# The Sources of Public Ownership: Historical Evidence From the Gas Industry

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I develop and test three theories of public ownership: a small markets hypothesis, a commitment hypothesis, and a patronage hypothesis. The empirical analysis employs a cross section of 1274 public and private gas companies operating in 1911. With these data, I find the following patterns: gas companies located in small towns were more likely to have been municipally owned than those in large towns; gas companies regulated by city councils were more likely to have been municipally owned than companies regulated that were unregulated; and gas companies regulated by state commissions were less likely to have been municipally owned than companies that were unregulated. Placed in their historical context, these results support the small markets and property rights interpretations of public ownership.

## 1. Introduction

Economists have used the new institutional economics to explain vertical integration, company-owned housing, short-term contracts in agriculture, worker-managed firms, and regulation through administrative agencies. This said, there remain many other organizations and institutions that have received little attention from new institutional economists.[1] One of these arrangements is public ownership. That economists sympathetic to the new institutionalism have given public ownership only limited attention is surprising on two levels. First, even in this era of privatization, public ownership remains a common form of economic organization. This is especially true of public utilities like water and sewer.[2] Second, publicly owned and operated firms exhibit characteristics that make them amenable to the new institutional approach. In particular, public ownership is common in industries where non-redeployable capital is

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1. See Shelanski and Klein (1995) for a survey of empirical research.
2. Schmitz (1996) looks at the frequency of public ownership across countries.

widespread. As I explain below, non-redeployable capital creates incentives for politicians to behave opportunistically. This opportunism can manifest itself in public ownership.

Three studies explore the sources of public ownership. Using data from the late nineteenth and early twentieth century, Schap (1986) finds that municipally owned electric companies were concentrated in small towns where markets were not large enough to allow private firms to operate profitably. Using data from the twentieth century United States, Pashigian (1976) finds that stringent, proconsumer regulations drove private transit systems out of business. Local governments then took them over, subsidizing them with tax dollars. Looking at contemporary Argentina, Chile, Jamaica, the Philippines, and the U.K., Levy and Spiller (1994) find that insecure property rights can lead to state-owned telecommunications systems. In countries that cannot commit to stable and reasonable policies, private telephone companies refuse to invest. By default, the state must construct and operate the telephone system itself.

This article reconsiders the sources of public ownership. Focusing on the history of the gas industry during the early twentieth century, it sets up a natural experiment. Historically, the number of municipally owned gas companies varied across space. For example, in 1910, 35 of Iowa's 117 gas companies were municipally owned, while only three of Illinois' 78 gas companies were municipally owned.[3] Market size and regulatory regimes also varied across space. In some cities and towns, gas companies faced onerous regulatory policies; in other places, they faced lax polices. Similarly, some gas companies had large markets; others had small markets. As market size and regulatory institutions varied, the number of municipally owned gas plants also would have varied. For example, if regulation mattered, municipally owned gas companies would have been most common in those regions that adopted harsh policies.

Besides exploring the effects of regulation and market size, this article also considers a patronage hypothesis. The patronage hypothesis suggests that politicians liked public ownership because it enabled them to reward their supporters with jobs. I test the patronage, and the other hypotheses, using data from over 1200 localities in 1911.

North (1981 and 1990) and North and Thomas (1973) argue that secure property rights are the cornerstones of economic growth and development; without secure property rights, private capital flees. Levy and Spiller (1994) take the argument to its next logical step; when private capital flees, the state is forced to undertake the investment itself. Levy and Spiller also highlight the foundations of secure property rights. In particular, they show that many institutions limit the behavior regulatory agencies. The more institutional limits there are, the less discretion the regulators have. Reducing discretion stabilizes regulatory policies and makes it easier for the state to commit to secure property rights. By exploiting the international variation in regulatory institutions, Levy and Spiller identify how different institutions (the foundations of secure property

3. For data on the number of municipally owned gas plants, see United States (1910).

rights) affect investment and ownership patterns in telecommunications. However, because their analysis is very detailed, they consider only a few countries and do not formally test their hypotheses. In spirit, this article is very similar to Levy and Spiller's. The only difference is that this article looks at intercity rather than international variation. Although the variation across countries is probably greater than the variation across cities, intercity comparisons have one great virtue: there are enough of them to make formal statistical tests possible.

By testing for a relationship between regulatory structures and public ownership, this article is also testing for a relationship between secure property rights and private capital formation. Although economists widely recognize and accept the link between credible commitment and private investment, there are few systematic empirical tests of the relationship.

## 2. A Regulatory History of the Gas Industry

To understand the empirical analysis, it is first necessary to understand the regulatory history of the gas industry. This section describes that history. It identifies the following trend: throughout the nineteenth century, most cities and towns had little power to regulate gas rates; by the turn of the twentieth century, many local governments had acquired the power to regulate rates; by 1920, the power to regulate rates had moved from local governments to state commissions. Two important observations emerge from the historical analysis. First, when local politicians had the authority to regulate gas rates, they let the ballot box drive their rate-making decisions. If voters wanted low rates, local politicians obliged them. Second, state regulatory commissions were less responsive to the demands of local voters and consumers. On average, state regulators tolerated higher gas rates than did local regulators. Apparently, state commissions acted as commitment mechanisms, reducing the likelihood of regulatory expropriation by local governments. These observations suggest that if a city had the power to regulate gas rates, it would have been more likely to own and operate a municipal gas company. Ex ante, if a city possessed the power to regulate rates, the city would have found it difficult to commit to reasonable policies. This would have discouraged private firms from investing in the first place. Ex post, a city with the authority to regulate rates would have been more likely to enact policies that would drive a private firm under. Also, given that state regulation was less politicized, it would have encouraged private capital formation and discouraged municipal ownership. The empirical analysis corroborates these predictions. Municipal regulation increased the probability of municipal ownership, while state regulation reduced it.

### 2.1 The Regulatory Institutions of the Nineteenth Century

Throughout the nineteenth century, five institutions constrained the regulatory power of city authorities. First, a city's desire to encourage future investment may have prevented it from actively promoting low gas rates. If the city forced gas producers to charge low rates during the 1850s and 1860s, gas and other utilities would have been reluctant to make new investments in later years. There was, however, an end-game problem. Once gas companies and other utilities

completed their networks, a city's incentive to encourage future investment fell. Consider the experience of the Chicago gas industry. During the late nineteenth century, most Chicagoans did not enjoy gas service. Simultaneously, city authorities adopted a lax regulatory stance and allowed gas companies to charge high gas rates. However, by the turn of the twentieth century, most Chicagoans had gas service, and city authorities began pursuing more onerous regulatory policies (Troesken, 1996).

Second, state constitutions often prohibited municipal governments from directly regulating the rates charged by gas companies and other utilities without express legislative permission. A federal court explained: "the regulation of the prices to charge consumers by gas companies is not one of the powers essential to municipal government, and is not included in general powers conferred on cities . . ." (*Mills v. City of Chicago*, et al., 127 Fed. 731 [1904]). The same court went on to explain that unless the state legislature explicitly granted regulatory powers to city governments, only the state could regulate gas rates: "and such power cannot be exercised by a city unless it has been delegated by the state in express words, or by fair implication from a power expressly granted" (*Mills v. Chicago*: 731).

Third, state constitutions sometimes prevented local authorities from establishing municipally owned gas plants without first securing permission from the state legislature. Such provisions helped protect gas companies' investments. Private gas companies feared competition from municipally owned plants because they often received subsidies and had no obligation to turn a profit.[4] Table 1 identifies the states that allowed municipalities to build and operate a gas plant without first securing a special legislative grant. To be clear, it was still possible for localities in states not on this list to own and operate their own gas works. Localities in these other states just had to jump through an additional hoop; they first had to petition the state legislature for permission.

