these benefits from the benefits yielded by inputs I need to assume that benefits from inputs are unaffected by the *composition* of output, so that a dollar of expenditure on provision of current services creates as many patronage jobs (for example) as a dollar of expenditure on new infrastructure. I abstract from the current *level* of expenditure by making assumptions that effectively remove it from political control: fees charged for the use of services generated by the current stock of infrastructure are the only source of current government revenue, and the current stock of infrastructure is inherited from the previous period.⁴

City government must decide how to allocate these fees between expenditures that yield immediate benefits (e.g., police and fire protection, filling potholes) and investment (new infrastructure). Its decision is modeled as the outcome of a “principal-agent” relationship: the principal (e.g., the city council) employs the agent (e.g., the city planning bureaucracy) to identify needs for current and capital expenditure and then allocates funds accordingly, the disbursement of which is overseen by the agent. The principal faces an uncertain prospect of reelection or election to higher office. Before municipal reform, the agent is assumed to be a political appointee whose probability of retaining office is identical to that of the

principal, while after reform the agent is assumed to have lifetime tenure and can be terminated only for just cause (e.g., as determined by a civil-service commission).⁵

Investments in infrastructure do not pay off until the next election cycle. This leads to a difference in the importance placed on capital versus current expenditure between the principal and the post-reform agent. Why do the agent’s preferences matter at all? The answer is that he can use his powers of information collection and expenditure oversight to manipulate the principal. For example, in preparing an itemized budget for submission to the principal he can spend more effort identifying attractive infrastructure projects relative to identifying pressing needs for current expenditure than the principal would in his place, or he can put more effort into overseeing the execution of investment relative to current expenditure than the principal would in his place. It is assumed, however, that the principal can imperfectly monitor the agent’s actions so that there are limits to how far the agent can pursue his own preferences at the expense of the principal’s. The resulting division of budgetary resources between current and capital expenditure will therefore lie somewhere in between the principal’s and the agent’s ideals. In Rauch (1994), utility functions and a monitoring “technology” are specified, and these generate steady-state outcomes for the share of expenditure allocated to infrastructure investment within an overlapping-generations framework.

The stylized reform therefore increases the share of expenditure allocated to infrastructure investment and consequently the steady-state growth rate for the city. Another interesting result of reform in this

⁴Historians and political scientists writing about the fiscal impact of municipal reform, on the other hand, have focused on the level of expenditure (the “standard yardstick” according to M. Craig Brown and Charles N. Halaby [1984 p. 70]) rather than its allocation. The problem with this approach in my view is that in predicting the effect of reform on the level of municipal expenditure there is no reasonable assumption that allows one to separate the benefits from inputs and outputs. Opportunities for corruption, broadly defined, are linked to the level of expenditure, but so is the amount of public services that a city can provide. There is no reason to think that this amount should be above the “optimal” level prior to reform, especially in the pre-World War II era. In this section I take an agnostic view concerning both the effect of reform on corruption and its effect on the level of public services relative to its optimum.

⁵Reform thus provides municipal government with the “bureaucratic insulation” from the political process often cited by analysts as crucial to LDC state effectiveness in managing economic adjustment (see e.g., Stephan Haggard and Robert R. Kaufman, 1992 p. 20). The model of this section can be seen as showing how this insulation can make the state more effective in promoting long-term growth as well.

model is a reduction in the probability that the principal will remain in power due to lower voter satisfaction with the delivery of current municipal services. This suggests that reform reduces the power of political machines, which is one of the objectives ascribed to municipal reformers by historians and political scientists. However, the cause of this result is lower provision of current services, presumably making current city residents worse off. Why, then, would they have voted to enact reform in the first place? One possible answer is the thesis of Samuel P. Hays (1964) and James Weinstein (1968), which can be summarized as follows: (i) during the Progressive Era, large-scale corporate organization was coming into its own in the U.S. private sector; (ii) local businessmen came to see the city as a large corporation and wanted to make it function more like one; and (iii) they led the drive for reform, using popular discontent with political machines to win the voting majorities needed to enact their agenda. If this is true, enactment of reform was associated with a change in the "hegemonic group" within the city. Suppose that this group wanted to use the reformed municipal government to promote growth through investment in infrastructure. In this case the cause of any observed change in the share of city expenditure allocated to this investment would be reform *per se* rather than the content of the reform as I have argued.⁶ Fortunately, it will prove possible to deal with this problem effectively in the empirical analysis, to which I now turn.

