WATER SUPPLY IN CALIFORNIA: ECONOMIES OF SCALE, WATER CHARGES, EFFICIENCY, AND PRIVATIZATION

BY

John Houtsma

Department of Economics

Mount Allison University

Sackville, NB

FAX: (506) 364-2625

Email: c/o pjcormie@nbnet.nb.ca

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In a water supply industry that consists of private and public providers, questions of interest include the following:

- Are there significant economies of scale, and if so, at which population size levels?
- How, on average, do private and public sector charges compare?
- Has there, over time, been a systematic change in the gap between private and public sector charges?
- Can it be demonstrated that investor-owned companies are more efficient than their public-sector counterparts?

The first three questions will be answered by a statistical analysis of water charge data collected by Black & Veatch Corp. on a biannual basis for the period 1995 – 2003. The remaining question received an affirmative answer in a 1996 study commissioned by the Reason Foundation, a conservative think-tank located in Los Angeles.

The current paper re-examines the last question in light of a broader literature on privatization, and by drawing on the more extensive and more representative data set referred to above. The findings and conclusions reached in this paper provide a new and quite different perspective on the fundamental question as to who should supply the consumers with water.

In the past communities have opposed proposals for privatization because concerns over whether the Public Utilities Commission would, or would be able, to keep water rates at acceptable levels. The present paper also sheds light on this question.

I INTRODUCTION AND OUTLINE

Who should supply consumers with water? It is perhaps not surprising that this age old question has received conflicting answers and that the debate continues. Some are convinced that for the sake of efficiency it should be done by the private sector. Others do not think that private sector providers are necessarily more efficient than public sector providers. And then there are other criteria such as levels of service, water quality, and leakage rates in water-short-areas.

Assuming that water charges by-and-large reflect cost levels, and recognizing the importance of regional differences in average charge levels, the first basic question is whether there are clear economies of scale in the water supply industry that have a different impact on private sector and public sector charge levels. The answer to this question determines which population size groups can be included in the private-public average charge comparisons, without introducing an economies of scale bias.

Next follows a comparison of private vs public average charge levels for places with similar population sizes. This is followed by a profile of rate increases over the period 1995 – 2003, distinguishing between private and public providers. The final part of the water charge section focuses on charge comparisons in two counties, namely Los Angeles County and Santa Clara County.

The water charge data in this study were obtained from Black & Veatch Corporation's biannual surveys for 1995, 1997, 1999, 2001 and 2003. The charges represent what a typical family has to pay each month for using 1500 cubic feet, 11,000 gallons. The latest survey, for 2003, covers 459 California cities or service areas served by 349 water surveyors.

Water supply by a private firm in Boston dates back to 1652, and the dominance of privately owned systems continued well into the 19th Century. Nowadays it is estimated that in the United States the private sector has a market share of about 20%. The water supply industry has been the subject of a number of comparative efficiency studies since the mid-1970's. Part III of the paper presents, in summary form, a brief literature review.

A study by Neal et al (1996) entitled "Restructuring America's Water Industry: Comparing Investor-Owned and Government Water Systems" recommends that water should be provided by the private sector. This study was sponsored by the Reason Foundation, a conservative think-tank based in Los Angeles. Among its most controversial findings were the following three:

- "Investor-owned water companies provide comparable water services to consumers at the same price as government-owned companies, even though they pay taxes and do not receive non-operating income."
- "Investor-owned companies are substantially more efficient in their operation of water services than government-owned water companies.'

- "The net cost of capital is higher for government-owned water companies than for investor-owned water companies."

Part IV of the paper will examine these claims, drawing on the data provided by Neal et al. It will be demonstrated that these claims are not supported by the facts.

Part V presents, in summary form, a list of conclusions.

II CALIFORNIA'S AVERAGE WATER CHARGES, 1995-2003

At the outset it should be recognized that the cost utilities, private as well as public, face inherently different. Factors such as geographic location, demand, political climate, water source, level of treatment, and age of system can greatly influence cost and rates. Careful attention must be given to these factors before drawing conclusions from a simple rate comparison.

It should also be recognized that in the United States regulatory, finance, taxation and other policies do not provide a level playing field for competition or expansion of the private water sector. Therefore, we should not necessarily expect to find equal water charges for water supply systems of equal size or in the same region. These factors that cause a cost of revenue disadvantage for the private sector will be reviewed in the last part of the paper.