Fourth, substantive due process protected gas companies against confiscatory rate regulation—regulation that set rates so low that firms could not earn a reasonable rate of return. The famous *Reagan* and *Smyth v. Ames* decisions established the rule: when regulators set rates too low, they violated producers' Fourteenth Amendment rights. Adopted in 1868, reconstructionists intended the Fourteenth Amendment to protect recently emancipated slaves. The amendment guaranteed all persons "equal protection of the laws" and forbade governments from depriving "any person of life, liberty, or property, without due process of law." Whatever its origins, by the late nineteenth century, the Fourteenth Amendment to the U.S. Constitution protected all industries against overzealous regulatory policies (Hovenkamp, 1988).

Finally, municipal franchises put limits on the behavior of both cities and producers. Through franchises, cities granted gas companies the rights they needed to dig up the streets and install mains. In return for these rights, gas

4. See, for example, *Hamilton Gas Light and Coke Company v. City of Hamilton*, 146 U.S. 258 (1892).

Table 1. States That Authorized Municipalities to Own and Operate Utilities Without First Petitioning the State Legislature for Permission

| State[a] | Year General Municipal Ownership Law Passed |
|---|---|
| Arkansas[b] | 1890 |
| Connecticut | 1893 |
| Kentucky | 1903 |
| Louisiana[b] | 1890 |
| Michigan | 1897 |
| Minnesota | 1901 |
| Mississippi | 1892 |
| Missouri[b] | 1890 |
| Nebraska[b] | 1890 |
| New Hampshire | 1909 |
| New York | 1905 |
| North Carolina[b] | 1890 |
| North Dakota[b] | 1890 |
| Ohio[b] | 1890 |
| Oregon[b] | 1890 |
| Pennsylvania[b] | 1890 |
| South Carolina | 1895 |
| Texas[b] | 1890 |
| Washington | 1899 |
| Wisconsin | 1898 |

*a.* As explained in the text, even in the absence of general municipal ownership statutes, states continued to make special legislative grants to individual municipalites empowering them to construct and operate gas works.

*b.* Legislatures in these states passed general municipal ownership laws prior to 1890. General municipal ownership empowered all municipalities in the state to own and operate gas works without first securing a special grant from the state legislature.

*Sources:* Van Sinderen (1906: 58–146) and author's survey of state court reporters and legal digests. See, especially, the following cases: *McCutchen v. City of Silvan Springs*, 185 Ark. 846 (1932); *Miller v. City of Los Angeles*, 197 Pac. 342 (1921); *Hyatt v. Williams*, 84 P. 41 (1906); *City and County of Denver v. New York Trust Company*, 229 U.S. 123 (1912); *Citizens Utilities Co. v. City of Rocky Ford*, 132 Colo. 427 (1955); *Norwich Gas and Electric Co. v. City of Norwich*, 76 Conn. 565 (1904); *City of St. Petersburg v. Pinellas County Power Co.*, 100 So. 509 (1924); *Jacksonville Electric Light Co. v. City of Jacksonville*, 18 So. 677 (1895); *Baker v. City of Cartersville*, 56 S.E. 249 (1906); *State v. City of Hiawatha*, 3 P. 1119 (1894); *Overall v. City of Madisonville*, 102 S.W. 278 (1907); *Houma Lighting Co. v. Town of Houma*, 127 La. 726 (1911); *City of Hagerstown v. Littleton*, 123 A. 140 (1923); *Spaulding v. Inhabitants of Peabody*, 26 N.E. 421 (1891); *Todd v. City of Crete*, 113 N.W. 172 (1907); *Missouri Service Co. v. City of Stabeny*, 108 S. W. 2nd 25 (1925); *Asbury v. Town of Albemarle*, 162 N.C. 247 (1913); *Hamilton Gas Light and Coke Company v. City of Hamilton*, 146 U.S. 258 (1892); *Lightpipe v. City of Orange*, 68 A. 120 (1907); *Wheeler v. City of Philadelphia*, 77 Pa. 338 (1875); *Baily v. City of Philadelphia*, 39 A. 494 (1898); *Keenan and Wade v. City of Trenton*, 168 S. W. 1053 (1914); *Gas Company v. Wheeling*, 8 W.Va. 320 (1875).

companies promised to provide gas of a specified quality and set its price below some specified ceiling. However, the price ceilings set by franchises were often not binding. The general price level fell steadily between 1860 and 1900, while franchise contracts often set prices in nominal terms.[5] Why franchises did not control for changes in the price level is unclear. Although municipal franchises were usually 10 to 30 years long, they were sometimes as short as five years or as long as 100 years. It is important to be clear on one point here. Franchises

5. See Priest (1993) and Troesken (1996) for a more complete discussion of the efficacy of franchise regulation.

were contracts. They imposed obligations on both the city and the gas company and required the consent of both parties. City authorities could not unilaterally dictate the terms of the franchise.

Franchises sometimes granted producers exclusive control over a particular market. For example, Milwaukee granted the Milwaukee Gas Light Company a franchise that promised the company exclusive control over the city's entire gas market for 100 years (Wilcox, 1910). This type of monopoly provision helped prevent local politicians from using the threat of entry to extort bribes from incumbent firms. During the progressive era, muckraking journalists frequently claimed that local politicians issued competitive franchises to elicit bribes from incumbents. As the many stories went, city councils would issue franchises and then auction them off to the highest bidder.[6]

## 2.2 The Origins and Effects of Municipal Regulation, 1900–1914

At the turn of the century, several states passed laws authorizing municipal governments to directly regulate gas rates and other utility rates. Table 2 identifies these states. These new municipal regulation laws meant that once a gas company's franchise contract with the city expired, city authorities could unilaterally dictate rates. Gas companies did not have to consent to the new rates for them to become legally binding. Moreover, once the state legislature granted a local government the power to regulate rates, the local government could not contract that power away. This had an important economic implication: if local authorities wanted to attract a gas company to their town, they could not credibly promise not to regulate rates in the future. The courts refused to enforce such promises. It was a well-established rule of law that municipal governments could not contract away their police powers (Pond, 1906).

Why did states suddenly begin passing municipal regulation laws at the turn of the twentieth century? The answer is tied to the development of the gas industry. Consider the experience of Illinois. In 1905, the Illinois legislature voted on a series of bills that would have granted all Illinois towns the power to regulate gas rates. An analysis of these votes shows the following: legislators from districts with low per capita gas production (i.e., districts with a poorly developed gas industry) opposed municipal regulation, while legislators from districts with high per capita gas production (i.e., districts with a well-developed gas industry) favored municipal regulation. Ultimately, political pressure from districts with low per capita gas production managed to defeat the municipal regulation bills. Towns with limited gas service opposed municipal regulation laws, because such laws undercut their ability to credibly commit to reasonable

6. See, for example, Lincoln Steffens' (1957) *The Shame of the Cities* or Wendt's and Kogan's (1943) *Lords of the Levee*, an almost unbelievable collection of stories about two unbelievable Chicago politicians, John "Bathouse" Coughlin and Mike "Hinky Dink" Kenna. For a more balanced, academic discussion, see Miller (1993: 326–27) who writes, "It seems likely that city officials often received side payments from utilities for granting the franchise and maintaining it on terms favorable to the utility ... What about the fact that municipalities threatened to, and sometimes did, grant competing franchises? Again, this behavior is perfectly consistent with the rent-extraction model, in that the local officials may have been exercising a threat in order to appropriate a larger share of the utilities' profits."