⁶Another possible argument for why reform *per se* could have increased the infrastructure share of expenditure is that reform improved the city's access to financing. A simplifying assumption made in the above model is the lack of access to capital markets by the city. In fact, debt ceilings expressed as percentages of assessed valuation were imposed on cities by the state governments that guaranteed their general obligation bonds. It is possible that reform could have been used successfully by cities to make a case for raising their debt ceilings. On the other hand, one of the major stated aims of many reformers was to reduce municipal indebtedness.

II. The Data Set

Three reforms that radically changed the structure of municipal government were undertaken during the Progressive Era. Civil service, also known as the merit system, was introduced to the United States in the 1880's but did not really take hold at the municipal government level until the 1890's and the Progressive Era. It required that applicants for city employment pass exams in order to be considered and that they could be fired only for just cause. It is the most essential element of "Weberian bureaucracy." The two other structural reforms were introduced during the Progressive Era. The commission form of government was introduced in Galveston, Texas, in 1901. Under this form of government the mayor, city council, and any other elected officials were replaced by a group of "commissioners," typically five in number, each of whom had both executive and legislative powers for a different department of municipal government. The city-manager form of government was introduced in Staunton, Virginia, in 1908. Under this form of government all executive powers were concentrated in a single appointed official called the city manager who was answerable to the city council, of which the mayor became merely the most important member. The city manager did not have legal protection against being discharged by the city council (though sometimes he was entitled to a public hearing on written charges), yet at the same time the proponents of the city-manager system clearly intended that he have lifetime tenure.

The stylized reform in the model of the previous section was clearly based on the institution of civil service. However, it is not clear to what extent the part of the bureaucracy that is responsible for identifying and supervising projects was covered, although the Civil Service Assembly pamphlet cited below does indicate when coverage is limited to police or fire department employees. The city-manager reform created an individual position that perfectly fits that of the post-reform agent except for the absence of

legal protection for lifetime tenure. In their survey of 48 U.S. cities, Harold A. Stone et al. (1940 pp. 63–65) found that, “Some cities had a high rate of turnover in managers,” one of the causes of which was “frequent political changes in the councils which resulted in the dismissal of the managers.” On the other hand, in 23 cities,

the city manager’s job was one of permanent tenure. Some managers had resigned to accept better positions in private business or as managers in other cities, and some had died in office, but no city manager was discharged or was forced to resign. ... Twenty-two city managers in the forty-eight cities studied served a single city for ten or more years.

Of course this long tenure could simply reflect the complete harmonization of preferences between the city council and the city manager that prevails for the principal and the pre-reform agent in the model of the previous section. Thus while the model predicts that civil service will have a positive effect on the share of infrastructure investment in total municipal expenditure, the prediction for city manager is unclear. In contrast to civil service and city manager, the commission reform was wholly unrelated to the stylized reform in the model above. Commissioners were elected officials, so this reform is not predicted by my model to change the allocation of resources between capital and current expenditure. The commission form of government therefore serves as a kind of control: its adoption should not have the same effects as the other two reforms. If it is in fact found to have the same effects, one can argue that city investment and growth are responding to reform per se rather than to the content of the reform.

Data on municipal government reform was gathered from several sources. A pamphlet entitled *Civil Service Agencies in the United States: A 1937 Census*, published by the Civil Service Assembly of the United States and Canada, gives the dates of adoption of civil service in U.S. cities. Unpublished work by M. Craig Brown gives the

dates of adoption (and discontinuation, if applicable) of the commission and city-manager forms of government, which I checked against the original sources to the extent possible.⁷ A dummy variable was established for each reform that takes the value of 1 during the years when the reform is present for a city and 0 during the years when it is absent. Civil-service coverage that is limited to police or fire department employees is assigned a value of 0.