CALIFORNIA'S REGIONAL WATER CHARGE DIFFERENCES

Table 1 illustrates the extent of the water charge differences across the State. The lowest rates are found in the San Joaquin Valley, whereas the highest rates are in the Coastal Region. The Northern and Southern Regions have similar average water rates. Within each region there is a wide range of rates as the data for 2003 illustrate. What is important to note is that the average charges for the Coastal (highest) region are almost 2½ times those for the San Joanquin Valley (lowest) region.

Table 1 CALIFORNIA'S REGIONAL AVERAGE WATER CHARGES, 1995-2003

REGION	SURVEY AVERAGES					RANGE
	1995	1997	1999	2001	2003	2003
San Joaquin Valley	$14.70	$15.54	$16.18	$16.15	$17.64	$9.00-$36.60
Northern	$24.72	$26.08	$27.45	$29.76	$31.85	$7.50-$112.60
Southern	$24.58	$26.45	$27.82	$29.28	$30.58	$9.45 - $77.72
Coastal	$35.50	$38.01	$38.33	$38.40	$40.31	$12.49 - $85.13

Source: California Water Charge Survey, Various Years.

The four California regions include the following Counties:

- San Joaquin Valley: Fresno, Kern, Merced and South, San Joaquin and Tular Counties.
- Northern: Alameda, Butte, Calaveras, Contra Costa, El Dorado, Humboldt, Lake, Marin, Mendocino, Placer, Sacramento, San Mateo, Santa Clara, and Sonoma Counties.
- Southern: Imperial, Los Angeles, Orange, Riverside, San Bernandino, San Diego, and Ventura Counties.
- Coastal: Santa Barbara, San Luis Obispo and Monterey Counties.

ECONOMIES OF SCALE?

The levels of average water charges for communities of different sizes were used to get a sense for whether or not there are economies of scale in the water supply business and, if so, at which levels of population. The underlying assumption, of course, is that the water charges tend to reflect cost of production. Although we know that this is not always the case, we assume that and deviations are random as far as size is concerned.

The results are quite similar for each of the four years (1995, 1997, 1999 and 2001) for which these charge profiles were computed. All four years are shown in Figure 1. In 1995 the highest average rates were in communities with populations between 8,000 and 10,000. In 2001, communities between 1,000 and 2,000 had the highest average rates. In all four years the lowest rates were enjoyed by cities with population sizes between 250,000 and 500,000. It is interesting to note that the smallest communities, with populations less than 1,000, did clearly not have the highest average rates.

As far as economies of scale are concerned, clearly lower charge levels are in effect for communities with population sites in excess of 10,000. Yet a further drop is observed beyond the 125,000 level. Again somewhat surprising perhaps is the fact that the largest cities, those with populations in excess of 500,000, did not have the lowest rates. There are only four cities in this group, and besides size, factors such as location, and water source, play a role in each one.

PRIVATE SECTOR VS PUBLIC SECTOR CHARGE LEVELS

Again four profiles were developed to compare average rates for each of the population size categories. The results for each of the four years were similar. Figures 2 and 3 show the average charge comparisons for 1995 and 2001, respectively. Summarizing the results, in 1995 the private sector's average charges were higher in 12 size classes, lower in 4, and approximately equal in 2. In 2001, six years later, the private sector had higher rates in 14 classes, lower in 2, and an equal average rate in 1 size class.

It should be pointed out that the comparisons in the five largest size classes, those with populations in excess of 100,000, are note very meaningful because, the private sector in California only manages five cities with population levels in excess of 100,000. In contrast, the public sector manages 42 cities in these size classes. For this reason, in

further rate comparisons, the focus will be on communities with population sizes less

