PRICING BY STATE-OWNED ENTERPRISES: THE CASE OF POSTAL SERVICES

R. Richard Geddes
Associate Professor
Policy Analysis and Management
123 Martha Van Rensselaer Hall
Cornell University
Ithaca, NY 14853
Phone: (607) 255-8391
Fax: (607) 255-4071
rrg24@cornell.edu

August 18, 2006

ABSTRACT

Sappington and Sidak (2003) develop a model of state-owned enterprise (SOE) pricing behavior in which firms maximize a weighted average of revenues and profits. The model predicts that SOEs will lower prices in more-elastic markets and raise them in less-elastic markets if the weight they place on profit is non-zero. SOEs often compete with private firms in some business activities, but enjoy monopoly power in others. This results in high demand elasticities in competitive markets relative to monopoly markets. The U.S. Postal Service has a monopoly over letter mail, but faces competition in other mail classes. The Postal Reorganization Act of 1970 relaxed the institutional constraints on pricing by the Postal Service to allow a test of several predictions flowing from the Sappington-Sidak SOE pricing model. The model's predictions are broadly confirmed. I extend the analysis to ask if the Postal Service's pricing in certain competitive markets constitutes a cross-subsidy from monopoly to competitive mail classes, and find evidence supportive of that contention. These findings suggest that SOE pricing behavior is worthy of antitrust scrutiny.

I am grateful to John Cawley, Dean Lueck, and to workshop participants at Cornell University, for helpful comments and suggestions. I am grateful to Spyros Xenakis for assistance with data, and to Robert H. Cohen for helpful conversations.

I. INTRODUCTION

It is common for state-owned enterprises (SOEs) to compete with private firms in at least one market. The pricing behavior of SOEs in those competitive markets is an important policy issue. Domestically, there are many industries in which government and private firms compete directly. The Tennessee Valley Authority and the Bonneville Power Authority, for example, compete with private firms in certain electricity markets.[1] Amtrak has hauled freight, including fruit, paper, auto parts, beer, and other goods via cars attached to its passenger trains, competing with private railroads and trucking firms.[2] The National Weather Service competes with private firms in specialized weather forecasting.[3] The federal government competes with private firms in tax preparation software.[4]

Government-private competition is even more important internationally. The world's largest financial institution, Japan Post, competes intensively in the savings and insurance businesses.[5] It was recently accused by a large private rival, Yamato Transport Company, of using its tax exemptions and monopoly in letter mail to illegally under-price its parcel delivery services.[6] Although the German government subsequently sold its

[1] The TVA also contemplates entering telecommunications and cable television. See "TVA Plan Seen by Critics as Unfair Grab for Power," *Wall Street Journal* [March 5, 1997, p. S1].
[2] See *e.g.* "Amtrak Gets Federal Approval to Carry Express Freight on Its Passenger Trains," *Wall Street Journal* [June 1, 1998, p. B2]. Amtrak essentially terminated this service in 2004.
[3] See National Research Council, *Fair Weather: Effective Partnerships in Weather and Climate Services* (Washington, DC: The National Academies Press) 2003. There is evidence that the National Weather Service has caused private meteorological services to lose customers. See Lott [1999, pp. 61-2].
[4] James W. Harper and Thomas M. Lenard, "Online Tax Preparation: Beyond the Bounds of E-Government," *Progress on Point: Periodic Commentaries on Policy Debate* (April 2002).
[5] "Japan's Postal Behemoth Digs In on Deregulation," *Wall Street Journal*, [January 6, 2000, p. A14]. Japan Post holds about $3 trillion in savings and insurance deposits.
[6] The Tokyo District Court did not grant Yamato's requested injunction because Yamato failed to carry out the proper analysis to prove "dumping" in violation of Japan's anti-monopoly law. See *Squire Sanders Antitrust & Trade Regulation Update* (February 2006), p. 5.

shares, it was majority shareholder when the European Commission found Deutsche Post AG (the German post) to be cross-subsidizing its parcel business in violation of Article 82 of the EC Treaty.[7] The Competition Appeal Board in Denmark found that the Danish Post, Post Danmark A/S, abused its dominant position through illegal price reductions to customers of a private rival.[8] Government-private competition is likely to be of greater concern with increasing liberalization and privatization around the world, and U.S. companies will confront more competition from SOEs or partially privatized firms as their operations globalize.

U.S. Postal Service (USPS) pricing behavior is important in its own right, however. It had almost $70 billion in revenue in 2005, and employed over 800,000 people. The USPS competes in package and express delivery,[9] and in electronic bill payment. The pricing behavior of so large a firm is likely to have an impact in those markets.

SOEs typically receive monopoly protection in some business sectors, tax and regulatory exemptions, reduced-rate borrowing from government authorities, and absolution from paying returns to equity holders. It is often assumed that, because they lack a profit motive, SOE's are unlikely to use those government-granted benefits to compete aggressively in competitive activities. Although the incentive and ability of SOEs to compete intensively in certain markets has recently been recognized in

[7] See Case COMP/35.141, Deutsche Post AG, 2001 OJ (L 125) 27. For a detailed discussion of the Deutsche Post case in the context of trade liberalization, see Cohen (2004).
[8] See "Post Denmark A/s abuse of dominant position confirmed by The Competition Appeal Board," (Copenhagen Stock Exchange, 1 July 2005). There were also fines of $1 million each levied against the Spanish post and La Poste, the French post, for abusing their dominant positions.
[9] This is true of posts in many countries. See OECD [1999, p. 8].

theoretical studies,[10] the empirical record remains sparse.[11] This paper helps to address that empirical gap.

In Section II, I describe the theoretical approach to SOE pricing developed by Sappington and Sidak, who show that public enterprises prefer a modified form of inverse-elasticity, or Ramsey, pricing.[12] I test the model through examination of the pricing behavior of the USPS in several competitive markets. I contend that organizational changes brought about by the Postal Reorganization Act of 1970 sufficiently relaxed regulatory controls on USPS pricing to allow a test of the hypothesis that SOEs will move toward modified Ramsey pricing when permitted.

I discuss the Postal Reorganization Act of 1970 in Section III. Through several key legal changes, the Act relaxed the pricing constraints on the USPS, allowing it to more effectively exploit its letter monopoly and other benefits and to lower prices in competitive mail classes. Given legislated monopoly over letter mail and intense competition in fourth-class and express mail, the model predicts lower relative prices in fourth-class and express mail after the Act's passage.

---

[10] See Lott [1990], Lott [1999], Sappington and Sidak [2003a], Sappington and Sidak [2003b], and Sokol [2003] and the references they cite. The Organization for Economic Co-operation and Development [OECD] surveyed postal operations across countries and stated that:

> Incumbent operators may, through a variety of actions, such as selective discounting, tying, or bundling, act anti-competitively in the competitive sectors of the postal market. These practices are equivalent to discounting on the competitive market which may (if the discount is significant enough) amount to anticompetitive cross-subsidization or predatory pricing. The likelihood of anti-competitive cross-subsidization is higher in the case of state-owned firms (which may not have strict profit-maximization objectives). [OECD 1999, p. 11].

[11] An important exception is Lott [1999, Chapter 4]. The chapter also illustrates the difficulty of conducting this type of empirical analysis.

[12] Sappington and Sidak [2003a].

I present the data in Section IV, and the empirical evidence in Section V. Both graphical and time-series evidence are broadly consistent with the model's predictions. Section VI concludes.