Partly in response to the municipal reform movement, the U.S. Bureau of the Census began collecting city budget data in 1902 and publishing it in a standard format for the express purpose of allowing cross-city comparisons. This was done in *Statistics of Cities* and *Financial Statistics of Cities* for all cities with populations of 30,000 or more through 1931, after which only cities of 100,000 or more were covered. Included among the dozens of series published each year are total expenditure, total capital outlays, and the infrastructural components of capital outlays: roads, sewers, and water supply, where all waterway and port improvements are included in roads.⁸ Thus

⁷The original sources are given in the appendix to Brown and Halaby (1984) and include contacts with city clerks.

⁸Here I define as infrastructure the same components of capital outlays selected by Randall W. Eberts et al. (1986). Douglas Holtz-Eakin (1993) includes other public utilities with water supply, but use of this slightly broader definition turns out to have no qualitative impact on the results presented in Section III. In both papers the primary concern was to construct estimates of the public capital stock to be used in estimating aggregate production functions. It could be argued that the stock of *human* capital should be included in our definition of the stock of infrastructure, so that *current* expenditure on education that adds to the skills of the future labor force should be added to capital expenditures on roads, sewers, and water supply to get a comprehensive measure of infrastructure investment. There are two problems with this approach. First, students may not join the labor force of the city in which they were educated, so expenditures on their education may not all augment next period’s municipal infrastructure stock. Second and more importantly, numerous studies have shown that educational expenditure per student is treated as an amenity by current city residents (voters), so the effect of reform on the share of budgetary resources allocated to current educational expenditures is ambiguous.

TABLE 1—DEFINITIONS OF VARIABLES IN TABLES 2 AND 3

RSW	Ratio of road + sewer + water investment expenditure to total city expenditure
RS	Ratio of road + sewer investment expenditure to total city expenditure
WATER	Ratio of water investment expenditure to total city expenditure
NONINFRA	Ratio of noninfrastructure investment expenditure to total city expenditure = all investment expenditure / total city expenditure - RSW
CIVSER	Dummy variable for presence of civil-service system not limited to police or fire department employees
MANAG	Dummy variable for presence of city-manager form of government
COMMISS	Dummy variable for presence of commission form of government
MANDROP	MANAG \times dummy variable for city that dropped city manager form of government
COMDROP	COMMISS \times dummy variable for city that dropped commission form of government

one can use these data to compute the share of city expenditures devoted to overall investment and to infrastructure investment more specifically.

From the Census Bureau's *Census of Population* and *Census of Manufactures* manufacturing employment and value-added data are available from 1899 to 1929 at five-year intervals for cities with populations of 10,000 or more, after which the data are only available for cities of population 100,000 or more. Since manufacturing is a "base" industry with a "multiplier" effect its growth should be a good proxy for overall city growth. Use of population growth itself is problematic because it contains a large exogenous demographic component and is estimated during intercensus years without the benefit of additional surveys. These estimates will be most inaccurate precisely when the net migration is large, and indeed complete population data are not even available for some rapidly growing cities in the sample described in the next paragraph. For this reason the share of infrastructure investment in total expenditure rather than infrastructure investment per capita is used in the analysis below.

In order to maximize city coverage during the Progressive Era when reform was most common I chose to examine the period 1902–1931 only. During this period city financial statistics were not collected for 1914 or 1920, were incompletely collected in 1921,

and were collected with insufficient detail to distinguish all three infrastructure investment categories (roads, sewers, and water supply) from other investment expenditures in 1902, 1903, 1913, and 1922. Thus a maximum time series of 23 years is available. *Statistics of Cities* supplies data for 150 cities with populations greater than 30,000 in 1904. Of these, 144 had complete financial and reform data for all 23 years.⁹

I computed two different ratios of infrastructure investment to total expenditure. The first, RSW, uses the standard definition of infrastructure investment (roads + sewers + water) in the numerator and covers 65 percent of total investment expenditure on average. (All definitions are repeated in Table 1 for easy reference.) However, 16 of the 144 cities in the sample never recorded positive expenditure for water investment, indicating that they did not own their water utilities, and 29 of the 144 cities did not record positive expenditure for water investment for more than half of the years in the sample (12 or more). I therefore computed RS using roads + sewers only in the

⁹Two cities were dropped due to contradictory data on the presence of commission government, two cities fell below 30,000 population at some point before 1931, one city was consolidated with another, and Washington, D.C. was dropped because its municipal government is controlled by the U.S. Congress.