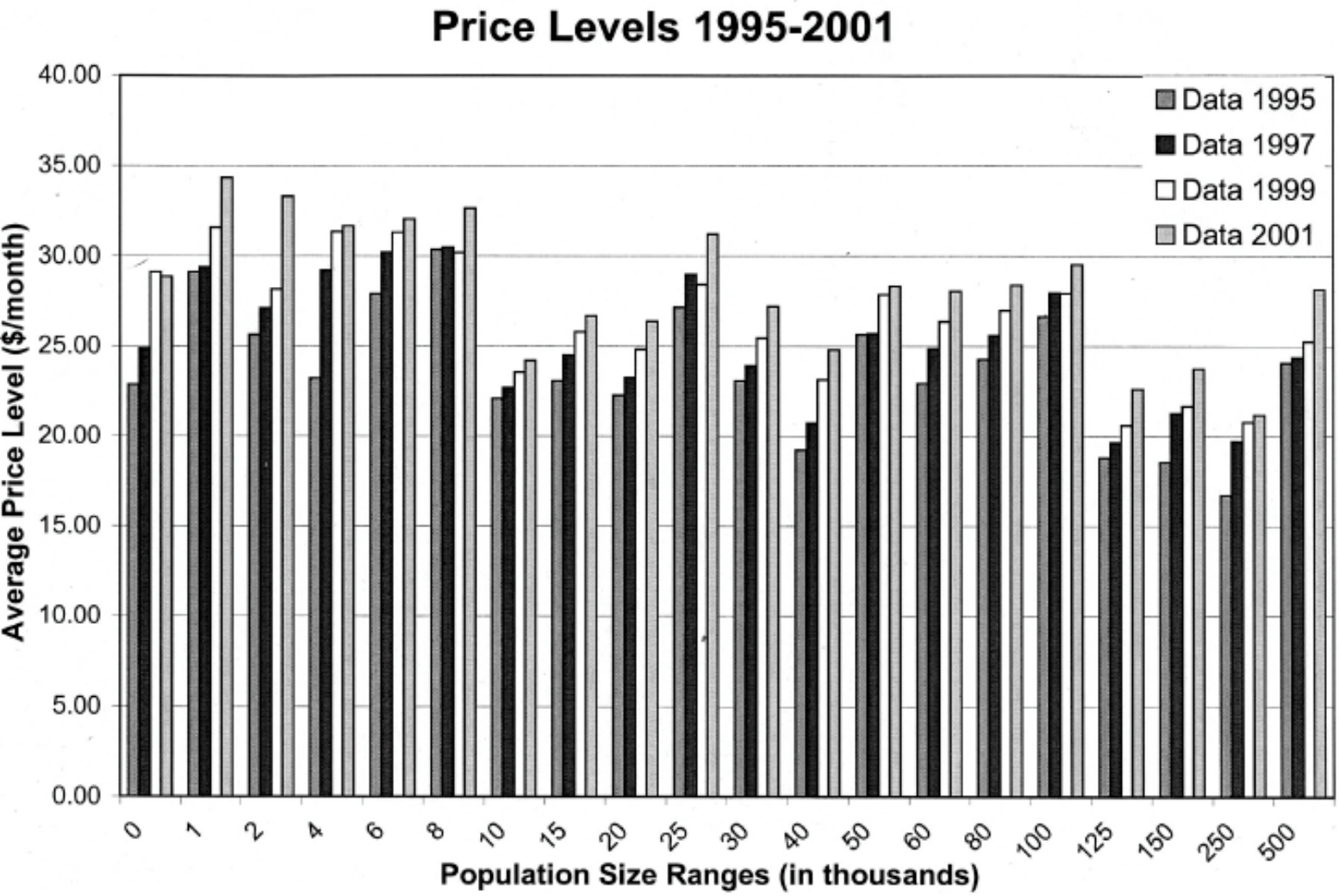

FIGURE 1

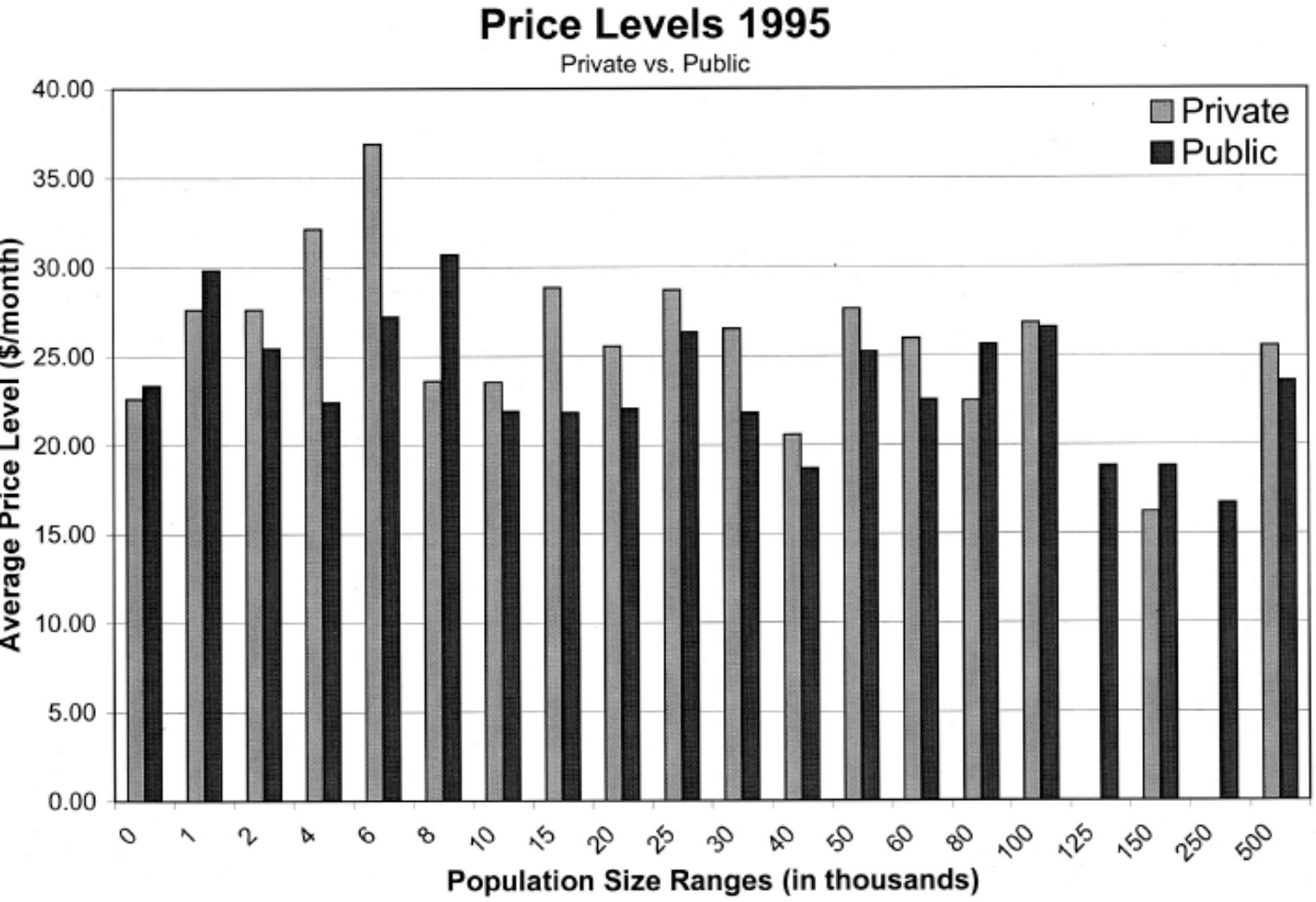
Price Levels 1995
Private vs. Public
Private
Public
Average Price Level ($/month)
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0
1
2
4
6
8
10
15
20
25
30
40
50
60
80
100
125
150
250
500
Population Size Ranges (in thousands)