II. A Theory of Public Enterprise Pricing

Sappington and Sidak [2003] provide a theory of public enterprise pricing that is easily applied to postal services. They consider a multi-product firm that maximizes a weighted average of revenue and profit. This is a reasonable assumption. Government firms will prefer greater revenues because of potentially larger non-pecuniary benefits to managers, greater salaries, added consulting opportunities after leaving the firm, greater prestige, and more utility if the manager values the mission of the firm.[13] Also, SOEs may have specific assigned goals other than strict profit maximization. The USPS for example, is charged with providing universal delivery service throughout the United States.[14] While SOEs are often technically disallowed from earning profits (the USPS, for example, is required to break even),[15] they will be concerned about profits if employees or other groups possess an informal property right to the firm's residual.[16]

If the SOE values both sales and profit, then the objective function for an SOE providing *n* services is

$$\omega\left[\sum_{i=1}^{n} p_i Q_i(p)\right] + [1-\omega]\left[\sum_{i=1}^{n} p_i Q_i(p) - C(Q)\right]$$

[13] Niskanen (1971, p. 38), Johnson and Libecap (1989, p. 448).
[14] 39 U.S.C. § 101(a), (b).
[15] 39 U.S.C. § 3621.
[16] See e.g. Alchian and Kessel [1962].

where $\omega \in [0,1]$ is the weight the firm places on revenue, p_i is the price for service *i*, Q_i is the demand for the firm's i^{th} service, and $C(Q)$ is the cost of producing output Q. The firm's preferred prices are given by a modified inverse-elasticity rule of the form:

$$\frac{p_i - [1-\omega]\,\partial C_i / \partial Q_i}{p_i} = \frac{1}{\varepsilon_i}$$

where $\varepsilon_i = \left| \frac{\partial Q_i}{\partial p_i} \frac{p_i}{Q_i} \right|$ or the own-price elasticity of demand for service *i*, and $\partial C_i / \partial Q_i$ is the SOE's marginal cost of service *i*. That is, the SOE desires a proportional mark-up of price over modified marginal cost for service *i* that varies inversely with the price elasticity of demand for that service.

Two aspects of this modified inverse elasticity rule are noteworthy. First, if (1-ω) > 0, meaning the firm places some weight on profit, then it will inverse-elasticity price. Second, this condition implies that SOEs will scale down or "discount" marginal costs by (1-ω), meaning that they will be *less* concerned with losses incurred when pricing below costs. They will thus be *more* fierce rivals in competitive markets relative to similarly situated private firms. Intuitively, this is because the SOE values the expanded output that results from lower prices in competitive activities more than its private counterpart. Importantly, the SOE will desire such pricing given a monopoly in some business sectors.[17]

Elasticities are likely to be greatest where the SOE faces the most competition and lowest where its monopoly is most binding. This is true for postal services. The three

[17] It is unlikely that government ownership would persist without legally enforced monopoly, since monopoly rents would be rapidly eliminated through competition and the political benefits of ownership would dissipate, leading to privatization [Peltzman 1989].

largest classes of mail are first-class mail, standard mail (bulk advertising mail formerly known as third-class mail), and package services (formerly known as fourth-class mail). First-class mail is generally considered the most monopolized class because it is composed primarily of letters subject to the Private Express Statutes of 1845.[18] Consequently, first-class mail has a low own-price elasticity of demand. Over the six rate cases between 1990 and 2005, the elasticity for first-class mail averaged -0.225.[19]

Fourth-class mail is primarily parcels and bound printed matter.[20] Parcel post faces intense competition from United Parcel Service, FedEx Ground, and numerous trucking companies. Both parcel post and bound printed matter have significantly higher demand elasticites than first-class. For the six rate cases between 1990 and 2005, the elasticity for parcel post averaged -1.013 and bound printed matter averaged -0.445.

Express mail, while small in terms of revenue, is of interest because it faces competition from private services including UPS Overnight and FedEx, and has the highest demand elasticity.[21] Express mail was not established as a separate class until October 9, 1977, so data are not available prior to the Act. For the six rate cases between 1990 and 2005, the demand elasticity for express mail averaged -1.57.

---

[18] See Sidak and Spulber [1996, chapter 2] for a discussion of the legislative details of the U.S. postal monopoly.

[19] Elasticities are calculated during rate cases. Those rate cases were in 1990, 1994, 1997, 2000, 2001, and 2005.

[20] *1996 Annual Report of the United States Postal Service*, p. 40-1. Bound printed matter is a package service that typically consists of catalogs, directories, and books. It faces some competition from private delivery firms. I here adhere to the older class names because they were in effect for most of the time period studied.

[21] Sappington and Sidak [2003, p. 183] identify overnight and package delivery as the two main services where the USPS faces direct competition: "For example, government postal firms often offer overnight mail and package shipping services in direct competition with private delivery companies." This is true internationally. OECD (1999, p. 8) states that, "All countries reported that competition is allowed in some segments of the postal sector, especially express mail and parcel services."

A change over time in constraints on pricing allows a test of the model's prediction that SOEs prefer modified Ramsey prices. The 1970 Act provided such a change, as described below.

III. USPS Pricing and the Postal Reorganization Act of 1970

The Postal Reorganization Act of 1970 provides a test of the hypothesis that, when permitted, SOEs will reduce prices in competitive activities and raise them in monopolized activities. While the Act appears to have tightened some constraints on the USPS (e.g. the break-even requirement), it greatly reduced the intensity of pricing oversight. Before the Act, Congress itself set postal rates with the assistance of the Bureau of the Budget.[22] While this arrangement resulted in prolonged and sometimes acrimonious debate over rates, it nevertheless vested final authority for price setting in Congress and constrained the Post Office.[23]

The Act changed the rate-setting mechanism dramatically. It created the Postal Rate Commission whose five members are appointed by the president with advice and consent of the Senate.[24] The Postal Rate Commission was explicitly instructed to take the cost of providing specific classes of mail into account in rate making through

> the requirement that each class of mail or type of mail service bear direct and indirect costs attributable to that class or type plus that portion of all other costs of the Postal Service reasonably assignable to each class or type. [39 U.S.C. § 3622 (b)(3)]

[22] Tierney [1981, p. 104].
[23] Tierney [1981, p. 104-7] provides a detailed description of debate surrounding rate setting prior to reorganization.
[24] 39 U.S.C. § 3601, 3624 (1970).

This section of the Act has been interpreted as an attempt by Congress to move away from high markups on first-class mail that subsidize other mail classes, as had been the case prior to the Act.[25]

Congress, however, did not provide the Commission with adequate authority to carry out that mandate. First, the Commission must consider seven other criteria besides attributable costs when determining rates.[26] Second, the Commission was not given authority to actually *set* postal rates, as Congress had done, but only to *recommend* rates to the USPS Board of Governors after a rate change request from the Postal Service.[27] A recommended change in a rate proposal is sent to the Board for reconsideration, and the Board can overrule the Commission provided it is unanimous.[28]

The third weakness relates to information, and has two dimensions. The Commission lacks subpoena power. It must rely on testimony brought by participants in a rate hearing rather than demanding specific information. Also, there are large information asymmetries between the Postal Service and all other parties.[29]

---

[25] *National Association of Greeting Card Publishers v. United States Postal Service,* 569 F.2d 570 (D.C. Cir. 1976). The U.S. Court of Appeals for the District of Columbia Circuit in *National Association of Greeting Card Publishers v. United States Postal Service* stated that:

> Discrimination in postal ratemaking in favor of certain preferred classes of mail and to the great disadvantage of first-class mail has long been part of our postal system . . . In seeking postal reform through the 1970 Act it was a central and express aim of both Houses of Congress to end the abuses of this practice.

[26] These include "a fair and equitable schedule," "the effect of the rate increase upon the general public," and the "simplicity of the structure," among others. 39 U.S.C. § 3622.

[27] 39 U.S.C. § 3661 (b).

[28] 39 U.S.C. § 3625 (a), (d). The Board has used this power several times since 1970.

[29] Tierney [1981, p. 115] states, "Though mail users and competitive delivery systems are investing huge sums of money in acquiring their own information and expertise, they find themselves at a disadvantage in facing the relatively information-rich Postal Service." And "Though the Postal Service is supposed to honor requests from rate-case participants for information, it can effectively refrain from doing so merely by dragging it feet or claiming not to have the data."

Finally, the Commission does not have the power to regulate the *quality* of postal services.[30] The Postal Service itself is able to determine critical variables such as the number of deliveries per week, the speed of deliveries, the location of collection boxes, and waiting time at post offices, among others. This gives the USPS latitude on these additional margins. Overall, the Act effectively transferred control of Postal Service pricing from Congress to the USPS itself. John Tierney, an expert on postal reorganization, states, "It hardly seems appropriate that a government agency enjoying a monopoly over certain of its services has the ultimate power to put into effect whatever rates it chooses."[31]

This is somewhat too strong, since USPS pricing is not entirely unconstrained. The Commission's decision does force the Board to be unanimous in overruling it, and Congress still exercises oversight through committee hearings, and the Senate has input into board memberships.[32] The USPS would also likely face severe political pressure if it were to abruptly alter prices across mail classes.