TABLE 2—SUMMARY STATISTICS FOR INFRASTRUCTURE INVESTMENT AND MUNICIPAL REFORM

A. Sample size: 144 cities			
23 years			
3,312 observations			
B.			
Number of cities in sample that:	CIVSER	MANAG	COMMISS
Ever adopted	76	20	60
Adopted during sample period	40	19	50 ^a
Dropped during sample period	1	3	14
C.			
Variable	Mean	Standard deviation	
RSW	0.176	0.099	
RS	0.138	0.083	

^a58 when the year 1904 is dropped from the sample.

numerator, which covers 52 percent of total investment expenditure on average. (None of the 144 cities recorded zero expenditure for either road or sewer investment for 12 or more years.) The sample means and standard deviations for RSW and RS are reported in Table 2. Table 2 also indicates that there is within-sample variation over time in civil service for 40 cities, in city manager for 19 cities, and in commission for 59 cities. The rate of discontinuation of commission government is higher than for the city-manager form of government, while civil service is known to have been dropped in only one case (the aborted reform period 1913–1916 in Denver).

Manufacturing employment and manufacturing value-added data are available from 1899 to 1929 at five-year intervals for all but three of the 144 cities. When computing growth rates of manufacturing employment and value-added, however, I begin in 1904 since this is the first year for which I have infrastructure investment data.

III. Results

There exists an extensive literature on the relationship between infrastructure investment and economic growth using post-World War II data. It covers U.S. data at the aggregate level, U.S. data disaggregated

both regionally and by industry, and international data at the aggregate level.¹⁰ Contributing to this literature is not the main purpose of this paper. Nevertheless, since I am working with pre-World War II data, I cannot take the existence of any relationships established in this literature for granted. It could be that most city expenditure on infrastructure investment during this period went to create “white elephants” that were useless for private-sector production. It could also be that the census officials who consolidated and standardized the municipal accounts did a poor job, or that the accounts with which they worked were badly misclassified to begin with.

Rauch (1994) investigates the effects of RSW and RS on manufacturing employment and value-added growth in both cross-section and panel regressions. The cross-section estimations regress the 25-year growth rate for the period 1904–1929 on the time average of RSW or RS for the same period and then successively add the log of 1899 manufacturing employment or value-added, dummies for the U.S. Census

¹⁰ For a sophisticated time-series analysis of aggregate U.S. data and a comprehensive survey of this literature, see Rafael Flores de Frutos and Alfredo M. Pereira (1994).

regions, and time averages of the municipal-reform variables. The panel estimations regress the five-year growth rates on the five-year time averages of RSW or RS, the log of the initial level of employment or value-added, and period dummies (instrumenting for RSW or RS and the initial levels using their lags and five-year averages of the municipal-reform variables), and alternately include and exclude city random effects.¹¹ All of the estimated coefficients on RSW or RS from the various cross-section regressions are significant at the 1-percent level and lie in the range of 0.21–0.28. For manufacturing employment growth the estimated coefficients on RSW or RS from the panel regressions lie in the range 0.26–0.31 and are significant at the 1-percent level without city random effects and at the 5-percent level for RSW and the 10-percent level for RS with city random effects. For manufacturing value-added growth, none of the estimated coefficients on RSW or RS from the panel regressions is statistically significant, but this may occur because the time series on value-added are too noisy to be informative.¹²

I now turn to the central concern of this paper, the investigation of the effects of structural municipal reform on infrastructure investment. To begin, I use the data described in Table 2 to estimate a standard fixed-effects model (one including both city and time dummies) with RSW and RS as the respective dependent variables and CIVSER, MANAG, and COMMISS as the explanatory variables. As I mentioned in the introduction, city fixed effects are crucial in order to control for unobserved cross-

sectional characteristics that could influence the dependent variable and be correlated with the explanatory variables. The use of time dummies is equally important in the present instance because most reforms were not rescinded, so that investment rates later in the period are much more under the influence of reform than in the early part of the period. In the absence of time-dummies estimates will be biased if there are systematic differences between the earlier and later parts of the period, for example, due to macroeconomic conditions or even changes in census accounting procedures.