FIGURE 2

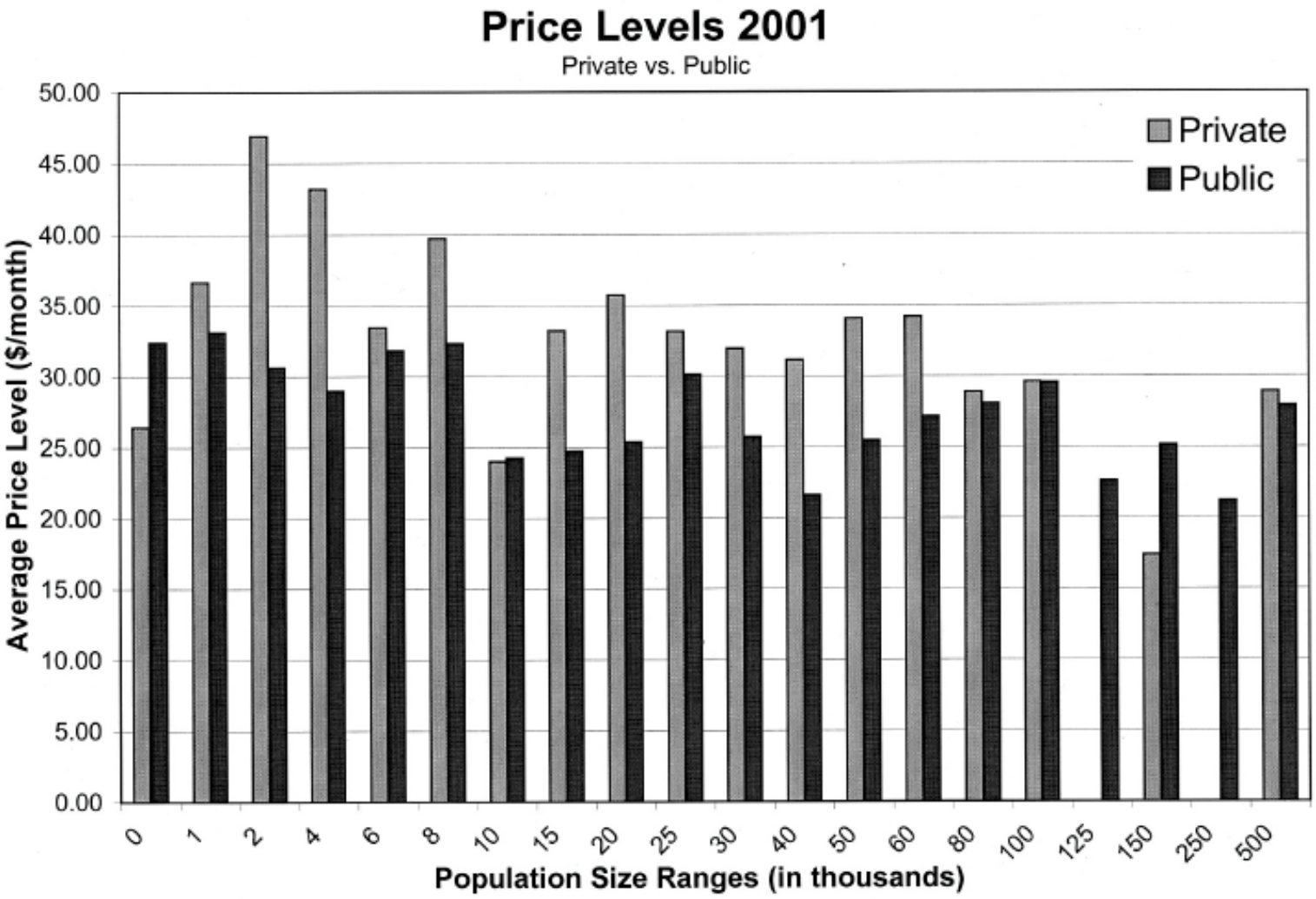
Price Levels 2001
Private vs. Public
Private
Public
Average Price Level ($/month)
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0
1
2
4
6
8
10
15
20
25
30
40
50
60
80
100
125
150
250
500
Population Size Ranges (in thousands)

FIGURE 3

than 100,000. This will also eliminate the economies of scale factor that would bias the results in favor of public sector rates.

Over the years new communities were added to the Black & Veatch Survey, and in some years a particular community did not report a charge level. Clearly, the composition of the survey affects the outcome. For this reason the results shown in the next table are those of the same communities reporting in each of the five years.

Table 2 shows the average rates for 74 communities supplied by the private sector and 314 by the public sector. In each of the five years the average private sector charges exceed the public sector averages. In each of the last three years the survey, 1999, 2001, and 2003, the difference is approximately 20%, with the private sector charges exceeding, on average, the public sector charges by about 20%.

Table 2 CALIFORNIA'S AVERAGE WATER CHARGES 1995 - 2003

PROVIDERS	YEAR					# COMMUNITIES <100,000	AVERAGE POPULATION SIZE	% RATE INCREASE 1995-2003
	1995	1997	1999	2001	2003			
Population Sizes < 100,000								
Private	**$25.90**	**$28.15**	**$31.14**	**$32.54**	**$34.48**	**74**	**34479**	**33.1**
Public	**$23.87**	**$25.02**	**$26.01**	**$27.16**	**$28.40**	**314**	**27270**	**19.0**
Ration [%] Private / Public	**108.5**	**112.5**	**119.7**	**119.8**	**121.4**			

Two other facts should be noted. First, the average population size, now that cities with population sizes of 100,000 or more have been omitted, is greater for private sector supplied communities. Second, private sector charges have grown at a faster rate than public sector charges. Over the eight year period covered by the surveys, the overall private sector average has increased by 33%, whereas the public sector average went up by 19%, slightly more than half of this.

Table 3 provides a further breakdown of average rates as they were changed over time. The top half of the table shows the principal private providers. The California Water Service Company dominates the overall outcome with 47 of the total of 74 observations in the surveys. Its average rates increased by 40.8% between 1995 and 2003, the largest increase observed. For all private providers covered by this table the increase over 8 years was 33%, as reported in Table 2.

The lower portion of the table lists the main public sector providers. Here the East Bay Municipal Utilities District shows an overall increase of 33.4%, equal to the private sector average. This is in contrast with the overall average for 263 single community public provider's which shows an increase of 20.2%. Without knowing more about East Bay Municipal Utilities District we are unable to explain this difference in average rate changes.