Given demand elasticities and changes in institutional constraints caused by the Act, the following six predictions flow from the Sappington-Sidak model:

---

[30] On July 25, 1990, the Postal Rate Commission formally advised the USPS of its opinion that it should not implement a plan to downgrade nationwide first-class delivery standards. ("Summary of Postal Rate Commission Advisory Opinion on First-Class Delivery Standards Realignment," N89-1, July 25, 1990, copy on file with the author). On July 26, 1990, Postmaster General Anthony Frank responded in a letter stating that, "After consideration of the opinion, we have concluded that it does not warrant changing our scheduled Saturday implementation of overnight standard changes. . . " (letter of the Postmaster General to the Chairman of the Postal Rate Commission, July 26, 1990, copy on file with the author). See also Sidak and Spulber, p. 50.

[31] Tierney (1981, p. 210). Similarly, Sidak and Spulber [1996, p. 100] state: "Unfortunately, the current forms of public control of the Postal Service are ineffectual. In essence, the Postal Service is an unregulated monopolist that is constrained only in the sense that it is expedient for the enterprise not to show a profit." Also see Oster [1995, p. 114-5] who states, "In sum, the Act replaced the overly-meddlesome, highly politicized oversight of the postal organization by Congress with oversight by a board which is under almost no control at all, coupled with sporadic Congressional inquiry when particular interests are threatened!"

1. Holding marginal cost constant across mail classes, the price of first-class mail will rise after the Act
2. Holding marginal cost constant across mail classes, the price of fourth-class mail will decline after the Act
3. The price of express mail will decline over time
4. Accounting for changes in marginal cost, the percentage markup on first-class mail will rise after the Act
5. Accounting for changes in marginal cost, the percentage markup on fourth-class mail will decline after the Act
6. Accounting for changes in marginal cost, the percentage markup on express mail will decline over time

I describe the data used to test these predictions in Section IV below.

IV. DATA

Annual data for all mail prices were obtained from the *Annual Report of the United States Postal Service* for various years.[33] I examine data on mail prices from 1950 through 2004.[34] I divided revenue by mail volume for each class to obtain an average price for mail at the class level. Data on express mail prices are only available for 1978 through 2004 because express mail did not exist prior to 1978. Data on elasticites were

[32] Sidak and Spulber [1996, p. 95].
[33] Prior to 1996 this report was called the *Annual Report of the Postmaster General*.
[34] It is possible to obtain data prior to 1950, but this appears sufficient to study the effects of the Act, and the impact of World War II on mail volumes begin to affect the series for earlier years.

obtained from Docket R2005-1, USPS-T-7 (Witness Thress' testimony) and USPS-T-8 (Witness Bernstein's testimony).[35]

Cost data were obtained from *USPS Annual Tables, GFY 2004 TFP* (November 24, 2004), Table 32, "Quantity and Unit Cost Indexes and Cost Share of Mail by Class." These are the only available class-level data that approximate marginal cost. They come from the Postal Service itself, and begin in 1963.[36] I present summary statistics and means tests, where meaningful, for ten variables of interest in Table 1.

TABLE 1
Variables, Descriptive Statistics, and Means Tests

Variable Name	Description	All Years	1950-1970	1971-2004	Change
PRICE1	The real price of 1st class mail, defined as revenue from 1st class divided by its volume	0.289 (0.067)	0.213 (0.035)	0.337 (0.025)	0.123 [14.039]*
PRICE4	The real price of 4th class mail, defined as revenue from 4th class divided by its volume	2.30 (0.471)	2.69 (0.338)	2.06 (0.372)	-0.629 [-6.449]*
PRIEXP	The real price of express mail, defined as revenue from express mail divided by its volume	15.908 (3.086)	___	15.908 (3.086)	___
COST1	The real marginal cost of first-class mail	0.242 (0.052)	0.223 (0.042)	0.246 (0.039)	0.023 [1.408]
COST4	The real marginal cost of fourth-class mail	2.839 (0.523)	3.264 (0.686)	2.739 (0.430)	0.526 [2.074]*
RATIO1	The ratio of the price of first-class mail to the price of fourth-class mail	0.135 (0.007)	0.079 (0.009)	0.169 (0.034)	0.090 [14.565]*
RATIO2	The ratio of the price of first-class mail to the price of express mail	0.022 (0.004)	___	0.022 (0.004)	___
RATIO3	The ratio of the marginal cost of first to fourth-class mail	0.086 (0.013)	0.069 (0.002)	0.090 (0.011)	0.022 [10.453]*
PMKUP1	Percentage markup on first-class mail	24.079 (1.896)	11.343 (17.385)	27.076 (8.658)	15.733 [2.488]*
PMKUP4	Percentage markup on fourth-class mail	-32.760 (32.938)	-11.482 (24.901)	-37.766 (32.876)	-26.284 [-2.514]*

Note: Standard deviations are in parenthesis. *t*-statistics for "change" are in brackets. * indicates a *t*-statistic significant at the 5 percent level of confidence, one-tailed test. Monetary values are expressed in 2000 dollars.

[35] I am grateful to Spyros Xenakis of the Postal Rate Commission for assistance with these data.
[36] *USPS Annual Tables, GFY 2004 TFP* (November 24, 2004), Table 32, "Quantity and Unit Cost Indexes and Cost Share of Mail by Class."

The means tests in the "change" column of Table 1 are of interest. The average real price of first-class mail was over 58 percent *higher* after the Act than before, while the real price of fourth-class mail was over 23 percent *lower*. RATIO1 increased by 114 percent after the Act. This is consistent with the first two predictions. These changes are inconsistent with the notion that the Post Office was losing money prior to the Act and that all mail prices had to rise to ensure break-even.

Changes in marginal costs are also of interest. There was no significant change in the real marginal cost of first-class mail after the Act, but the real marginal cost of fourth-class mail increased. This is striking given that the real price of fourth-class declined after the Act. Like RATIO1, RATIO3 increased after the Act, but only by about one-fourth as much.

The final two variables are percent markups. The markup on first-class mail rose from 11.34 percent to 27.08 percent, an increase of 139 percent. The markup on fourth-class mail declined from -11.48 percent to -37.77 percent, a 229 percent reduction. This is consistent with the model's fourth and fifth predictions. Care must be taken in interpreting simple means tests, however, since they may be the result of time trends rather than the Act *per se*. I explore the evidence in more detail below.

V. Graphical and Time-series Evidence

I divide the following discussion into two sections. I first examine the data ignoring possible changes in marginal cost across mail classes. There are several reasons for this. First, the earliest year that data are available on costs across mail classes was 1963, leaving only eight years before the Act. Second, the only available cost data are from the Postal Service itself. They are un-audited and not subject to Commission

review. Third, as Sappington and Sidak emphasize, SOEs have an incentive to manipulate accounting data to help relax a binding regulatory constraint against pricing below marginal cost. In particular, they may understate accounting costs by classifying as overhead some of the costs that in reality vary with output. Alternatively, the SOE may assign some variable costs to a different product from that which actually incurred them. For these reasons, cost data may be subject to error. Finally, there were no changes in the Act that were likely to alter relative marginal costs across mail classes, so constant relative marginal cost is a reasonable assumption.[37]

A. Constant Relative Costs across Time

Graphs of all variables are presented in the Appendix. Figure 1 presents data across time for real first- and fourth-class mail prices. This figure suggests that the changes observed in Table 1 were not due to a time trend. Although both first- and fourth-class mail prices were rising before the Act, fourth-class prices began to fall soon after the Act's implementation in 1971, while first-class rates appear to move to a higher level. This change in relative rates is dramatically illustrated in Figure 4, which displays the ratio of first- to fourth-class rates, or RATIO1. RATIO1 was essentially constant prior to the Act, but upon implementation began a slow upward trend that did not peak until 1996. This is consistent with the model's first prediction.

Figure 4 is also compelling because there are few alternative explanations with which it is consistent. As noted, court findings suggest that relative first-class prices were already too high before the Act, so it is unlikely that Figure 4 reflects intentional

[37] Figure 3 displays first- and fourth-class costs, and does not suggest any clear trend before versus after

adjustment by the Commission. Moreover, it is unlikely that adjusting prices to cost would have taken 25 years were the Commission endowed with sufficient power to control prices.[38]

Figure 4 is more suggestive of the slow extraction of monopoly rents to increasingly subsidize competitive package delivery, subject to remaining political constraints, than of successful realignment of post-Act prices. Additionally, examination of Figure 1 suggests that the upward trend in real first-class prices leveled off in the mid-1980s. This implies that the increase in RATIO1 since then is due to declining real fourth-class prices, as shown in Figure 1.