The first and second columns in Table 3 report the results of these fixed-effect regressions. As predicted, each of the infrastructure-investment ratios tends to be higher on average with civil service than without, the effect being stronger for the share of expenditure allocated to road and sewer investment. On the other hand, each infrastructure-investment ratio tends to be *lower* on average with the city manager and commission forms of government than without, the effect being much stronger for COMMISS. It is straightforward to infer from these two regressions that, if one uses the share of expenditure allocated to water-supply investment as the dependent variable, the coefficient on civil service will be negative. This is confirmed by the third column of Table 3. As noted above, 20 percent of the cities in the sample apparently did not own their water utilities during all or most of the sample period, so one can argue that the result for roads and sewers is a better indicator than the result for water of the impact of civil service on investment in infrastructure. A source of further evidence pertaining to this argument is the effect of adoption of civil service on noninfrastructure investment. The model of Section I makes no prediction regarding this effect, but if it were negative it would suggest that the positive effect of civil service on road and sewer investment is an aberration. In fact, the fourth column of Table 3 shows that the share of expenditure allocated to noninfrastructure investment tends to be higher on average with civil service than without.

¹¹ Unfortunately, estimation of this instrumental-variables model with city fixed effects creates a problem in the short panel (number of time periods less number of lags = 4) because the fixed effects induce a time-averaging of the error term, invalidating the use of lagged endogenous variables as instruments.

¹² If I cut the number of observations in half and use ten-year growth rates instead of five-year growth rates, without city random effects I obtain coefficients on RSW and RS for value-added growth that are positive and significant at the 1-percent level, though they become insignificant when city random effects are included.

TABLE 3—PANEL REGRESSIONS FOR INVESTMENT SHARES OF MUNICIPAL EXPENDITURE

Dependent variable	RSW	RS	WATER	NONINFRA	RSW	RS	RSW	RS
CIVSER	0.0079 (0.0069)	0.0147 (0.0057)	-0.0068 (0.0044)	0.0068 (0.0049)	0.0075 (0.0065)	0.0120 (0.0053)	0.0076 (0.0065)	0.0121 (0.0053)
MANAG	-0.0060 (0.0099)	-0.0043 (0.0083)	-0.0017 (0.0063)	-0.0131 (0.0071)	0.0001 (0.0091)	0.0017 (0.0075)	-0.0015 (0.0097)	-0.0012 (0.0080)
COMMISS	-0.0177 (0.0059)	-0.0161 (0.0049)	-0.0016 (0.0038)	0.0046 (0.0042)	-0.0125 (0.0055)	-0.0120 (0.0045)	-0.0162 (0.0062)	-0.0143 (0.0051)
RSW ₋₁					0.4265 (0.0163)		0.4255 (0.0163)	
RS ₋₁						0.4528 (0.0160)		0.4517 (0.0160)
MANDROP							0.0187 (0.0248)	0.0260 (0.0203)
COMDROP							0.0154 (0.0118)	0.0092 (0.0096)
R ² :	0.3375	0.3495	0.1919	0.2351	0.4610	0.4877	0.4614	0.4881
Root mean-square error:	0.0827	0.0690	0.0523	0.0586	0.0744	0.0609	0.0744	0.0609
Number of observations:	3,312	3,312	3,312	3,312	3,168	3,168	3,168	3,168

Notes: City and time dummies are included. Variable definitions are as given in Table 1. Standard errors are shown in parentheses.