Table 2. States That Authorized Municipalities to Regulate Gas Rates

| State[a] | Years of Municipal Regulation |
|---|---|
| Arkansas | 1903–1934 |
| California | 1903–1910 |
| Florida | 1897–1951 |
| Iowa | 1897–1953 |
| Kansas | 1904–1911 |
| Minnesota[b] | 1903–1960 |
| Mississippi | 1904–1956 |
| Missouri | 1907–1913 |
| Nebraska[b] | 1911–1960 |
| Ohio[c] | 1890–1911 |

a. In a few states, legislatures passed laws empowering individual cities to regulate rates. In particular, the following states authorized the following cities to regulate gas rates: Delaware, Wilmington; Illinois, Chicago; Nebraska, Lincoln and Omaha (prior to general law in 1911); and Tennessee, Memphis.

b. In Minnesota and Nebraska, municipal regulation prevailed, at least, until 1960.

c. In Ohio, municipalities had the authority to regulate gas rates before 1890.

*Sources*: Van Sinderen (1906: 58–146); Stotz and Jamison (1938: 1–67); Rose (1995: 51); author's survey of the annotated statutes of each state; and the following court cases: *New Memphis Gas & Light Company v. City of Memphis*, 72 Fed. 952 (1896); *Wyandotte County Gas Company v. State of Kansas*, 231 U.S. 622 (1914); *Minneapolis Gaslight Co. v. City of Minneapolis*, 142 N.W. 728 (1913); *St. Paul Book & Stationary co. v. St. Paul Gaslight Co.* 153 N.W. 262 (1915); *Cedar Rapids Gas Light Company v. City of Cedar Rapids*, 223 U.S. 655 (1912); *Lincoln Gas & Electric Light Company v. City of Lincoln*, 223 U.S. 349 (1911); and *Nebraska Gas & Electric Company v. City of Stromsburg*, 2 F. 2nd 518 (1924).

rate regulations and discouraged future investment in the gas industry. Given the experience of Illinois, it seems reasonable to hypothesize that the first states to pass municipal regulation laws were those with well-developed gas industries. States with poorly developed industries would have worried that municipal regulation would discourage future investment (Troesken, 1996).[7]

Describing municipal regulation of urban transit systems during the late twentieth century, Pashigian (1976:1258) writes: "With some exceptions, the regulatory agencies [at a local level] have been captured not by the transit firms of the industry but by the riders." Observers said the same thing about the early twentieth century gas industry. In a speech before the Pacific Gas Association, an officer of a San Francisco gas company said:[8]

> When the time for the regulation of rates arises, a [city] councilman or supervisor, elected on a platform that calls for a reduction in the gas and electric rates, is hardly in a proper frame of mind to listen to evidence and impartially vote thereon. No matter what the evidence is, if he does not vote for a reduction a large number of citizens, and all of the daily papers, will accuse him of being biased in favor of the corporation.

7. See also Kanazawa and Noll (1994). Exploring the origins of state railroad regulation in Illinois, they find evidence that at least some voters worried that regulation might discourage future development and expansion of the railroad.

8. From a speech delivered before the Pacific Gas Association at its annual convention in the fall of 1908. The speech was reprinted in the *American Gas Light Journal*, September 28, 1908: 527.

Forrest McDonald, biographer of Samuel Insull and noted historian, concurs: "At the turn of the century, public utilities were regulated by municipal governments. Such regulation was governed largely by political concerns; shrewd politicians ... recognized ... that voters were often inclined to respond favorably to attacks on utilities (McDonald, 1957: 117)."

A few examples illustrate the politicized nature of municipal regulation. In 1905, Illinois granted the Chicago City Council the authority to regulate gas rates. A few years later, Carter Harrison ran as a Chicago mayoral candidate. Harrison, and several candidates for city council, promised that, if elected, they would reduce gas rates in the city from 85 cents to 70 cents. After Harrison and his friends won, they launched an investigation into the costs of manufacturing and distributing gas. The expert they hired, W. J. Hagenah of the Wisconsin Public Utilities Commission, recommended a 77-cent rate. According to Hagenah, anything lower than 77 cents would not allow producers a reasonable rate of return. Chicago authorities promptly fired Hagenah and hired Edward Bemis. After paying Bemis five times the salary they paid Hagenah, Chicago authorities got the result they wanted. Bemis recommended, and the city eventually passed, a 70-cent rate ordinance. Ironically, earlier in his political career, Carter Harrison had opposed attempts by the city to regulate gas rates. As Chicago's mayor in 1900, Harrison claimed that the city would use the power to regulate rates only as a way of "blackmailing" Chicago gas companies—if the gas companies did not pay off the city council, the city would order them to reduce rates (Troesken, 1996).

On May 4, 1891, the Cleveland City Council passed an ordinance requiring the city's two gas companies to reduce their rates from $1 to 60 cents. The ordinance grew out of a plan launched by Cleveland's newly elected mayor. The mayor thought the city paid too much to light streets and public buildings. He directed several members of the city council to meet and devise a plan to lower the city's gas bill. At one of these meetings, one council member suggested that private consumers also paid too much for their gas. Someone else said that the price of gas for private consumers should be reduced to 60 cents. The other council members agreed that 60 cents was a good rate. Within a few days, and without any investigation into the costs of manufacturing gas, the council passed an ordinance setting rates at 60 cents.[9] Officials in other cities exhibited a similarly cavalier attitude. In 1887 Tennessee authorized Memphis officials to regulate gas rates, subject to the provision that they never set rates below $1.50. A few years later, without any investigation into the costs of producing and distributing gas, the Memphis City Council ordered the New Memphis Gas Company to reduce its rates to $1.50.[10]

9. The following issues of the *Cleveland Leader and Herald* describe the battle between the city council and the gas company: May 5, 1891:8; August 11, 1891:8; August 12, 1891:5; August 25, 1891:8; August 28, 1891:8; November 14, 1891:8; and June 1, 1892:1.

10. The company sued for an injunction, arguing that the rate was confiscatory. In granting the injunction, the court said it was following the doctrine of the *Reagan* cases, a doctrine the court described as "very well understood and familiar." See *New Memphis Gas & Light Company v. City of Memphis*, 72 Fed. 952 (1896).

Sometimes public utilities claimed that local officials used onerous regulations as a way to get their capital at bargain rates; by making it unprofitable to stay in the market, city authorities may have encouraged utilities to sell out more quickly than they otherwise would have. Consider the case of the Knoxville Water Company, a private firm. During the early 1900s, the Knoxville city council passed an ordinance requiring a large reduction in water rates. A few years later, the city tried to purchase the Knoxville Water Company. The company sued. It claimed that the rate ordinance was confiscatory and part of a scheme to purchase its plant at a bargain price. After nearly two decades of litigation, Knoxville bought the water company.[11]

Although substantive due process protected gas and other utilities from the most egregious forms of municipal regulation, securing that protection was neither cheap nor timely. Recall the story about Chicago and the 70-cent gas ordinance. After the city enacted the ordinance, Chicago gas companies sued for injunctive relief. They claimed, among other things, that 70 cents was a confiscatory rate. Litigating in every state and federal court imaginable, the city and Chicago gas companies battled for nearly two decades before the gas companies won. Litigating substantive due process questions took so long, in part, because of the rules adopted by the courts. For example, the courts granted immediate injunctive relief only when there was overwhelming evidence that regulators had set confiscatory rates. In more ambiguous cases, the courts allowed the rates to go into effect. If after the rates went into effect, the company continued to find them confiscatory, it could file another claim.[12]

## 2.3 The Origins and Effects of State Regulation, 1907–1919

Between 1907 and 1922, nearly 30 states created state commissions to regulate public utilities.[13] Table 3 identifies these states. According to the discussion below, state utility commissions helped local governments credibly commit to reasonable regulatory policies. This made it easier for cities and towns to attract private capital. State regulation helped local governments commit because gas companies believed that state regulators were more sympathetic to producers than were local regulators. Gas companies were right; rates were higher under state regulation than under local regulation. In short, by tying the hands of local politicians, state regulators encouraged private companies to invest and prevented local regulators from driving existing companies into bankruptcy.