Although the technology of mail delivery has changed substantially over this period, technological improvement is likely to have favored delivery of first-class letter mail rather than fourth-class packages.[39] It is also unlikely that technological change would cause such an abrupt shift beginning in 1971.

Another possibility is that Figure 4 reflects something unobserved but unique about fourth-class pricing. This trend is not unique to fourth-class prices, however. Figure 5 displays the ratio of first-class to express mail prices, or RATIO2. The trend here is not as pronounced as in Figure 4 and appears to have leveled off in recent years, but is still decidedly positive.[40] Between 1978 and 1996 this ratio increased by 93

---

the Act.

[38] This is consistent with what other scholars have observed. For example, Tierney [1981, p. 130] states:

> Yet it appears that the Postal Service and the rate commission so far have done little to end the placing of an inappropriate share of the rate burden on first-class mail to cross-subsidize other classes. Although the appeals court disapproved of further use of the inverse elasticity rule, the Postal Service and the rate commission continue to implicitly apply it.

[39] Important advances have been in optical character recognition and sorting technology for letters, but packages must still frequently be physically handled. See Geddes [2003b].

[40] Lott [1990. P. 246] recognizes the propensity to lower prices in express services:

percent. The real price of express mail fell by over 45 percent during that same period, as shown in Figure 2. This trend is consistent with the model's third prediction.

I also use intervention analysis to examine the effects of the Act on PRICE1, PRICE4, and RATIO1.[41] One approach is to employ classical regression analysis including a dummy variable for pre- and post-Act years. This leads to errors in inference if the series is non-stationary, since the assumptions of the classical regression model are not fulfilled.[42] This problem does not disappear in large samples. Non-stationarity can be detected through the use of unit-root tests, which I describe below.[43]

For a variable *y*, I estimate the equation

$$y_t = \alpha_o + \alpha_1 y_{t-1} + \alpha_2 t + \mu D_A + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \varepsilon_i$$

where *t* is time, and D_A is a binary variable equal to unity for all *t* equal to or greater than 1971, zero otherwise. Here *i* runs from 1 to *k*, where *k* is the number of lags. Following Perron (1989) lag length (i.e., the values of k) were chosen using *t* statistics on the coefficients of β_i. A particular lag length *k* was chosen if the *t*-statistic on β_k was greater than 1.60 in absolute value and the *t*-statistic on β_i for i > k was less than 1.60.

To test the unit root hypothesis, the *t*-statistic for the difference α_1 is from unity was

---

One widely recognized instance of charging different prices based upon the elasticity of demand is where the postal service has been charging a monopoly price for first-class mail and then using the proceeds to subsidize the provision of overnight mail delivery which they suffer losses on. The recent increase in first-class rates to 25 cents coincided with a simultaneous reduction in the government postal service's domestic overnight express mail charges to $8.75, despite the fact that the express mail service was already losing money at the higher price.

[41] See Enders [1995] for a discussion of intervention analysis.

[42] A series is covariance stationary if the mean and all auto-covariances are not affected by a change in time origin [Enders 1995, pp. 68-71]. Non-stationarity can produce a "spurious regressions" problem. [Granger and Newbold 1974].

[43] Enders [1995, 212-221].

compared to the critical value reported in Perron (1989).[44] If the *t*-statistic is greater than this critical value, then the null hypothesis of a unit root can be rejected, and inferences can be made with confidence.[45]

This procedure is appropriate for testing reorganization's effects for two reasons. First, the date of reorganization is known, and we wish to assess its effects. By utilizing dummy variables, the model assumes a single break at a known point in time. Second, this approach provides a single test that can at once distinguish between a unit root process and a trend-stationary series that has a single break.[46]

The Sappington-Sidak model predicts $\mu > 0$ for the PRICE1 series, $\mu < 0$ for the PRICE4 series, and $\mu > 0$ for the RATIO1 series. Estimates are reported in Table 2. The predictions of the Sappington-Sidak model are confirmed for all three series. After controlling for a time trend, the Act increased real first-class prices by about 2 cents, and reduced fourth-class prices by over 12 cents. The Act increased the ratio of first- to fourth-class mail by 1.1 percent, which is greater than a one standard deviation change in that variable.

TABLE 2
Intervention Estimates of the Effect of the
Postal Reorganization Act on Mail Prices

[44] Critical values for these *t*-statistics were compared to those reported in Table IV. B, Perron [1989, p. 1376]. Critical values depend upon the proportion of observations that come before the break, or λ, for each variable. For most series examined here, that value is 3.76 at the five percent confidence level.
[45] Unit root tests have lower power to distinguish between unit root and near-unit root processes, so rejection of a unit root is strong evidence of a stationary series. Enders [1995, p. 251].
[46] Other potential tests for unit roots require splitting the sample into two sub-periods and using Dickey-Fuller tests, which greatly reduces the degrees of freedom [Enders 1996, p. 245].

Variable	Sample Size	Number of Lags	Constant	Lag of Dep. Vbl. (α_1)	Time Trend (α_2)	Act Dummy (μ)
PRICE1	52	2	-0.052	0.813	0.0001	0.019
			(-0.074)	(7.747)**	(0.134)	(2.152)**
PRICE4	53	1	6.386	0.810	-0.003	-0.122
			(1.275)	(14.165)**	(-1.182)	(-1.737)**
RATIO1	53	1	-0.610	0.818	0.0003	0.011
			(-1.317)	(12.157)**	(1.335)	(2.509)**

Note. -- Data are from 1950 through 2004. The unit-root hypothesis can be rejected for all series at the 10 percent level of confidence. *t*-statistics are in parenthesis. * Significant at the .10 level. ** Significant at the .05 level, one-tailed test for Act dummy, two-tailed test for other variables.

B. Empirical Evidence Including Costs

The Postal Service's approximation of marginal cost is unit volume variable cost.[47] As noted above, there are several reasons to be cautious when utilizing these data, which should be kept in mind when assessing results.

Figure 3 displays real first- and fourth-class costs across time. There does not appear to be any clear trend in either class before versus after the Act, and the model does not generate predictions about these trends. Figure 7 displays percent markups over marginal cost on first- and fourth-class mail. Figure 7 is consistent with the model's fifth prediction of a declining fourth-class markup, but first-class markup has no clear trend post-Act. Figure 7 also indicates that markups were relatively uniform prior to the Act, suggesting that Congress may have followed a de facto policy of adhering to constant markups. There is thus a constant baseline from which to examine movement toward inverse-elasticity pricing after the Act.

Figure 7 also suggests a new consideration, however. Markups appear to move together from 1971 until roughly 1983, when the two depart sharply.[48] A compelling

[47] For details on how these costs were calculated, see "Appendix H: Calculating Postal Product Costs: Marginal Costs," of "Summary Description of USPS Development of Costs by Segments and Components, Fiscal Year 2004," which is available on the Postal Rate Commission's website: www.prc.gov. It is posted

explanation for that departure is the *National Association of Greeting Card Publishers* Supreme Court decision in 1983.[49] Briefly, that important decision resolved a conflict between the Court of Appeals for the Second Circuit and the Court of Appeals for the District of Columbia Circuit over the proper approach to postal ratemaking as set forth in the Act, and in the process clarified the roles of the Postal Service relative to the Postal Rate Commission. The decision did many things, so it is difficult to assess exactly how it affected rate outcomes. However, several aspects of the Court's decision suggest that it may have facilitated the departure observed in Figure 7. For example, the Court held that:

> In enacting the Act to divest itself of its previous control over setting postal rates, Congress was concerned about the influence of lobbyists and resulting discrimination in rates among classes of postal service, but did not intend to require maximum use of cost-of-service principles or to eliminate the ratesetter's discretion as to the methods for assigning costs; it simply removed the ratesetting function from the political arena.[50]

This finding suggests that it is acceptable for other non-cost factors to impact rates, which is consistent with the departure observed in Figure 7.

Keeping the possible effects of this decision in mind, I test the model's fourth and fifth predictions regarding markups using the time-series approach described above. Here the model predicts $\mu > 0$ for the first-class markup series (PMKUP1) and $\mu < 0$ for the fourth-class markup series (PMKUP4). Estimates are reported in Table 3.