Table 3

PRIVATE PROVIDERS' AVERAGE WATER CHARGES								
COMPANY'S NAME	**YEAR**					**# COMMUNITIES < 100,000**	**AVERAGE POPULATION SIZE**	**% RATE INCREASE 1995-2003**
	1995	**1997**	**1999**	**2001**	**2003**			
Azusa Light & Water Co.	**$15.95**	**$15.95**	**$21.17**	**$21.17**	**$22.35**	**5**	**38,044**	**39.40**
California American Water Co.	**$37.45**	**$40.75**	**$40.70**	**$39.13**	**$38.40**	**9**	**20,340**	**2.5**
California Water Co.	**$20.01**	**$21.78**	**$22.33**	**$22.61**	**$23.40**	**7**	**53,980**	**16.4**
San Jose Water Co.	**$25.53**	**$25.98**	**$27.45**	**$28.88**	**$34.79**	**6**	**39,652**	**36.3**
Southern California Water Co.	**$25.61**	**$28.41**	**$32.49**	**$34.86**	**$36.06**	**47**	**33,682**	**40.8**
All private Providers	**$25.87**	**$28.24**	**$31.35**	**$32.81**	**$34.48**	**74**	**34,479**	**33.3**

PUBLIC PROVIDERS' AVERAGE WATER CHARGES								
DISTRICT NAME	**YEAR**					**# COMMUNITIES <100,000**	**AVERAGE POPULATION SIZE**	**% RATE INCREASE 1995-2003**
	1995	**1997**	**1999**	**2001**	**2003**			
Coachella Valley Water	**$13.78**	**$14.11**	**$14.11**	**$14.41**	**$14.41**	**6**	**20.211**	**4.5**
East Bay Municipal	**$24.27**	**$27.48**	**$28.89**	**$30.08**	**$32.37**	**25**	**27,342**	**33.4**
Eastern Municipal Water	**$27.77**	**$28.47**	**$28.47**	**$28.47**	**$25.76**	**4**	**35,200**	**-7.2**
El Dorado Irrigation	**$17.45**	**$21.88**	**$21.28**	**$21.63**	**$20.94**	**5**	**15.03**	**1.2**
Marin Municipal Water	**$40.60**	**$39.78**	**$41.26**	**41.26**	**$41.25**	**11**	**12,122**	**1.6**
Other Providers	**$23.43**	**$24.43**	**$25.42**	**$26.67**	**$28.40**	**263**	**28,170**	**20.2**
All Public Providers	**$23.87**	**$25.02**	**$26.01**	**$27.16**	**$28.40**	**314**	**27,270**	**19.3**

At the beginning of this section, and more specifically in Table 1, the significance of regional differences was illustrated. Can this factor be eliminated in private-public sector charge comparisons is our next question. There appear to be two such opportunities. First, the Southern California Water Company has a large presence in Los Angeles County. And second, the San Jose Water Company operates exclusively in Santa Clara County.

Tables 4 and 5 show the rate comparisons within each of these two counties. The results illustrated by these two tables are consistent with our earlier findings. Within the same county, each of these two companies had average water charges that exceed the corresponding public sector averages by more than 20%.

Table 4 RATE COMPARISONS WITHIN LOS ANGELES COUNTY

PROVIDERS	YEAR					# COMMUNITIES <100,000
	1995	1997	1999	2001	2003	
Southern California Water Company				$35.23	$35.80	34
Public Providers	N/A	N/A	N/A	$28.19	$28.30	19
Ratio (%) PRIVATE / PUBLIC				125%	130%	

Table 5 RATE COMPARISONS WITHIN SANTA CLARA COUNTY

PROVIDERS	YEAR					# COMMUNITIES <100,000
	1995	1997	1999	2001	2003	
San Jose Water Co.	$25.53	$25.98	$27.45	$28.88	$34.79	7
Public Providers	$20.85	$20.57	$21.60	$24.51	$27.35	9
Ratio (%) PRIVATE / PUBLIC	122%	126%	127%	118%	127%	

III A BRIEF LITERATURE REVIEW OF WATER SUPPLY EFFICIENCY STUDIES

Private water companies pioneered the early development of the United States water industry. The Water Works Company of Boston, for example, was established in 1652, and is cited as the country's first water company. Other companies followed. The dominance of private systems continued well into the 19th century (The Hudson Institute, 1999).

