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The Impact of Competitive Entry into the Swedish Postal Market

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1. Introduction

After losing its letter monopoly, Sweden Post (Posten) remained highly profitable. When asked why Posten did not succumb to a graveyard spiral of rising prices and falling volume, Sture Wallander, Posten's Vice President for International Relations, answered, "Have you ever seen a firm confront a new competitor by raising prices?"

This paper examines how Sweden Post confronted its new competitor and describes the impact of postal competition in Sweden. The paper begins by tracing the origins of competition in the Swedish mail market. Next, it quantifies the challenges faced by the new entrant, CityMail, into a business characterized by large economies of scale. Third, it describes Posten's responses to competitive entry. Fourth, it assesses the impact of competition on Sweden's postal prices. Finally, it quantifies the impact of Posten's response to competition on Swedish consumer surplus.

2. Origins

Towards the end of the 1980s, Sweden prepared to deregulate its telephone monopoly in a climate of liberalization. In 1989, government studies concluded that the Swedish postal market should also be liberalized. By this point Sweden Post had already begun to reduce staff in anticipation of competition. When CityMail entered and created a *de facto* competitive market in 1991, Parliament responded with several legislative measures. It abolished the *de jure* monopoly, effective January 1, 1993, and it imposed the Value Added Tax (VAT) on mail.¹ It also prescribed a universal service obligation for Posten, but authorized no compensation for it.²

The founders of CityMail knew that bulk mail prepared by computers could be printed in postal code sequence, eliminating the need for most or all of the upstream activity that is required by single-piece and non-presorted bulk mail. In the early 1990s Sweden Post did not offer presort discounts and offered a mere four percent discount for bulk mail. Posts in other countries, especially the U.S. Postal Service and La Poste in France, had been offering worksharing discounts for many years.³ CityMail planned to take advantage of this opportunity.

¹ The full 25 percent VAT was phased in over a two-year period.

² In addition to CityMail, several small firms have entered local markets and there are today about 25 small competitors with a combined market share of less than half a percent.

³ Worksharing began in the U.S. in 1943, when advertising mail and publications were required to be presorted into city zone sequence. In 1967, the presorting requirement was changed to be based upon the 5-digit postal code sequence. No specific discounts were offered initially for presorting. Presorting was a requirement that lowered the overall cost of the class of mail. In 1976, the U.S. Postal Service offered discounts for First-Class mail that was presorted. In 1978, a carrier route presort discount for advertising mail was introduced, and a year later, the prices for advertising mail and publications were set to reflect each mailing's depth of presort.

CityMail's business plan was built on the proposition that it would deliver mail presorted by so-called "industrial customers," whose mailings were dense enough to warrant presorting to the 5-digit (or carrier route) level. It would do this at a lower cost than the price Posten was charging.⁴ By delivering to recipients only twice a week, CityMail would avoid much of the fixed cost associated with Posten's five-day-a-week delivery.⁵ Because CityMail initially served only Stockholm, Sweden's most densely populated city, it further reduced its fixed delivery cost relative to the nationwide delivery of Posten. In addition, CityMail wanted to take advantage of the concentration in the mail market that consisted of about 75 large bulk mailers who relied heavily on an even smaller number of bulk mail preparation firms.⁶ Moreover, CityMail recognized the ease of transporting bulk mail from these producers to its operations in Stockholm.

3. CityMail's Challenge

In large part, CityMail's capture of market share was slower than anticipated, because customers were reluctant to use a new supplier in spite of very competitive pricing. Early cases of anti-competitive practices by Posten, which abused its dominant position, constituted another impediment. These practices included loyalty agreements, exclusivity clauses, selective pricing and annual bonus discounts. Posten also instituted a multi-zone geographical price structure for bulk mail that was found to be illegal by the Competition Authority and the courts. Subsequently, the Competition Authority also found a two-zone price structure to be anti-competitive, but the courts overturned that finding on the grounds that the zonal differences were cost based. Through mediation by the National Post and Telecom Agency, the prices for CityMail's access to post office boxes and for the forwarding of CityMail's undeliverable (as addressed) mail were agreed upon. In addition, a joint firm (that included the small local operators) was set up to maintain a database of addresses and process changes of address for the country.

The slow capture of market share forced CityMail into bankruptcy twice. Before the second bankruptcy in 1997, under some pressure from the National Regulatory Authority (PTS), Posten purchased and, for a short while, operated CityMail. The Competition Authority accepted this arrangement, so long as CityMail was operated as a separate corporation until a buyer could be found. Instead of selling CityMail, Posten filed for its bankruptcy and later the receiver sold the firm back to its founders. CityMail has had several owners since and is currently owned by Norway Post. It should be noted that the Competition Authority has not

⁴ Sweden's 5-digit postal code identifies carrier routes since Posten has only 10,500 routes for 9 million people and 5.4 million addresses (including 0.9 million business addresses.)