Legislators created state regulatory commissions in response to the lobbying of utilities. Utilities lobbied for state regulation because they saw it as a politically expedient way to undermine the regulatory policies of local governments.

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11. For details, see *Knoxville Water Company v. Knoxville*, 200 U.S. 22 (1906); and *Mayor v. Knoxville Water Company*, 64 S.W. 1075 (Tenn. 1901).

12. See Troesken (1996); *William R. Wilcox v. Consolidated Gas Company of New York*, 29 S. Crt. 192 (1908); and *Des Moines Gas Company v. City of Des Moines*, 35 S. Crt. 811 (1914).

13. See Stigler and Friedland (1962), and Stotz and Jamison (1938).

Table 3. Creation of State Utility Commissions

| State | Year State Commission Created | State | Year State Commission Created |
|---|---|---|---|
| Alabama | 1915 | Nebraska | *a* |
| Arizona | 1912 | Nevada | 1911 |
| Arkansas | 1932 | New Hampshire | 1911 |
| California | 1911 | New Jersey | 1910 |
| Colorado | 1913 | New Mexico | 1941 |
| Connecticut | 1911 | New York | 1907 |
| Delaware | 1949 | North Carolina | 1913 |
| Florida | 1951 | North Dakota | 1919 |
| Georgia | 1907 | Ohio | 1911 |
| Idaho | 1913 | Oklahoma | 1913 |
| Illinois | 1913 | Oregon | 1912 |
| Indiana | 1913 | Pennsylvania | 1914 |
| Iowa | *a* | Rhode Island | 1912 |
| Kansas | 1911 | South Carolina | 1922 |
| Kentucky | 1934 | South Dakota | *a* |
| Louisiana | 1934 | Tennessee | 1919 |
| Maine | 1913 | Texas | *a* |
| Maryland | 1910 | Utah | 1917 |
| Massachusetts | 1887 | Vermont | 1908 |
| Michigan | 1909 | Virginia | 1914 |
| Minnesota | *a* | Washington | 1911 |
| Mississippi | 1956 | West Virginia | 1913 |
| Missouri | 1913 | Wisconsin | 1907 |
| Montana | 1913 | Wyoming | 1915 |

*a*. No state regulatory commissions prior to 1960.

*Source*: Stigler and Frieland (1962: 13).

For example, testifying before the Illinois legislature, an official of a Chicago gas company pleaded (*Chicago Tribune*, April 28, 1905: 6),

> By city regulation you place it in the hands of the people interested to sit in judgement of their own case. Despite their protestations of fairness they could not restrain from giving themselves the best of it. Therefore we fear city regulation.... [W]e do not want to be at the mercy of the city. Let there be a commission appointed, a state commission appointed by the governor.... Let this commission examine books and investigate accounts, let the commission fix rates.

Blackford (1970 and 1977), MacDonald (1957, 1958, and 1962), and others document the same patterns in many other states; utilities supported state regulation because they believed it would undermine the onerous policies of local regulators.[14]

14. Aside from the Blackford and McDonald citations given in the text, see Brown (1936); Minnesota Home-Rule League (1914); Stotz and Jamison (1938); and Troesken (1996).

Legislators argued that state regulatory commissions would protect both consumers and producers. State regulation would prevent utilities from charging monopoly rates and, simultaneously, protect the utility against overzealous local regulators. For example, in creating a state commission, the Illinois legislature wrote (Illinois General Assembly, "Illinois Legislative Public Utilities Commission," 1913: 861),

> If municipalities are incapable of protecting their citizens for any reason from unjust exactions of public service corporations, it is the duty of the State to protect them in such a manner it deems right and proper. Conversely, if the citizens of any municipality, through their representatives, take such action as will destroy or confiscate public utility investments, it is likewise the duty of the State to assert its paramount authority to the end that justice may be accorded to citizens interested in such concerns ...

It is not clear if state regulation lived up to its stated goal—to protect both consumers and producers. The empirical evidence suggests that, at worst, producers captured state commissions and charged near-monopoly rates. At best, the state regulation had uneven effects, keeping rates reasonably low in some cases and allowing near-monopoly rates in others.[15] Setting aside the question of regulatory capture, state regulators generally tolerated higher rates than local regulators. Two studies compare directly the effects of state and local rate regulation. In his study of urban transit systems, Pashigian (1976) finds that local regulations placed a heavier burden on producers than did state regulation. Elsewhere, I examine the gas industry at the turn of the century and identify the same pattern. Local regulators reduced gas rates much more than state regulators (Troesken, 1994).

## 3. An Overview of Public Ownership in the Gas Industry

Like regulatory institutions, public ownership varied across time and space. Using data from the census of manufacturers, Table 4 highlights this variation.

15. In a seminal article, Stigler and Friedland (1962) compare electric rates in states with and without state utility commissions; their data come from the early twentieth century when regulatory regimes varied across space. Stigler and Friedland find that rates and profits were not significantly lower in state with utility commissions. From this, they conclude that states regulation allowed utility companies to charge high rates and earn monopoly profits. Moore (1970) estimates demand and cost equations to isolate the effects of regulation. Moore uses a cross section of electric utilities operating in 1962. He finds that state regulation lowered rates from monopoly levels by only 3 percent. Unlike these early studies, Meyer and Leland (1980) find that state regulation sometimes had a substantial effect on utility rates. Meyer and Leland pool data from 48 states over the period 1969 through 1974. These data, and the estimating procedure used, allow for the possibility that the effectiveness of regulation varied over time and across space. Allowing for this possibility distinguishes Meyer and Leland's (1980) study from earlier work. They find "pervasive differences" in "regulatory impact across states." In some states, state regulation greatly affected utility rates; in other states, it did not.

In 1890 less than 1 percent of all gas companies were municipally owned. Municipal ownership peaked in 1910, when nearly 10 percent of all gas companies were municipally owned. After 1900, municipal ownership was most common in three states: Iowa, Minnesota, and Wisconsin. Census data suggest that municipally owned gas companies were very small compared with their private counterparts. At their peak in 1910, municipal companies produced about 1 percent of all gas sold in the United States, though they accounted for nearly 10 percent of all gas companies.

## 4. Three Theories of Public Ownership

### 4.1 The Commitment Hypothesis

Levy and Spiller (1994) suggest that public ownership is a response to the threat of overzealous or arbitrary regulatory policies. Their suggestion applies to the gas industry and stems from the logic of credible commitment. Gas companies must make a substantial investment in a system of gas mains. Once installed, they cannot easily move or redeploy those mains. Because gas mains are specific to a particular regional market, the politicians governing the region hold the mains hostage. This asset-specificity leaves the gas company vulnerable to opportunism (Williamson, 1985). For example, because gas producers cannot easily redeploy their capital, it is possible for local politicians to use the threat of low gas rates to win votes from consumers or extort bribes from producers. As a result, before investing in specific capital, gas companies would demand commitments that the city would not behave opportunistically ex post. They needed guarantees that once they installed their mains, local authorities would not impose low rates or high taxes. Without those guarantees, private entrepreneurs would not invest (Goldberg, 1976; Williamson, 1985). If the city wished to provide its constituents with gas service, it would have to undertake the investment itself (Levy and Spiller, 1994). The city would have to own the capital. In this way, one might think of public ownership as a form of vertical integration.