In the discussion in the Introduction to this paper I argued that investment in infrastructure is distinguished by its long gestation period. This gestation period has at least two components, a planning period and a construction period, either of which could extend over more than one year. This should create persistence in infrastructure investment expenditure due to difficulty in terminating projects that are “in the pipeline,” on the one hand, and slowness in bringing new projects “up to speed,” on the other hand. An econometrically natural way to handle this inertia is to use the partial-adjustment model. For the reader’s convenience I will repeat this standard model here. The desired level of the dependent variable y (e.g., RSW or RS) for city j in year t is determined by

$$(1) \quad y_{jt}^* = \alpha_j + \gamma_t + \mathbf{x}_{jt}\boldsymbol{\beta}$$

where α_j is a city fixed effect, γ_t is a year fixed effect, and \mathbf{x}_{jt} is a vector of explanatory variables (e.g., municipal government reforms). The adjustment of the actual level of y is a proportion of the difference be-

tween this year’s desired level and last year’s actual level:

$$(2) \quad y_{jt} - y_{jt-1} = \lambda(y_{jt}^* - y_{jt-1}) + \varepsilon_{jt}$$

$$0 < \lambda < 1$$

where ε_{jt} is a Gaussian white-noise error term. Substituting equation (1) into equation (2) and rearranging yields

$$(3) \quad y_{jt} = (1 - \lambda)y_{jt-1} + \lambda\alpha_j + \lambda\gamma_t + \mathbf{x}_{jt}\lambda\boldsymbol{\beta} + \varepsilon_{jt}.$$

Note that when estimating equation (3) one can recover estimates of the parameters in equation (1) by dividing the estimated coefficients on the city and year dummies and the explanatory variables by 1 minus the estimated coefficient on the lagged dependent variable.

The estimates of equation (3) using RSW and RS as dependent variables are reported in the fifth and sixth columns of Table 3, respectively. [The estimates of equation (3) using WATER and NONINFRA as depen-

dent variables, not reported here, are similar to those for the third and fourth columns of Table 3 but with all coefficients smaller and no changes in sign.] As shown by Stephen Nickell (1981), the estimated coefficients in a fixed-effects model with a lagged dependent variable are subject to an asymptotic bias of order $1/T$, where T is the number of time periods in the sample less the number of lags. Since in the present case $T = 22$, this bias should be small, and I will ignore it. Taking the coefficients and standard errors at face value, then, adoption of civil service has a positive and statistically significant (at the 5-percent level) effect on the share of expenditure allocated to road and sewer investment. The point estimate of the effect of CIVSER on RS in equation (1) is $0.0120/(1 - 0.4528) = 0.022$. To gauge the economic significance of this effect it can be combined with the midpoint of the range of estimates of the coefficient on RS (0.21–0.26) in the manufacturing employment growth regressions cited above. One can then infer that the adoption of civil service results in an increase in the manufacturing employment growth rate through the channel of increased infrastructure investment of roughly 0.005, or one-quarter of its mean value of 2 percent.

Turning to the effects of the other structural municipal reforms, recall that the prediction in Section II for the effect of the city-manager form of government on the allocation of expenditure to infrastructure investment was either positive or zero. Arguably, the finding of zero effect in the fifth and sixth columns of Table 3 reflects the success of this reform from the point of view of its inventor, who wanted municipal affairs to be administered by a professional, yet for his administration to embody the will of the city council.¹³ The effect of the commission form of government on the allocation of expenditure to infrastructure invest-

ment is not as predicted, being negative rather than zero. Nevertheless, even this finding helps me to state with confidence that the content of reform rather than reform per se was the important determinant of its effect on expenditure allocation.

Returning to the thesis mentioned at the end of Section I, perhaps in the cases where the city-manager and commission reforms were rescinded the cause was the failure of the municipal government to implement the increase in the share of expenditure allocated to infrastructure investment that the backers of reform expected. Under this hypothesis the zero and negative effects on infrastructure investment of the city-manager and commission reforms, respectively, might be attributable to the presence of “bad” city-manager and commission governments in the sample. To test this hypothesis I created a dummy variable indicating whether a city rescinded a city-manager (commission) reform, interacted it with MANAG (COMMISS), and then included this interaction term in the panel regressions. A negative coefficient on MANDROP (COMDROP) indicates that “bad” city manager (commission) governments had a more negative or less positive effect than the rest of these governments on the share of municipal expenditure allocated to infrastructure investment. In fact, the coefficients on both MANDROP and COMDROP in the last two columns of Table 3 are positive (though statistically insignificant). If anything, these results suggest that voters might have rescinded the reforms in these cities because the governments allocated *too much* expenditure to infrastructure investment, thereby displaying the preference for provision of current services assumed by the model of Section I.