It is estimated that currently the public sector has a market share in the United States of about 20%. With the abundance of data, a number of comparative efficiency studies have been conducted and published since the mid-1970s. Seven studies, listed below, were reviewed by Donahue, (1989). Donahue concluded:

"The weight of evidence, then, favors the conclusion that there is no tendency for private water utilities to be any more productive" (p. 75).

Water Supply Efficiency

Study	Conclusion
Mann and Mikesell, 1976	Public more efficient
Crain and Zardkoohi, 1978	Private more efficient*
Bruggink, 1982	Public more efficient
Feigenbaum and Teeples, 1983	No significant difference
Feigenbaum, Teeples, and Glyer, 1986	No significant difference
Byrners, Grosskopf, and hayes, 1986	No significant difference
Teeples and Glyer, 1987	No significant difference

Source: Donahue (1989)

Lambert, Dichen, and Raffiee, 1993	No significant difference
Bhattacharyya, Harris, Naraynan and Raffiee, 1995	Public more efficient on average

* Due to a methodological question this finding is not supported by Bhattacharyya et al (1994).

The studies by Lambert et al (1993) and Bhattacharyya et al (1995) examine more recent data. Their findings are consistent with those of the earlier studies.

IV RESTRUCTURING AMERICA'S WATER INDUSTRY?

Should the United States follow England's example and privatize its water industry? The authors of the Neal et al (1996) study think so. In what follows we will examine their principal findings that are the basis for this recommendation.

Their database consists of the following. On the investor-owned side are three water utilities, California Water Service Company, San Jose Water Company, and Southern California Water Company, which together service 60% of all customers served by investor owned companies in California. On the government-owned side are almost all the public suppliers in two counties, namely Alameda and Contra Costa Counties. Combined, these government-owned companies are approximately the same size as the three investor owned water utilities. During the period of study they both had revenue streams ranging from $325 to $350 million per year. The principal financial information for each group, expressed in $$ per connection is summarized in Table 6.

Table 6 FINANCIAL SUMMARY OF WATER COMPANY OPERATIONS
(PER CONNECTION)

	Investor Owned	Government Owned
Total Operation Revenue	**$426**	**$425**
Total Operation Expense	**($273)**	**($330)**
Depreciation	**($29)**	**($75)**
Operation Earnings	**$124**	**$20**
Employees per 1000 connections	**1.62**	**3.49**
Salaries (Per connection)	**$57**	**$158**
Non-Salaries Expenses	**$216**	**$172**
Maintenance	**$23**	**$39**

Source: Neal et al (1996) Tables 1 and 6.

The comparison of revenue and costs per connection in the top portion of Table 4 lead Neal et al to the following conclusion:

> "Since both investor-owned and government-owned water companies have almost identical streams of operating revenue, converting government-owned utilities to investor-owned utilities would yield efficiencies in operation (emphasis added) of ($124 minus $20) $104 per connection"

If "all other things were equal", or in other words we were "comparing apples with apples," this would indeed be the case. However . . ., there are a number of differences that need to be taken into account before valid comparisons can be made. The most obvious differences are a result of the following:

1. Difference in locations (Counties) and cost levels.
2. Difference in wage levels.
3. Difference in maintenance expenses
4. Difference in depreciation

The importance and significance in terms of costs OF the location factor is illustrated by the data in table 7. This table shows that the charge levels, and presumably the cost of supplying water, are higher in Almeda and Contra Costa Counties than the overall average of California as well as those in Los Angeles and Santa Clara Counties. Los Angeles County is where the Southern California Water Company does most of its business, whereas all the places supplied by the San Jose Water Company are located in Santa Clara County. Incidentally, its largest customer is San Jose, a city with a population of 835,000, which is a major source of economies of scale. The third firm, the California Water Service Company, operates in a number of counties.

TABLE 7 DIFFERENCES IN CHARGE LEVELS BY COUNTY AND PROVIDER

COUNTIES AND PROVIDERS	1995	1997
All California Public Providers	**$23.57**	**$24.80**
***Alameda and Contra Cost Counties All (Public) Providers**	**$26.88**	**$29.18**
***Los Angeles County All Providers incl. Southern California Water Company**	**$25.85**	**$28.70**
***Santa Clara County**		
All providers	**$23.24**	**$23.62**
San Jose Water Company	**$25.53**	**$25.98**
All Public Providers	**$20.85**	**$20.58**

To assume, as Neal et al do implicitly, that in case the private sector were to supply Alameda and Contra Costa Counties their total operating expense per connection would remain at $273, is clearly an error. These counties are located in higher cost regions of the State, increasing operating expenses. Along with this the investor-owned firms would have to raise total operating revenue per connection. Without this operating earnings would suffer, and be less than $124.