As a matter of history, cities that could not commit to reasonable policies over the long run sometimes attracted private capital by allowing companies to recoup all of their investments up-front. For example, when local governments first granted gas companies franchises to operate in their cities, they often allowed those companies to charge very high rates. They did this by imposing very few restrictions on rates or quality. These arrangements enabled the companies to earn very high profits for a few years and compensated them for the very real possibility of regulatory expropriation in later years (Troesken, 1996). Note, however, that in this story, regulatory expropriation is a part of the contract; the companies expect that it will occur but invest anyway because of the promise of monopoly profits in their first few years. Levy and Spiller (1994) describe similar arrangements in their international survey of telecommunications. In another historical example, Keefer (1996) argues that the excess construction profits earned by Spanish railroads during the nineteenth century were a response to a lack of credibility of the Spanish state. Simply put, the railroads had to earn all of their profits during construction, because they were confident

Table 4. Municipal Ownership by State, 1890–1920

| State | 1890 | | 1900 | | 1910 | | 1920 | |
|---|---|---|---|---|---|---|---|---|
| | Total Number of Gas Companies | Number of Municipal Companies | Total Number of Gas Companies | Number of Municipal Companies | Total Number of Gas Companies | Number of Municipal Companies | Total Number of Gas Companies | Number of Municipal Companies |
| Alabama | 11 | 0 | 11 | 0 | 13 | 2 | 12 | 1 |
| Arkansas | 7 | 0 | 7 | 0 | 5 | 0 | 1 | 0 |
| California | 41 | 0 | 41 | 0 | 73 | 1 | 57 | 0 |
| Connecticut | 21 | 0 | 21 | 0 | 28 | 1 | 22 | 0 |
| Delaware | 4 | 0 | 4 | 0 | 5 | 0 | 7 | 0 |
| Florida | 11 | 0 | 11 | 0 | 12 | 1 | 14 | 2 |
| Georgia | 12 | 0 | 12 | 0 | 15 | 3 | 17 | 4 |
| Illinois | 53 | 0 | 53 | 0 | 78 | 3 | 70 | 1 |
| Indiana | 39 | 0 | 39 | 0 | 53 | 1 | 53 | 1 |
| Iowa | 26 | 0 | 26 | 0 | 117 | 35 | 68 | 8 |
| Kansas | 17 | 0 | 17 | 0 | 12 | 1 | 7 | 0 |
| Kentucky | 17 | 1 | 18 | 1 | 15 | 0 | 10 | 1 |
| Louisiana | 3 | 0 | 3 | 0 | 5 | 0 | 4 | 0 |
| Maine | 9 | 0 | 9 | 0 | 18 | 2 | 13 | 0 |
| Maryland | 11 | 0 | 11 | 0 | 18 | 0 | 16 | 1 |
| Massachusetts | 68 | 0 | 71 | 3 | 64 | 4 | 51 | 0 |
| Michigan | 38 | 0 | 39 | 1 | 55 | 1 | 59 | 3 |
| Minnesota | 11 | 0 | 12 | 1 | 42 | 26 | 23 | 7 |
| Mississippi | 5 | 0 | 5 | 0 | 8 | 0 | 7 | 0 |
| Missouri | 25 | 0 | 26 | 1 | 29 | 1 | 26 | 0 |
| Nebraska | 9 | 0 | 10 | 1 | 48 | 7 | 20 | 2 |
| New Hampshire | 13 | 0 | 13 | 0 | 14 | 1 | 13 | 0 |
| New Jersey | 34 | 0 | 34 | 0 | 47 | 1 | 38 | 0 |
| New York | 101 | 0 | 101 | 0 | 141 | 3 | 96 | 0 |
| North Carolina | 10 | 0 | 10 | 0 | 14 | 0 | 22 | 3 |
| Ohio | 73 | 1 | 75 | 2 | 78 | 0 | 15 | 2 |
| Pennsylvania | 89 | 1 | 89 | 0 | 99 | 0 | 86 | 0 |
| Rhode Island | 6 | 0 | 6 | 0 | 8 | 0 | 4 | 0 |
| South Carolina | 4 | 0 | 4 | 0 | 12 | 4 | 10 | 0 |
| Tennessee | 11 | 0 | 11 | 0 | 17 | 0 | 10 | 0 |
| Texas | 11 | 0 | 11 | 0 | 11 | 0 | 25 | 0 |
| Vermont | 7 | 0 | 7 | 0 | 9 | 0 | 9 | 0 |
| Virginia | 12 | 4 | 16 | 4 | 21 | 6 | 17 | 5 |
| West Virginia | 8 | 1 | 9 | 1 | 4 | 1 | 3 | 0 |
| Wisconsin | 25 | 0 | 25 | 0 | 49 | 12 | 34 | 1 |
| Total United States[a] | 871 | 8 | 886 | 15 | 1282 | 122 | 1008 | 45 |
| Percent Municipally Owned | | 0.9 % | | 1.7 % | | 9.5 % | | 4.5 % |

a. The total for the U.S. may not always equal the sum of the columns, because several states are excluded from the table. By and large, these are less populous states in the northwest.

*Sources:* United States (1890), United States (1900), United States (1910), and United States (1920).

that the Spanish government would expropriate their investments immediately after they were completed.

Interpreting public ownership as a response to insecure property rights and onerous regulation cuts against the traditional capture theory of regulation. As the capture theory goes, the cohesive interests of producers usually overwhelm the scattered interests of consumers. More recent studies of regulation, however, find that consumers can sometimes affect the regulatory process. For example, Irwin (1994) shows that consumers can influence tariff levels through their power at the ballot box. Also, the effectiveness of regulation can vary across administrative jurisdictions. We saw this in the history of the gas industry; local regulators tended to respond to consumer interests, while state regulators sympathized more with producer interests. State regulation, moreover, may have acted as a commitment mechanism; with state regulation, producers were assured that they would not be subject to the political whims of local regulators. Given this pattern, municipal regulation would have increased the likelihood of municipal ownership, while state regulation would have decreased the likelihood.

### 4.2 The Patronage Hypothesis

A hypothesis not considered in earlier economic work is the idea that municipal ownership supported a giant patronage scheme: perhaps politicians garnered support by giving away jobs at the local gas company. Nobody said it better than George Washington Plunkitt, the inimitable boss of Tammany Hall (Riordon, 1994: 78):

> Some of the reformers are sayin' that municipal ownership won't do because it would give a lot of patronage to the politicians. How those fellows mix things up when they argue! They're givin' the strongest argument in favor of municipal ownership when they say that. Who is better fitted to run the railroads and the gas plants and the ferries than the men who make a business of lookin' after the interests of the city? Who is more anxious to serve the city? Who needs the jobs more?

Progressive era conservatives worried that as the number of municipally owned utilities grew, so too would the number of municipal employees. Eventually, municipal employees would come to dominate local politics. "One day," prophesized Robert Porter, the "unconsidered trifles who cluster round" the "local authority" would grow into a political "Frankenstein," a collective monster "so huge" that its "creators would not be able to control" it.[16] Although mu-

16. Porter (1907:109). The patronage hypothesis remains a common explanation for public ownership. Consider, for example, this excerpt from a *Wall Street Journal* article on patronage in Pakistan and the country's state-owned airline: "[Pakistan] politicians have doled out state assets with abandon to gain votes. The last government of Mr. Sharif's Pakistan Muslim League spent about $1 billion importing cars to offer to loyal supporters at duty-free prices to use as taxis. And Ms. Bhutto's government is generous with government jobs; state-run Pakistan International

nicipal ownership might have facilitated patronage arrangements, it was not a prerequisite for patronage. Gas companies and local politicians could have just traded favors: "you hire our friends and political supporters, and we'll go easy on you the next time the city sets gas rates." As C. K. Yearly (1970: 117–18) observes, in return for favors from local politicians, private utility companies "were obliged to respond not only with cash but also with places for those who, though deserving, could not be accommodated on the public payroll."