TABLE 3
Intervention Estimates of the Effect of
the Postal Reorganization Act on Percent Markups

---

as a library reference with the name *USPS-LR-K-1* under the rate case *Docket No. R2005-1*.
[48] The sharp drop in both markups in the early 1970s may be due to rapid inflation, when rates were not adjusted quickly enough to keep up with rising costs.
[49] *National Association of Greeting Card Pubs. v. USPS*, 462 U.S. 810 (1983).
[50] Id. pp. 821-3.

Variable	Sample Size	Number of Lags	Constant	Lag of Dep. Vbl. (α_1)	Time Trend (α_2)	Act Dummy (μ)
PMKUP1	40	1	-83.070	0.540	0.046	4.781
			(-0.278)	(3.131)**	(0.300)	(0.713)
PMKUP4	40	1	958.50	0.706	-0.487	-3.297
			(1.053)	(5.424)**	(-1.049)	(-0.289)

Note. -- Data are from 1963 through 2004. The unit-root hypothesis can be rejected for all series at the 5 percent level of confidence. *t*-statistics are in parenthesis. * Significant at the .10 level. ** Significant at the .05 level, one-tailed test for Act dummy, two-tailed test for other variables.

As seen in Table 3, the Act dummy is insignificant for the markup on both first-class and fourth-class mail. The analysis of the *National Association of Greeting Card Publishers* decision above, however, suggests that it may be more appropriate to examine these markups after the courts had decided on the proper interpretation of the Act for rate-making purposes, that is, after 1983. I thus constructed a second dummy variable for this court decision, $D_{c,}$ which equals unity for all *t* equal to or greater than 1983, zero otherwise. I report the results using that dummy variable in Table 4 below:

TABLE 4
Intervention Estimates of the Effect of the
National Association of Greeting Card Publishers Decision on Percent Markups

Variable	Sample Size	Number of Lags	Constant	Lag of Dep. Vbl. (α_1)	Time Trend (α_2)	Court Dec. Dummy (μ)
PMKUP1	40	1	-478.48	0.617	0.247	-3.752
			(-1.021)	(4.731)**	(1.040)	(-0.699)
PMKUP4	40	1	-155.62	0.642	0.078	-20.135
			(-0.171)	(5.761)**	(0.169)	(-1.904)**

Note. -- Data are from 1963 through 2004. The unit-root hypothesis can be rejected for all series at the 5 percent level of confidence. *t*-statistics are in parenthesis. * Significant at the .10 level. ** Significant at the .05 level, one-tailed test for Act dummy, two-tailed test for other variables.

These estimates suggest that, although the decision had no effect on first-class markups, it significantly reduced the markup on fourth-class mail, which is consistent

with the model's fifth prediction.[51] These estimates imply that, after the court decision, fourth-class markups fell by about 20 percent.

The model's sixth prediction is that the markup on express mail will decline over time as the Postal Service reduces prices in this high-elasticity service. Figure 8 provides some support for this prediction. The percentage markup on express mail declined from about 70 percent in 1978 to slightly more than 22 percent in 1994. Although these markups are always positive, the trend was downward over this period, similar to fourth-class mail. Also, similar to fourth-class mail, these markups began to trend upward in the 1990s.[52]

C. The Issue of Cross-Subsidy

Does this empirical evidence demonstrate cross-subsidization of competitive mail classes using revenues from monopoly mail classes? The question is important for several reasons. In addition to violating the spirit of 39 U.S.C. § 3622 (b) (3), such cross-subsidization may constitute a violation of Section 2 of the Sherman Act. Notably, a 2004 Supreme Court decision determined that the Postal Service is exempt from antitrust prosecution due to the doctrine of sovereign immunity, so questions of antitrust violations are academic.[53] However, Congress is considering postal reform bills, and both the House and Senate versions of those bills ensure that sovereign immunity would

[51] These estimates are robust to the inclusion of both an Act and a court decision dummy.

[52] This is also true for first-class markups, which trended upward from 1990 though 1998, and then leveled off. One explanation consistent with the theory is that demand elasticities declined over this period, giving rise to increasing markups. That explanation is consistent with elasticities for express mail only, however, which declined from -1.72 in 1994 to -1.47 in 2005. First-class elasticities increased over that same period, from -0.19 to -0.25. Elasticities for parcel post increased from -0.94 to -1.07, and rose for other components of fourth-class mail as well.

[53] *Postal Service v. Flamingo Industries (USA) Ltd.*, 540 U. S. 736 (2004).

no longer apply to the Postal Service. If the bills pass, the Postal Service would become subject to antitrust prosecution.[54]

Perhaps because of that immunity, there have been no U.S. court cases laying out precise tests of cross-subsidization in postal services. However, the issue was examined in a 2001 European Commission decision involving the German post, Deutsche Post AG (DPAG).[55] In that case, United Parcel Service alleged that DPAG was using revenue from its letter monopoly to offer parcel delivery, which faces competition, below cost. United Parcel Service argued that DPAG was cross-subsidizing its parcel service using monopoly revenue, and that an efficient firm would not be able to compete and cover the cost of providing parcel service. In its decision, the Commission held that DPAG must earn revenue from its parcel services that at least covers the cost attributable or incremental to the provision of that service, which implies that DPAG could not set prices below the average incremental cost (AIC) of providing parcel service.[56]

The data discussed above are the Postal Service's estimates of marginal cost or, in its terminology, unit volume variable cost. Incremental cost is marginal cost with other

[54] The bills would also create a "competitive products fund" which is aimed at limiting cross subsidy.
[55] Case COMP/35.141, Deutsche Post AG, 2001 OJ (L 125) 27. European competition law and U.S. antitrust law are similar in many respects, and have converged over time. See e.g. European Commission, DG Competition, "DG Competition Discussion Paper on the Application of Article 82 of the Treaty to Exclusionary Abuses," (Brussels, December 2005).
[56] Id. at 5. David E.M. Sappington and J. Gregory Sidak, "Competition Law for State-Owned Enterprises," *Antitrust Law Journal* 71: 2, pp. 488-9 provide the following definition of incremental cost and average incremental cost:

> *Incremental cost* is a generic concept that refers to the increase in the firm's total cost when it expands its output of a particular product or products by some specified increment, holding constant the amount of other products that the firm produces. Often, the increment in question is the entire amount of the relevant product. *Average incremental cost* is incremental cost per unit of the output in question.

"product specific costs," which may not be volume-variable, added.[57] Therefore, incremental costs will never be lower, but typically will be higher, than unit volume variable or marginal costs. Figure 7 suggests, at least since the *Greeting Card Publishers* decision, that the Postal Service would fail the pricing test for cross subsidy used in the Deutsche Post decision if applied to its parcel service.[58] The average markup on fourth-class mail between 1983 and 2004 was minus 55 percent. If the price of fourth-class mail was not sufficient to cover marginal cost over that time, it was certainly not sufficient to cover average incremental cost, and would thus not have passed the test for absence of cross subsidy established in the Deutsche Post decision. This is important because such pricing may force an equally or more-efficient private competitor from the market, or force it to operate at a less efficient scale, thus raising the social cost of providing these competitive services.

However, there are several reasons why a more stringent cross-subsidy test is appropriate for SOEs, meaning that prices must be more than sufficient to cover AIC.[59] The incentive to price below AIC is demonstrated above. There are a variety of reasons why an SOE has enhanced *ability* to sustain prices below AIC in the long run. These factors are not based on greater operational efficiency or better technology, but rather are

---

[57] Specifically, the Postal Service states that:

> Incremental costs are calculated by a formula very similar to marginal costs, with one exception. Rather than multiplying each unit of volume by the marginal cost of the last unit, incremental cost (IC) multiplies each unit by its own marginal cost. To this number is added product specific costs (PSC_i), which are non volume variable cost specific to a given subclass of mail.

Page H2 of Appendix H, supra, note 47.

[58] Figure 7 can only be suggestive of such a conclusion because it reflects costs and prices at the class level. Because parcels are only one component (albeit the largest) of fourth-class mail, an analysis at the sub-class level is necessary to reach firmer conclusions.

[59] See Sidak and Sappington (2003b, pp. 517-522) for a discussion.

by-products of the firm's government-owned status. They suggest that the firm's observed AIC will be artificially low, and should be adjusted upward to establish the proper floor for cross subsidy.