Neal et al indicate that the government-owned organizations pay higher wag rates. They provide sufficient information to put a dollar figure on this: it cost $35 per connection in additional labour costs. Eliminating this, even if it could be done, does definitely not produce an efficiency gain, since it is a transfer from water users to workers. Similarly, reducing depreciation from $75 to $29 and maintenance from $39 to $23 does not necessarily create efficiency gains. If efficiency gains could be achieved this way, why not reduce depreciation and maintenance to zero?

Subtracting the water rate difference of $35 and the maintenance difference of $16 from the government-owned total operating expense reduces the $330 to $279, close to the $273 reported for the investor-owned firms. Furthermore, even if $273 were to increase by only 5%, due to the change in location, to $287, the public sector would show a small expense advantage.

What was not addressed in the Neal et al study was a comparison of the values of the real capital, the buildings, equipment, pipes, etc. There are four indicators in the data provided that seem to indicate that the public sector is, somehow, operating with more capital per connection.

These four indicators are listed in Table 8:

TABLE 8 COSTS STEMMING FROM PHYSICAL CAPITAL
(PER CONNECTION)

	INVESTOR OWNED	GOVERNMENT OWNED
Depreciation	**$29**	**$75**
Cost of (Financial) Capital	**$66**	**$92**
Maintenance	**$23**	**$39**
Employees per 1000 Connections	**1.62**	**3.49**

In light of these major differences it stretches credibility to claim that these operations are the same, and are producing similar services. They do have to meet the same water quality standards. But what about customer service, and for example, leakage rates? With greater investments in physical capital, as seems to be the case, and more than twice the number of employees per connection, it is incumbent on Neal et al to demonstrate that the overall qualities of the water supply services are the same. Putting this somewhat differently, before being able to claim efficiency advantages for the private sector they would have to demonstrate the redundancy of the additional depreciation, cost of (financial) capital, maintenance, and employees of government-owned water supply organizations.

A final note on the net cost of financial capital. Neal et al calculate the cost of debt, including lost taxes, at 8.09% for investor-owned utilities vs 8.27% for government-owned utilities. If the dividends received by the shareholders also amounted to 8.09% (or less), the net cost of capital would be higher for government-owned companies. However, since the regulator, The California Public Utilities Commission allows for higher rates of return on equity capital, the net cost of capital (a weighted average of interest on debt ($31) and dividends ($35) is higher for the private sector.

The Investor Fact Sheet of the American States Water Company dated June 30, 2001, confirms the above. The American States Water Company is the parent company of the Southern California Water Company. At the time when interest rates and the cost of borrowing by means of bonds are relatively low, in the 6% range perhaps, the company's return on total capital was 9.2%, its authorized return on Common Equity was 10%, and its Actual Return on Common Equity was 10.2%.

V SUMMARY AND CONCLUSIONS

The following points summarize the main findings discussed in this paper.

1. There are significant economies of scale in California's water supply industry. Average charge levels drop for communities with population sizes in excess of 10,000. A further drop was observed when population levels exceed 125,000.

2. On average, private sector water charges exceed public sector rates. In recent years the difference has increased to about 20%.

3. A number of studies of comparative efficiency of water utilities conducted since the mid-1970's did not find investor-owned water utilities to be more efficient than government-owned utilities.

4. The claim, made by Neal et al (1996), that investor-owned water companies provide comparable water services to consumers at the same price as government-owned water companies lacks credibility. When major differences in inputs, both physical capital, it's maintenance, and labour are considered, it seems most unlikely that consumers receive "comparable services." A difference in the region where the services are produced, and the associated lower costs for investor-owned utilities, may well explain the equality of operating revenue per connection observed in their study.

5. When adjustments are made to Total Operating Expense in an attempt to "compare apples with apples" (to make other thins equal), their claim that investor-owned companies are "substantially more efficient" is no longer valid. On a related issue, the relatively high authorized returns on common equity make the net cost of capital higher for the regulated investor-owned water companies than for government-owned companies which pay a lower rate of interest on their debt.

6. Generally speaking it will be difficult to make the case for "restructuring", or privatization, of a community's water supply on the grounds of efficiency, unless it is poorly managed by the municipal organization. No doubt the private sector has in the past, and will, continue to present helpful bench-marks and challenges to managers of government-owned operations.

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