The observation that patronage could exist under private as well as public ownership might help explain the timing of municipal ownership. As shown in Section 3, the municipal ownership movement peaked between 1910 and 1920, just when many states began creating state utility commissions. (See Tables 3 and 4.) Transferring regulatory power away from city governments toward state governments, state regulation curtailed the ability of local authorities to do favors for or extract rents from private utilities. Utilities no longer had an incentive to exchange favors with local politicians. Suppose a utility refused to hire patronage workers. What could local politicians do? They no longer had the power to regulate rates.

Comparing wages in public and private gas companies would provide a powerful test of the patronage hypothesis. If, after controlling for regional variations in wages, one found that wages were higher in public plants, this would support the patronage hypothesis. In this article, however, I do not compare wages in public and private plants. (I am collecting the necessary wage data and will do that analysis elsewhere.) Here I offer a weaker test of the patronage hypothesis. In particular, I test for the possibility that as regulatory power moved away from local governments and toward state commissions, public ownership increased. As I explained in the preceding paragraph, if patronage were important, public ownership would have increased with the onset of state regulation.

### 4.3 The Small Markets' Hypothesis

Table 4 and the surrounding discussion suggest that publicly owned gas companies were typically very small. Schap (1986) uncovers the same pattern in the electric industry. At the turn of the century, municipal electric companies were most common in small towns. Schap argues that in small towns, inadequate consumer demand prevented producers from exploiting scale economies and from recouping their large capital investments. This argument assumes both inadequate demand and large scale economies. As just told, however, the small markets' story must be about more than just economics. It requires a political story as well. Crudely put, one needs to explain why local governments in small towns did not just subsidize private firms or allow the firms to charge higher prices.

Koh, Berg, and Kenny (1996) offer a more complete explanation for the concentration of public ownership in small towns. Koh et al. argue that small-

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Airlines is notorious for having nearly 500 workers per aircraft" (*Wall Street Journal*, December 14, 1995: 1).

town consumers monitored municipal electric companies better than large-town consumers. Presumably, the free-rider problems associated with consumer monitoring were less severe in small towns. Estimating cost functions for 182 public and private electric companies, Koh et al. find evidence consistent with this hypothesis: publicly owned electric companies were more efficient at low output levels. In short, the costs of municipal ownership were lower in small towns, and, hence, the chances of having it were higher.

## 5. Empirical Analysis

In 1911, the *Brown's Directory of American Gas Companies* published information on public and private gas companies operating in the United States. Using the directory, I constructed a data set that consists of the 1274 gas companies operating in 1911.[17] The data set includes nearly all gas companies operating in the U.S. According to the census of manufacturers, in 1910 there were 1282 gas companies operating in the United States.

Using these firm-level data, I exploit the intercity and interstate variation in regulatory regimes and population size to test existing theories of public ownership. Theory predicts that a city's regulatory institutions and its population (market size) would have determined whether the town or a private enterprise owned the gas company. More precisely, theory suggests that ownership depended on whether the local government regulated the company's rates; whether a state commission regulated the company's rates; whether the company's state allowed municipalities to own and operate their own gas plants without petitioning the legislature for permission; and on the population of the city where the company was located. In practice, I code dummy variables to indicate ownership (dummy equals one if the company was publicly owned) and regulation (e.g., municipal regulation dummy equals one if the company was regulated by city).[18] I then regress the ownership dummy against the population of the company's city and the regulation dummies.

Table 5 summarizes predicted effects of all the variables according to the different hypotheses. The commitment hypothesis predicts a positive coefficient on the municipal regulation dummy. From Section 2, we know that consumers captured local regulators. Given this, the commitment hypothesis suggests

17. The data are for companies producing manufactured gas. Natural gas was not yet widely used. Also, the census bureau did not include natural gas companies in its census of manufacturers in the gas industry. For a few large cities, Brown's reported multiple companies. Typically, these individual companies were controlled and operated by a single holding company. Hence, whenever the directory listed multiple private firms for a single city, I counted those firms as a single firm.

18. I use Tables 1, 2, and 3, to code the regulation dummies. Unlike state utility regulation, the laws governing municipal rate regulation and municipal ownership are obscure and have received little scholarly attention. Consequently, compiling Tables 1 and 2, which identify the states that passed municipal ownership and municipal rate regulation laws, requires care. To construct these tables, I first consulted Van Sinderen (1906), who compiled a list of the statutes governing municipal ownership and regulation. I then checked Van Sinderen's list with my own comprehensive survey of the annotated statutes of the various states and legal treatises on municipal corporations. As a third check, I surveyed the relevant case law in all of the states.

Table 5. Predicted Effect of Explanatory Variables Under Alternative Hypotheses

| Variable | Commitment Hypothesis | Patronage Hypothesis | Small Markets Hypothesis |
|---|---|---|---|
| $y_1 = 1$ if company municipally owned; 0 otherwise | dependent variable | dependent variable | dependent variable |
| $y_2 = 1$ if company municipally regulated; 0 otherwise | + | — | no prediction |
| $y_3 = 1$ if company state regulated; 0 otherwise | −/0 | + | no prediction |
| $X_{11} = 1$ if general municipal ownership law in co's state; 0 otherwise | + | no prediction | no prediction |
| $X_{12}$ = population of city where company located | no prediction | no prediction | — |

that local regulation would have discouraged private capital formation. The commitment hypothesis also predicts a positive coefficient on the dummy for a general municipal ownership law. The easier it was for a city to build a competing public plant sometime in the future, the more reluctant private capitalists would have been to build their own plant. Lastly, the commitment hypothesis predicts a negative coefficient on the state regulation dummy. In Section 2, I suggested that state regulation might have acted as a commitment mechanism. By insulating producers against the policies of local governments, state commissions prevented local governments from expropriating private capital through overzealous regulations.

According to the patronage hypothesis, the more regulatory power a local government possessed, the less likely it was to require a municipally owned utility to operate a patronage scheme. It could, after all, simply trade favors with the private company. Alternatively, if local politicians had little regulatory power, they would have had a hard time convincing the gas company to hire their friends and supporters. In this case, local politicians would have needed to get their own gas plant to give their friends jobs. The patronage hypothesis, therefore, predicts that the number of municipally owned gas plants would have been highest in those states where local governments had the least regulatory control. Specifically, it predicts a negative coefficient on the municipal regulation dummy and a positive coefficient on the state regulation dummy.

According to the small markets' hypothesis, municipal ownership flourished in small cities and towns where markets were not large enough to allow utilities to recoup their large up-front investments. This logic predicts the following relationship: as the population of a company's town increased, the likelihood that it was publicly owned would have fallen. The coefficient on population, therefore, should be negative.

Table 6. Basic Probit Model

| Variable | Mean (Std. Dev.) | $y_1 = \alpha_1 + \gamma_2 y_2 + \gamma_3 y_3 + \beta_1 X_1 + \epsilon_1$ (1) Coefficient (t-statistic) | Marginal Effects |
|---|---|---|---|
| $y_1 = 1$ if company municipally owned; | 0.081 | dependent | ... |
| 0 otherwise | ... | variable | |
| $y_2 = 1$ if company municipally regulated; | 0.296 | 0.569 | 0.050 |
| 0 otherwise | ... | (5.07)[a] | |
| $y_3 = 1$ if company state regulated; | 0.382 | −0.323 | −0.029 |
| 0 otherwise | ... | (2.55)[b] | |
| $X_1 = (X_{11}, X_{12})$: | | | |
| $X_{11}$ = population of city where | 26434 | −0.15-04 | −0.14-5 |
| company located | (105857) | (3.56)[a] | |
| $X_{12} = 1$ if general municipal | 0.493 | −0.057 | −0.005 |
| ownership law in co's state; | ... | (0.52) | |
| 0 otherwise | | | |
| Constant | ... | −1.345 | ... |
| | | (12.67)[a] | |
| Number of observations | 1274 | 1274 | ... |
| Percentage correctly predicted | ... | 0.92 | ... |
| Log-likelihood function | ... | −319.81 | ... |

a. significant at the .001 level (two-tail test).

b. significant at the .05 level (two-tail test).