SOEs typically receive an array of government-granted benefits as a result of their SOE status. Examples include tax exemptions, direct subsidies from the Treasury, lower costs of debt, and a host of regulatory exemptions (such as from costly SEC disclosure requirements and antitrust enforcement). SOEs do not have to pay taxpayer-owners an expected return on equity, which lowers their cost of equity. Additionally, because SOEs are not pure profit-maximizers, they do not need to recoup losses from below-cost pricing in current periods with profits in future periods.[60] An SOE may thus be able to force an equally or more-efficient firm out of the market, or cause it to operate at a less efficient scale if the standard AIC price floor is used. The price floor test for an SOE should be adjusted upward to compensate for the array of government-granted benefits outlined above. Given that prices for fourth-class mail since the Act have not covered marginal cost, it is unlikely that they have covered average incremental cost plus any appropriate adjustment for government-granted privileges and immunities.

VI. Summary and Conclusions

The Postal Reorganization Act of 1970 significantly reduced control over U.S. Postal Service pricing, even though monopoly power was retained. A model of SOE pricing predicts that after the Act the USPS would move toward higher prices for less

[60] A private profit-maximizing firm must recoup losses in future periods that were incurred by pricing below cost in current periods. See Lott (1999). An SOE in contrast may be able to sustain prices below cost indefinitely. OECD (1999, p. 55.)

elastic services, and lower prices for more elastic services. It also predicts that the USPS would move toward higher percentage markups on less elastic services, and conversely. The evidence presented here is consistent with those predictions. I find that first-class prices rose after the Act, and that fourth-class prices fell, so that the ratio of first- to fourth-class prices rose sharply after the Act. I also find that express mail prices fell over time.

Evidence regarding markups shows that, once ratemaking responsibilities were resolved by the courts, that fourth-class markups fell, but that there was no effect on first-class markups. Overall, the evidence is broadly supportive of a model predicting modified inverse-elasticity SOE pricing.

Finally, the evidence regarding fourth-class mail is strongly suggestive of a cross-subsidy to that class. The data presented here show that prices were set below marginal cost, which implies that they are less than the standard average incremental cost price floor test for cross-subsidy. They are thus certainly below a price floor that would correctly include an adjustment for government-granted benefits received by an SOE.

These findings have implications for the application of antitrust law to SOEs. They suggest that it is inappropriate to take a benign view of SOE pricing behavior in competitive markets. This study has demonstrated empirically that, when permitted, SOEs will price aggressively in those markets. They may use lax regulation as well as government-granted benefits to depress prices. A fresh perspective on the implications of government-private competition is warranted.

APPENDIX: FIGURES

Figure 1:
Real First- and Fourth-Class Mail Prices (PRICE1 and PRICE4)

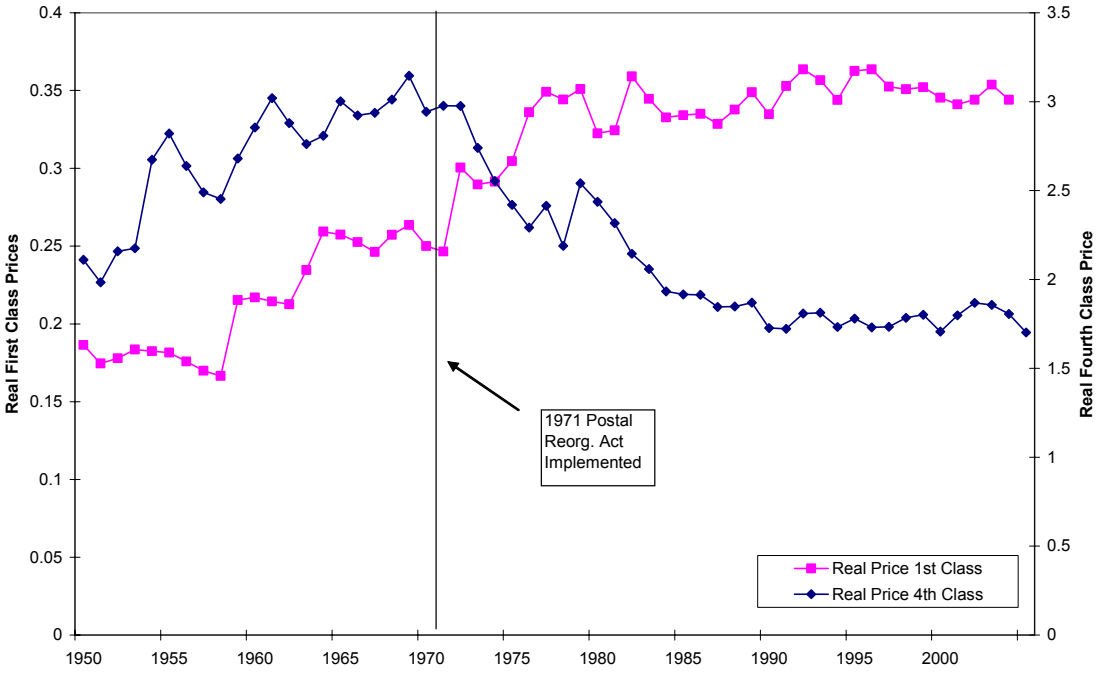


Figure 2:
Real Express Mail Prices 1978-2004
in 2000 Dollars (PRIEXP)

Figure 3:
Real First-Class and Fourth-Class Costs
in 2000 Dollars (COST1 and COST4)

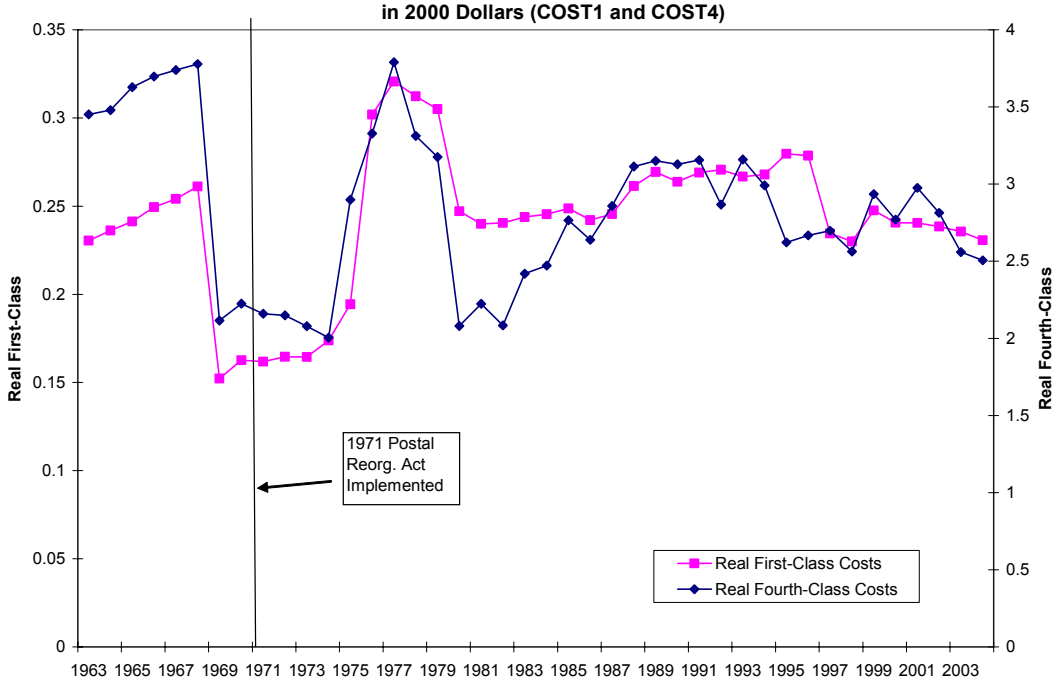


Figure 4:
Ratio of First-Class to Fourth-Class Mail Prices (RATIO1)