IV. Conclusions

The institution of civil service in U.S. cities during the Progressive Era was found to have a positive effect on the share of municipal expenditure allocated to investment in infrastructure. I have interpreted this central finding as showing that professionalization of the state bureaucracy

¹³Stone et al. (1940 p. 14) describe the intent of the inventor of the city-manager plan (Richard S. Childs) as follows: “By authorizing the council to hire and fire the city manager at its discretion, however, the city manager plan effectively gave the council control over administrative, as well as over legislative, policy.”

lengthens the period that public decision-makers are willing to wait to realize the benefits of expenditures, leading to allocation of a greater proportion of government resources to long-gestation-period projects such as infrastructure. If my interpretation of my central finding is correct, it should be corroborated by case studies of the role of professional bureaucracies in economic policy-making. I know of two such studies for U.S. urban areas during the Progressive Era, one by Jameson W. Doig (1988) for the Port of New York Authority and the other by Steven P. Erie (1992) for Los Angeles. These studies have focused on quasi-independent agencies headed by boards of commissioners who are *appointed to fixed, overlapping* terms, giving the board as a whole an "insulation" and permanence approximating that of the post-reform agent of Section I.

Doig (1988 p. 33) states explicitly that the Port of New York Authority had "some advantages in vision—some ability to see further than the next election." Although the Authority was created in 1921 to rationalize the operation of the Port of New York, its vision led it "to turn to motor-vehicle bridges in the late 1920s and construct the George Washington span and three smaller bridges—in less time than expected, at lower cost, and without the interstate conflicts that marred and delayed important projects by other agencies" (p. 86).

In Los Angeles, after civil service was adopted in 1903 and a slate of reform candidates was elected in 1906 (although neither a city manager nor a commission charter was ever passed), the city government created a harbor commission (without a harbor) and a water and power commission. According to Erie (1992 p. 520), these "bureaucratic machines" were the driving forces behind the realization of "massive public projects [that] supplied the three essential pillars of regional development—the man-made harbor at Wilmington-San Pedro (the largest in the world), the Owens River and Colorado River aqueducts (among the most complex engineering feats of their age), and the Department of Water and Power's hydroelectric plants (the largest municipal

power system in the nation) generating the cheap energy needed to attract Eastern industry after World War I." It remains to be seen whether case studies of other cities or countries will show professional bureaucrats to be key proponents of long-term productive investment.

An underlying point made both by these case studies and by my statistical analysis is that institutions, such as appointed commissions and civil service, can matter for economic development. In this connection it is worth noting that Brown and Halaby (1984 p. 77), in their study of machine politics and urban reform movements in 30 large U.S. cities during the period 1890–1940, found "that reformers consolidated city power so seldom and so briefly" that it was necessary to turn "to the structural by-products of reform" in order to measure the impact of reformers against that of "bosses." This suggests as a subject for future research an interesting model of the reform process, where a reform party can have a lasting impact even if it holds power only for a short time, provided that it implements institutional changes that are "sticky." As one of the major historical episodes of successful administrative reform in any country, the Progressive Era will continue to be a fertile source for investigations of the economic impact of political institutions and the determinants of institutional change.

REFERENCES

- Alesina, Alberto and Perotti, Roberto. "Income Distribution, Political Instability, and Investment." National Bureau of Economic Research (Cambridge, MA) Working Paper No. 4486, October 1993.
- Amsden, Alice. *Asia's next giant: South Korea and late industrialization*. New York: Oxford University Press, 1989.
- Barro, Robert J. and Sala-i-Martin, Xavier. "Convergence." *Journal of Political Economy*, April 1992, 100(2), pp. 223–51.
- Brown, M. Craig and Halaby, Charles N. "Bosses, Reform, and the Socioeconomic Bases of Urban Expenditure, 1890–1940," in Terrence J. McDonald and Sally K. Ward, eds., *The politics of urban fiscal policy*. Beverly Hills, CA: Sage, 1984, pp.