In the basic regression model, I estimate the following single stage probit:

$$y_1 = \alpha_1 + \gamma_2 y_2 + \gamma_3 y_3 + \beta_1 X_1 + \epsilon_1, \quad (1)$$

where $y_1$ equals one if the company was municipally owned, and zero otherwise; $y_2$ equals one if the local government regulated the company's rates, and zero otherwise; $y_3$ equals one if a state commission regulated the company's rates, and zero otherwise; $X_{11}$ equals the population of the city where the company located; $X_{12}$ equals one if there was a general municipal ownership law in the company's state, and zero otherwise; and $\epsilon_1$ is a random error term.

Table 6 reports the results of the basic model. The results are consistent with the commitment and small markets hypotheses. The municipal regulation dummy is significant and positive. Calculating marginal effects at variable means, municipal regulation increased the probability of public ownership by 5 percent. This suggests that municipal regulation discouraged private firms from organizing and left it to local governments to undertake the task. State regulation, in contrast, encouraged private capital formation. As suggested by the historical discussion above, state regulation acted as a commitment mechanism. The state regulation dummy is significant and negative. State regulation reduced the probability of municipal ownership by 3 percent. The population variable is negative and significant. As the population of the company's town rose, the probability of municipal ownership fell. Specifically, a one standard deviation increment in the mean population reduced the probability of municipal ownership by 15 percent.

The regression results do not support the patronage hypothesis. If patron-

age were important, municipal ownership would have declined as municipal authorities got more power. This did not happen. Municipal regulation led to more municipal ownership, not less. Also, according to the patronage hypothesis, state regulation would have lead to more municipal ownership, because it undermined the ability of local politicians to exchange favors with private utilities. Hence, the patronage hypothesis predicts that state regulation would have increased the probability of municipal ownership. Again, this did not happen. On the contrary, state regulation reduced the probability of municipal ownership.

## 6. Controlling for Unobserved Variables: Two-Stage Estimation

Perhaps some unidentified variable drives the correlation between regulation and municipal ownership. If so, the regression results would be spurious. The correlation between municipal regulation and municipal ownership would not suggest that municipal regulation caused municipal ownership. It would only suggest that the relationship between municipal regulation and municipal ownership was driven by some other unobserved variable that was correlated with both. One might think of this as a fixed-effects problem or as an endogeniety problem. In an earlier version of this article, I modeled it as a fixed-effects problem. Using a panel of data aggregated at the state level, I regressed changes in the percent of municipally owned firms in the state against changes in the state's regulatory institutions. The results of that analysis corroborated the commitment hypothesis but contradicted the small markets hypothesis. States that passed laws allowing municipalities to regulate gas rates had large increases in municipal ownership. States with small increases in population did not have large increases in municipal ownership.

In the current version of this article, I model the unobserved variable problem as an endogienity problem. That is, I allow for the possibility that municipal ownership is not only a function of the city's regulatory institutions, but that those institutions are, among other things, also a function of whether the city's gas company was municipally owned or privately owned. This approach requires that I explicitly model the forces that led states to pass laws allowing municipalities and state commissions to regulate gas rates. The historical discussion in Section 2 proves helpful on this count.

As I explained in Section 2, towns with little or no gas service opposed legislation granting them the power to regulate gas rates. They opposed such legislation because it undermined their ability to commit to reasonable policies and attract private capital. Given this, I assume that the probability that a company was municipally regulated depends on the miles of gas mains in both the company's state and in its town. Presumably, states with few gas mains had poorly developed gas industries and would have been less likely to pass municipal regulation legislation. Similarly, cities and towns with few gas mains would have been less likely to lobby the state for the power to regulate gas rates. Including a city-level measure is important, because cities sometimes lobbied for city-specific regulation laws. For example, in Illinois, Chicago had the power to regulate rates, while other Illinois cities and towns did not. Similarly,

in Tennessee, Memphis had the power to regulate rates, while other Tennessee cities and towns did not.

Employing the same logic, in states where most cities and towns had gas service, there would have been less opposition to municipal regulation and, therefore, the likelihood of municipal regulation laws would have risen. Hence, in the regression, I include the ratio

$$\frac{\text{towns with gas service in company's state}}{\text{total number of towns in company's state}}.$$

In calculating this ratio, I exclude all towns with populations of less than 2,500. Finally, I assume that the population density of the company's state would influence the likelihood that the company was municipally regulated. As population density rose, there also would have been more consumers of gas. This might have given consumers more political clout; there were more of them to vote. Then again, it also might have undercut their political power; because there were more of them, free-rider problems also might have been more severe.

Again based on the analysis in Section 2, I hypothesize that state regulation emerged first in those states that allowed municipalities to regulate gas rates. Recall that utilities lobbied for state regulation to forestall the hostile policies of local authorities. The idea that producers favored the creation of state utility commissions suggests that states with an antibusiness/antiproducer electorate would have been the last to create state commissions. To capture this effect, I code two variables: the percentage of the state's electorate that voted for the Democratic presidential candidate (Woodrow Wilson) in 1912, and the percentage of the state's electorate that voted for the Progressive Party's presidential candidate (Theodore Roosevelt). The inclusion of these variables is based on a crude but, I think, plausible assumption: states that favored non-Republican presidential candidates were more antibusiness than those that favored Republicans. Table 7 summarizes the variables and relationships that I think determined the presence of municipal and state regulation.

I estimate two systems of equations. In the first system, I consider the possibility that only municipal regulation and municipal ownership are simultaneously related. (State regulation and municipal ownership are not simultaneously related). The first system, therefore, assumes the following structure:

$$y_1 = \alpha_1' + \gamma_2' y_2 + \beta_1' X_1 + \epsilon_1' \tag{2}$$

$$y_2 = \alpha_2 + \gamma_1 y_1 + \beta_2 X_2 + \epsilon_2, \tag{3}$$

where Equation (2) has the same dependent and explanatory variables as Equation (1). The two equations differ only in their coefficients and their error terms. In Equation (3), I regress the municipal regulation dummy $y_2$ against the municipal ownership dummy $y_1$ and a vector of instrumental variables ($X_2$). The instrumental variables are population density in the company's state ($X_{21}$), miles of gas mains per capita in the company's town ($X_{22}$), miles of gas mains per capita in the company's state ($X_{23}$), and the ratio of towns with gas service to all towns in the company's state ($X_{24}$).