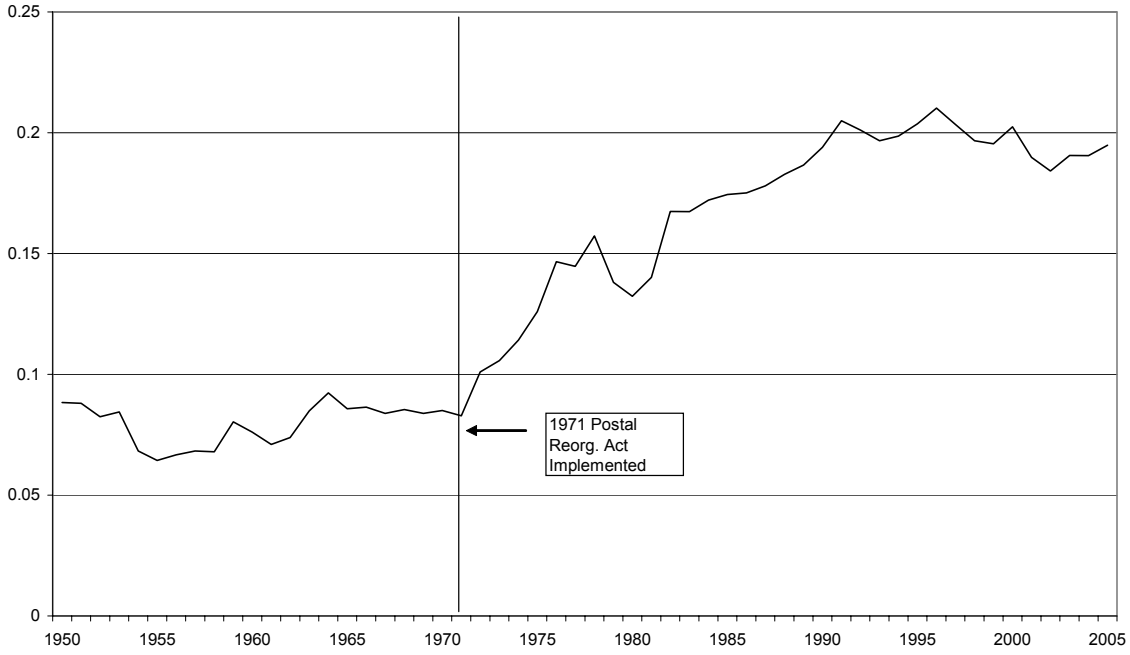


Figure 5:
Ratio of First-Class to Express Mail Prices
1978-2004 (RATIO2)

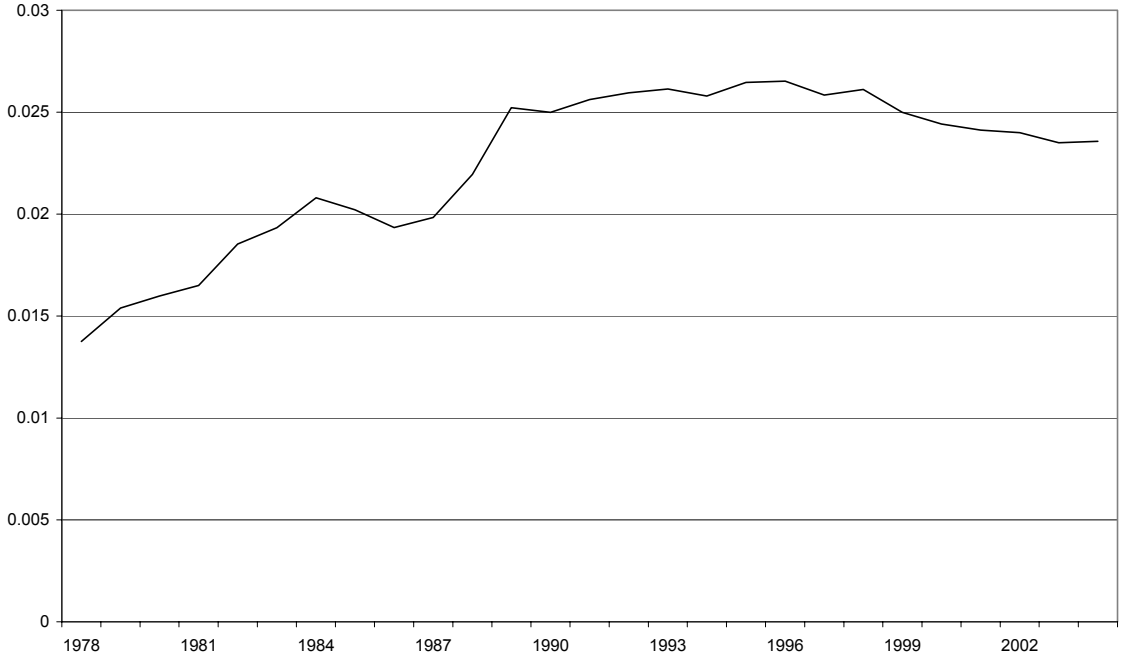


Figure 6:
Ratio of Costs for First- to Fourth-Class Mail (RATIO3)

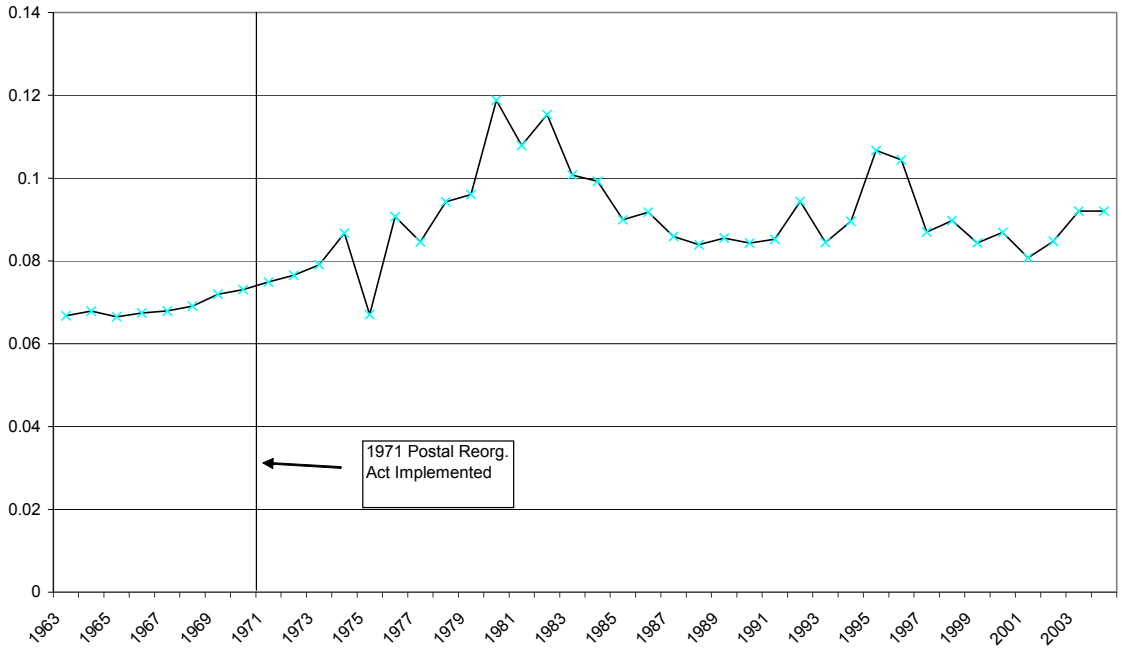


Figure 7:
Percent Mark-up on First-Class and Fourth-Class Mail (PMKUP1 and PMKUP4)