- 69-99.
Civil service agencies in the United States: A 1937 census. Chicago: Civil Service Assembly of the United States and Canada, 1938.
- Cukierman, Alex; Kalaitzidakis, Pantelis; Summers, Lawrence H. and Webb, Steven B.** "Central Bank Independence, Growth, Investment, and Real Rates." *Carnegie-Rochester Conference Series on Public Policy*, December 1993, 39, pp. 95-140.
- De Long, J. Bradford and Shleifer, Andrei.** "Princes and Merchants: European City Growth Before the Industrial Revolution." National Bureau of Economic Research (Cambridge, MA) Working Paper No. 4274, February 1993.
- Doig, Jameson W.** "Entrepreneurship in Government: Historical Roots in the Progressive Era." Mimeo, Princeton University, September 1988.
- Eberts, Randall W.; Dalenberg, Douglas and Park, Chul Soo.** "Public Infrastructure Data Development." Mimeo, Federal Reserve Bank of Cleveland, May 1986.
- Eric, Steven P.** "How the Urban West Was Won: The Local State and Economic Growth in Los Angeles, 1880-1932." *Urban Affairs Quarterly*, June 1992, 27(4), pp. 519-54.
- Evans, Peter B.** "The State as Problem and Solution: Predation, Embedded Autonomy, and Structural Change," in Stephan Haggard and Robert R. Kaufman, eds., *The politics of economic adjustment*. Princeton, NJ: Princeton University Press, 1992, pp. 139-81.
- Flores de Frutos, Rafael and Pereira, Alfredo M.** "Public Capital and Aggregate Growth in the United States: Is Public Capital Productive?" Department of Economics Discussion Paper No. 93-31, University of California, San Diego, March 1994.
- Glaeser, Edward L.; Kallal, Hedi; Scheinkman, José A. and Shleifer, Andrei.** "Growth in Cities." *Journal of Political Economy*, December 1992, 100(6), pp. 1126-52.
- Haggard, Stephan and Kaufman, Robert R.** "Institutions and Economic Adjustment," in Stephan Haggard and Robert R. Kaufman, eds., *The politics of economic adjustment*. Princeton, NJ: Princeton University Press, 1992, pp. 3-37.
- Hays, Samuel P.** "The Politics of Municipal Reform in Municipal Government in the Progressive Era." *Pacific Northwest Quarterly*, October 1964, 55(4), pp. 157-69.
- Holtz-Eakin, Douglas.** "State-Specific Estimates of State and Local Government Capital." *Regional Science and Urban Economics*, April 1993, 23(2), pp. 185-209.
- Lal, Deepak.** *The Hindu equilibrium, vol. I: Cultural stability and economic stagnation, India c 1500 BC - AD 1980*. Oxford: Clarendon, 1988.
- Nickell, Stephen.** "Biases in Dynamic Models with Fixed Effects." *Econometrica*, November 1981, 49(6), pp. 1417-26.
- Rauch, James E.** "Does History Matter Only When It Matters Little? The Case of City-Industry Location." *Quarterly Journal of Economics*, August 1993a, 108(3), pp. 843-67.
- _____. "Productivity Gains from Geographic Concentration of Human Capital: Evidence from the Cities." *Journal of Urban Economics*, November 1993b, 34(3), pp. 380-400.
- _____. "Bureaucracy, Infrastructure, and Economic Growth: Theory and Evidence from U.S. Cities During the Progressive Era." Department of Economics Discussion Paper No. 94-06, University of California, San Diego, May 1994.
- Stone, Harold A.; Price, Don K. and Stone, Kathryn H.** *City manager government in the United States: A review after twenty-five years*. Chicago: Public Administration Service, 1940.
- U.S. Bureau of the Census.** *Statistics of cities*. Washington, DC: U.S. Government Printing Office, various years.
- _____. *Financial statistics of cities*. Washington, DC: U.S. Government Printing Office, various years.
- Wade, Robert.** *Governing the market: Economic theory and the role of government in East Asian industrialization*. Princeton, NJ: Princeton University Press, 1990.
- Weinstein, James.** *The corporate ideal in the liberal state, 1900-1918*. Boston, MA: Beacon, 1968.
- Young, Crawford.** "Zaire: The Unending Crisis." *Foreign Affairs*, Fall 1978, 57(1), pp. 169-85.