Table 7. Predicted Effects: Instrumental Variables

| Explanatory Variables | Dependent Variable: Municipal Regulation | Dependent Variable: State Regulation |
|---|---|---|
| $y_1 = 1$ if company municipally owned; 0 otherwise | ? | ? |
| $y_2 = 1$ if company municipally regulated; 0 otherwise | dependent variable | + |
| $y_3 = 1$ if company state regulated; 0 otherwise | no prediction | dependent variable |
| $\mathbf{X}_2 = (X_{21}, X_{22}, X_{32})$: | | |
| $X_{21}$ = persons per square mile in company's state (in thousands) | ? | no prediction |
| $X_{22}$ = miles of gas mains per 1,000 persons, company's city | + | no prediction |
| $X_{23}$ = miles of gas mains per 1,000 persons, company's state | + | no prediction |
| $X_{24}$ = percent of cities in company's state with gas service | + | no prediction |
| $\mathbf{X}_3 = (X_{31}, X_{32})$: | | |
| $X_{31}$ = percent of electorate in company's state that voted for Progressive party | no prediction | — |
| $X_{32}$ = percent of electorate in company's state that voted for Democratic party | no prediction | — |

The second system of equations considers the possibility that both state regulation and municipal regulation are simultaneously related to municipal ownership. The second system, therefore, assumes the following structure:

$$y_1 = \alpha_1'' + \gamma_2'' y_2 + \gamma_3'' y_3 + \beta_1'' \mathbf{X}_1 + \epsilon_1'' \tag{4}$$

$$y_2 = \alpha_2' + \gamma_1' y_1 + \beta_2' \mathbf{X}_2 + \epsilon_2' \tag{5}$$

$$y_3 = \alpha_3 + \gamma_1'' y_1 + \gamma_2''' y_2 + \beta_3 \mathbf{X}_3 + \epsilon_3, \tag{6}$$

where Equations (4) and (5) are identical to Equations (2) and (3), except in their coefficients and in their error terms. In Equation (6), I regress the state regulation dummy $y_3$ against the municipal ownership dummy $y_1$, the municipal regulation dummy $y_2$, and a vector of instrumental variables ($\mathbf{X}_3$). The two instrumental variables are the percentage of the electorate in the company's state that voted for the Progressive Party's presidential candidate in 1912 ($X_{31}$), and the percentage of the electorate in the company's state that voted for the Democratic Party's presidential candidate in 1912 ($X_{32}$).

I estimate both systems with a two-stage procedure. First, reduced forms are estimated with the probit maximum likelihood method. Then, using the predicted values from the reduced form estimates, I estimate the structural equations. The probit maximum likelihood method is again used for the structural equations. Maddala (1991) describes this estimating procedure and derives the covariance matrices.

Table 8 reports the results from the two-stage probits. The results sustain those from Table 6. In both systems, the same patterns appear: municipal

regulation is positive and significant, state regulation is negative and significant, and population is negative and significant in both systems. As before, municipal regulation increased the probability of municipal ownership, while state regulation and increased population reduced the probability of municipal ownership. The instrumental variables also perform well. As predicted, in states where most cities and towns had gas service, municipal regulation was more common. And a gas company located in a state with an antibusiness electorate—that is, the state's electorate voted for the Democratic and Progressive presidential candidates in 1912—was less likely to have been regulated by a state commission.

## 7. Concluding Remarks

States that authorized municipalities to regulate gas rates had more municipally owned gas companies than states that prohibited municipal regulation. State regulation, in contrast, reduced the likelihood of municipal ownership. Further, gas companies located in small towns were more likely to have been municipally owned. Consistent with the commitment hypothesis and the small markets hypothesis, these results are best understood and appreciated within the context of existing work. On one level, these results speak to the usefulness of Levy and Spiller's (1994) comparative institutionalism. Although there are several studies that formally test various aspects of the new institutional economics, carrying out such tests remains a difficult task. Emulating Levy and Spiller, this article illustrates an approach that could guide future empirical work. More important, the results corroborate the widely believed, but largely untested, argument that secure property rights are necessary to promote private capital formation.

On another level, these results speak to the generality of Pashigian's (1976) analysis. Pashigian shows that municipal regulation drove private transit systems out of business. As private systems shut down, local governments took them over, subsidizing them with tax dollars. State regulation was less burdensome than local regulation. It did not drive private transit systems under and result in government takeovers. That Pashigian and this article identify such similar patterns is striking. It is striking because the articles differ in the industries they study and the historical settings they consider. Pashigian looks at urban transit systems during the late twentieth century; this article looks at the gas industry during the late nineteenth and early twentieth centuries. Different industries; different historical settings. Same results. It does not get much more robust than this.

Finally, the results here suggest two avenues for future research. First, although this article does not support the patronage hypothesis, data on wages and employment in public and private enterprises would allow a more powerful test of the hypothesis. (As noted earlier, I am currently collecting and analyzing such data). Second, although this article helps explain the intra-industry variation in public ownership, public ownership also varies across industries. For example, while public ownership is very common in the water and sewer industries, it is less common in the gas and electric industries. What explains

Table 8. Two-Stage Probits

| Variable | System of Equations: $y_1 = \alpha_1' + \gamma_2' y_2 + \gamma_3' y_3 + \beta_1' X_1 + \epsilon_1'$ (2); $y_2 = \alpha_2 + \gamma_1 y_1 + \beta_2 X_2 + \epsilon_2$ (3) | | System of Equations: $y_1 = \alpha_1'' + \gamma_2'' y_2 + \gamma_3'' y_3 + \beta_1 X_1 + \epsilon_1''$ (4); $y_2 = \alpha_2' + \gamma_1' y_1 + \beta_2'' X_2 + \epsilon_2'$ (5); $y_3 = \alpha_3 + \gamma_1'' y_1 + \gamma_2''' y_2 + \beta_3 X_3 + \epsilon_3$ (6) | | |
|---|---|---|---|---|---|
| | Equation (2) | Equation (3) | Equation (4) | Equation (5) | Equation (6) |
| $y_1 = 1$ if company municipally owned; | dependent | 0.319 | dependent | −0.048 | −0.103 |
| 0 otherwise | variable | (0.39) | variable | (1.61) | (1.63) |
| $y_2 = 1$ if company municipally regulated; | 0.569[c] | dependent | 0.262[a] | dependent | 0.030 |
| 0 otherwise | (2.70) | variable | (5.49) | variable | (0.38) |
| $y_3 = 1$ if company state regulated; | −.323[d] | ... | −0.253[a] | ... | dependent |
| 0 otherwise | (2.31) | | (4.24) | | variable |
| $X_1 = (X_{11}, X_{12})$: | | | | | |
| $X_{11}$ = population of city where company located | −0.15-04[a] (7.17) | ... | −0.14-04[b] (3.17) | ... | ... |
| $X_{12} = 1$ if general municipal ownership law in co's state | −0.057 (0.50) | ... | 0.152 (1.15) | ... | ... |
| $X_2 = (X_{21}, X_{22}, X_{23})$: | | | | | |
| $X_{21}$ = persons per square mile in co's state (in thousands) | ... | −0.014[a] (9.48) | ... | −0.015 (0.03) | ... |
| $X_{22}$ = miles of gas mains per 1,000 persons, co's city | ... | 0.048[b] (3.03) | ... | 0.085 (0.70) | ... |
| $X_{23}$ = miles of gas mains per 1,000 persons, co's state | ... | 0.085 (0.94) | ... | 0.201 (0.55) | ... |
| $X_{24}$ = percent of cities in co's state with gas service | ... | 1.39[a] (8.12) | ... | 1.45[a] (18.74) | ... |
| $X_3 = (X_{31}, X_{32})$: | | | | | |
| $X_{31}$ = percent of electorate in co's state that voted for progressive party | ... | ... | ... | ... | −4.12[a] (5.73) |
| $X_{32}$ = percent of electorate in co's state that voted for democratic party | ... | ... | ... | ... | −3.30[a] (8.57) |

a. significant at the 0.001 level (two-tail test).
b. significant at the 0.005 level (two-tail test).
c. significant at the 0.01 level (two-tail test).
d. significant at the 0.05 level (two-tail test).
Symptotic t-statistics are in parentheses.

the interindustry variation in public ownership? These and other questions need answers.

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