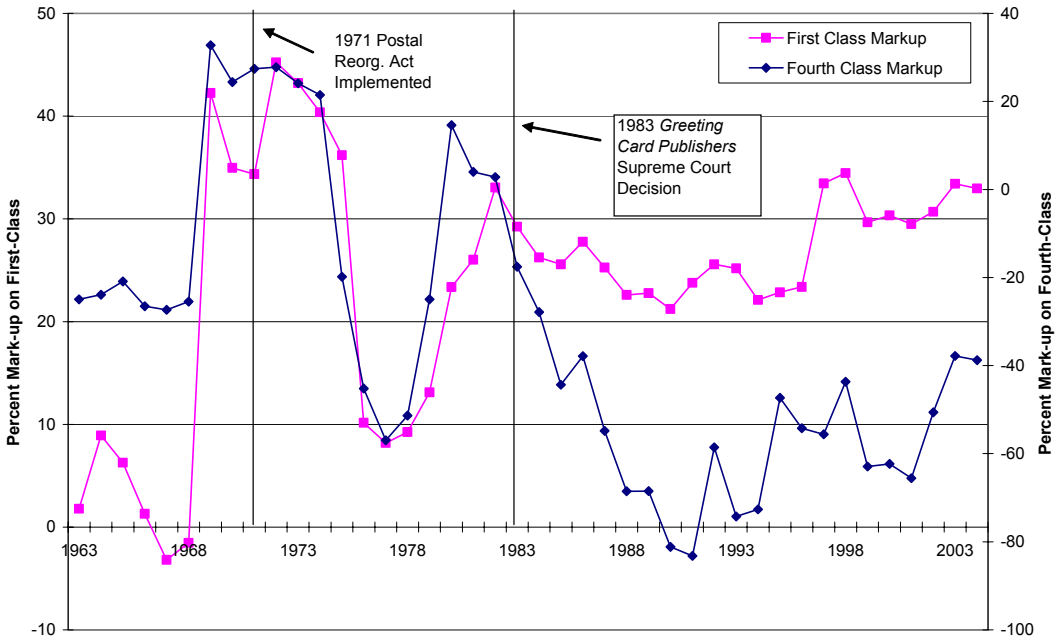
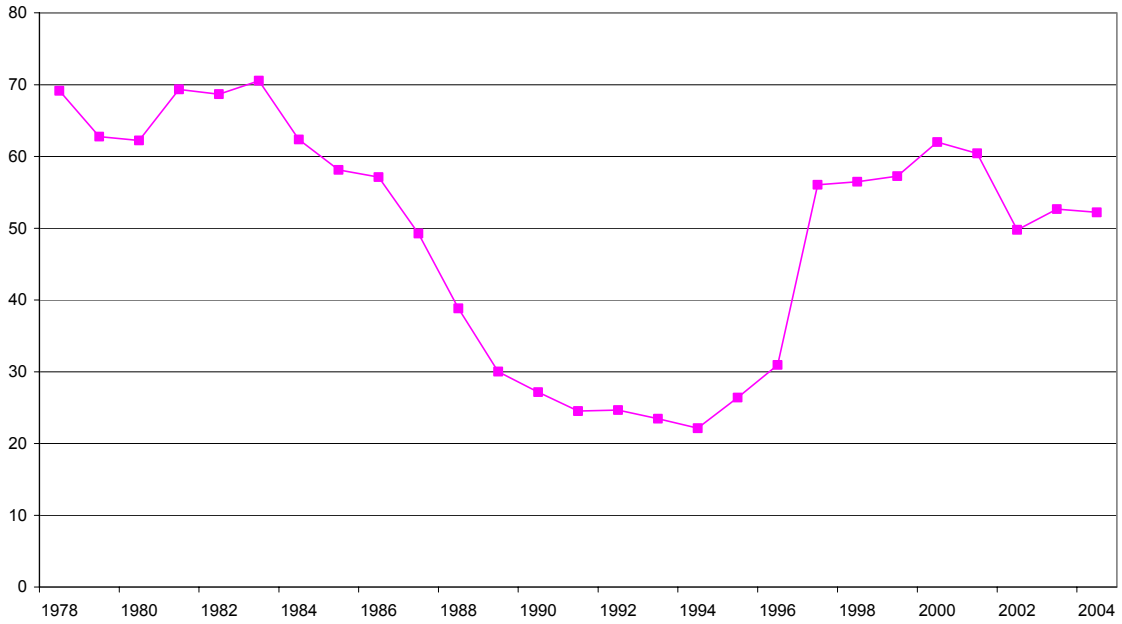


Figure 8:
Percent Markup on Express Mail
1978-2004



REFERENCES

Alchian, Armen A. and Rubin A. Kessel. 1962. "Competition, Monopoly, and the Pursuit of Money," in: Aspects of Labor Economics, Special Conference Series (National Bureau of Economic Research, Princeton: Princeton University Press) 157-175.

Cohen, Robert B., "Trade and Competition Issues Raised by the Liberalization of State-Owned Monopolies: The Example of Deutsche Post's Cross-subsidization of Its Express Delivery Operations," (Washington, DC: Economic Strategy Institute) 2004.

Enders, W., 1995. *Applied Econometric Time-Series.* New York: John Wiley and Sons.

Ewing, Donald R., and Roger K. Salaman. 1977. T*he Postal Crisis: The Postal Function as a Communications Service*, Office of Telecommunications Special Publication #77-13 (Washington, DC: U.S. Department of Commerce/Office of Telecommunications).

Geddes, R. Richard. *Saving the Mail: How to Solve the Problems of the U.S. Postal Service* (Washington, DC: The American Enterprise Institute) 2003a.

_____. "Technological Change and the Case for Government Intervention in Postal Services," in Daniel B. Klein and Fred E. Foldvary eds., *The Half-Life of Policy Rationales: How New Technology Affects Old Policy Issues* (New York: New York University Press) 2003b.

_____. *Competing with the Government: Anticompetitive Behavior and Public Enterprises* (Stanford, CA: Hoover Institution Press) 2004.

Granger, C. and P. Newbold. 1974. "Spurious Regressions in Econometrics." *Journal of Econometrics* 2: 111-120.

Johnson, Ronald N. and Gary D. Libecap. 1989. "Agency Growth, Salaries, and the Protected Bureaucrat," *Economic Inquiry*, 27, no. 3, 431-451.

Lott, John R. 1990. "Predation by Public Enterprises," *Journal of Public Economics*. 43 (1990) 237-251.

_____. 1999. *Are Predatory Commitments Credible?: Who Should the Courts Believe?* Chicago: The University of Chicago Press.

Lumsdaine, Robin L., and Serena Ng. 1999. "Testing for ARCH in the Presence of a Possibly Misspecified Conditional Mean." *Journal of Econometrics*. V93, n2 December pp. 257-79.

MacAvoy, Paul W., and George S. McIssac. 1995. "The Current File on the Case for Privatization of the Federal Government Enterprises." in *Deregulation and Privatization in*

the United States (Hume Papers on Public Policy, Vol. 3, no. 3, Autumn) edited by Paul W. MacAvoy, (Edinburgh: Edinburgh University Press).

Miller, James C. III. 1983. "End the Postal Monopoly," *Cato Journal* 5:149-155.
Niskanen. William A. 1971. *Bureaucracy and Representative Government* (Aldine Atherton, Chicago).

Niskanen. William A. 1974. Comment, *Public Choice* 17, no. 1, 43-45.

Niskanen. William A. 1975. "Bureaucrats and Politicians," *Journal of Law and Economics* 18, no. 3, Dec. 617-43.

Organization for Economic Cooperation and Development. 1999. *Promoting Competition in Postal Services*. (OECD: Committee on Competition Law and Policy) Document DAFFE/CLP(99)22.

Oster, Sharon M. 1995. "The Failure of Postal Reform." in *Deregulation and Privatization in the United States* (Hume Papers on Public Policy, Vol. 3, no. 3, Autumn) edited by Paul W. MacAvoy, (Edinburgh: Edinburgh University Press).

Peltzman, Sam, 1989. "The Economic Theory of Regulation after a Decade of Deregulation," *Brookings Papers: Microeconomics 1989*. (Washington DC: Brookings Institution).

Perron, Pierre 1989. "The Great Crash, the Oil Shock, and the Unit Root Hypothesis." *Econometrica* 57: 1361-1401.

Sappington, David E.M. and J. Gregory Sidak. 2000. "Are Public Enterprises the Only Credible Predators?" *The University of Chicago Law Review*, Vol. 67, No. 1 (Winter) pp. 271-292.

Sappington, David E.M. and J. Gregory Sidak. 2003a. "Incentives for Anticompetitive Behavior by Public Enterprises," *Review of Industrial Organization* 22:183-206.

Sappington, David E.M. and J. Gregory Sidak. 2003b. "Competition Law for State-Owned Enterprises," *Antitrust Law Journal* Vol. 71, No. 2 pp. 479-523.

Sidak, J. Gregory and Daniel F. Spulber. 1996. *Protecting Competition from the Postal Monopoly* (Washington, DC: AEI Press).

Sokol, D. Daniel, "Express Delivery and the Postal Sector in the Context of Public Sector Anti-Competitive Practices," *Northwestern Journal of International Law & Business* 23:353 (2003).

Tierney, John T. 1981. *Postal Reorganization: Managing the Public's Business* (Boston: Auburn House).

Tierney, John T. *The U.S. Postal Service: Status and Prospects of a Public Enterprise* (Auburn House 1988).

Tolley, George S. 1994. “Direct Testimony of George S. Tolley on Behalf of the United States Postal Service, Postal Rate and Fee Changes, 1994, Dkt. R94-1 (Postal Rate Commission 1994).

U.S. Postal Service. 1973. "Statutes Restricting Private Carriage of Mail and Their Administration." House Committee on Post Office and Civil Service, 93rd Congress, 1st Session, Committee Print.