⁵ CityMail employed full-time personnel who belonged to the same labor union as Posten's carriers. They were paid equivalent wages and benefits but had somewhat less restrictive work rules than Posten's carriers.

⁶ About 10 to 20 large mail preparation firms handled most of the business.

made a finding against Posten since 1998. To be fair, Posten was sailing in uncharted waters and, upon reflection; its actions are not as surprising in hindsight as they were at the time when they were executed. The limits of legitimate competition will, in our opinion, be tested in most liberalized postal markets where serious end-to-end competition emerges.

During its fifteen years of operation, CityMail has increased the scope of its operations, with expansions into the metropolitan and rural area around Stockholm, into the cities of Malmoe and Gothenburg in 1996, and into the metropolitan and rural areas surrounding those two cities in 2000.⁷ Recently, it announced plans to expand its coverage this year to a total of 1,950,000 addresses, or about 36 percent of the addresses in Sweden. At the beginning of 2000, CityMail moved from delivering twice a week to each address to delivering every third business day.⁸ This change resulted in an important reduction in its fixed cost of delivery.

Table 1 shows the volumes captured by CityMail from 1991 to 2004, its share of total mail volume in Sweden, and the number of addresses it served; all of which have steadily increased. CityMail's volume increased to 254 million letters in 2005. It is noteworthy that in periods when the number of addresses served by CityMail has remained constant, it has managed to grow its volume.

Table 1: Volume, Market Share and Number of Addresses Served by CityMail

Year	Volume (in Millions)	Market Share (%)	Addresses Served (in Thousands)
1993	19.1	0.6	451
1995	36.3	1.0	900
1997	115.5	3.5	1,200
1999	163.5	5.1	1,200
2001	175.2	5.5	1,700
2003	215.7	6.6	1,700
2004	245.1	7.5	1,700

In spite of its growth, we believe that CityMail's potential volume is limited, at least as it currently operates, both because many mailings are not sufficiently dense to be efficiently presorted to the carrier route level, and to a lesser extent, because many mailers are unwilling to suffer the service lag of delivery every third day. Moreover, Posten has the advantage of providing universal coverage (for one stop shopping) and has an established reputation for

⁷ Malmoe and Gothenburg are, respectively, the second and third largest cities in Sweden.

⁸ For example, an address might get delivery on Monday and Thursday the first week, on Tuesday and Friday the second week, and Wednesday the third week. The cycle would then repeat. There is no Saturday delivery in Sweden.

reliability and quality. It also has name recognition built on almost 400 years of serving Sweden. It appears to us that CityMail will remain a niche player. If the preponderance of bulk mailers becomes willing to accept staggered delivery days, and if single-piece volume keeps falling, then it would seem that Sweden Post should investigate every other day delivery to residences. In fact, as posts in all developed countries become increasingly a bulk mail and advertising mail medium, reduced delivery frequency will likely receive much more serious consideration. Savings from reduced delivery frequency as a percentage of total postal cost would be in inverse relation to the per capita volume of posts.⁹

In order to be profitable, CityMail's unit revenue must exceed the sum of average variable and fixed unit costs. Street delivery (CityMail's principal activity) has a very high percentage of fixed cost owing to the time it takes to travel between stops (i.e., travel time). Volume governs the percentage of total street delivery time that is variable and the lower the volume, the higher is the percentage represented by the fixed cost of delivery. Moreover, volume determines the unit (per piece) fixed cost of delivery, which drops as volume per address increases. Thus, CityMail's low initial volumes caused high initial fixed cost per unit, resulting in losses. CityMail's ability to increase its volume is the key driver of its ability to lower fixed costs per unit and eventually become profitable.

Using a cost model (based on the U.S. Postal Service functional cost elasticities) that estimates fixed and variable unit cost for posts over a range of volumes, we have estimated the fixed delivery cost of both CityMail and Posten.¹⁰ See Appendix A-2. For purposes of simplification, we have assumed that CityMail has delivered every third business day from its outset. Thus, we somewhat understate the unit fixed cost of delivery for the years before 2000. The model uses volume per capita for the addresses served and the number of addresses served in any given year. The model is based on average postal density (i.e., the time it takes to travel between stops.) Because CityMail delivers to the densest regions of Sweden, we presume that its fixed cost is somewhat lower than average. We do not, however, take this into account and therefore we somewhat overstate CityMail's fixed cost of delivery.

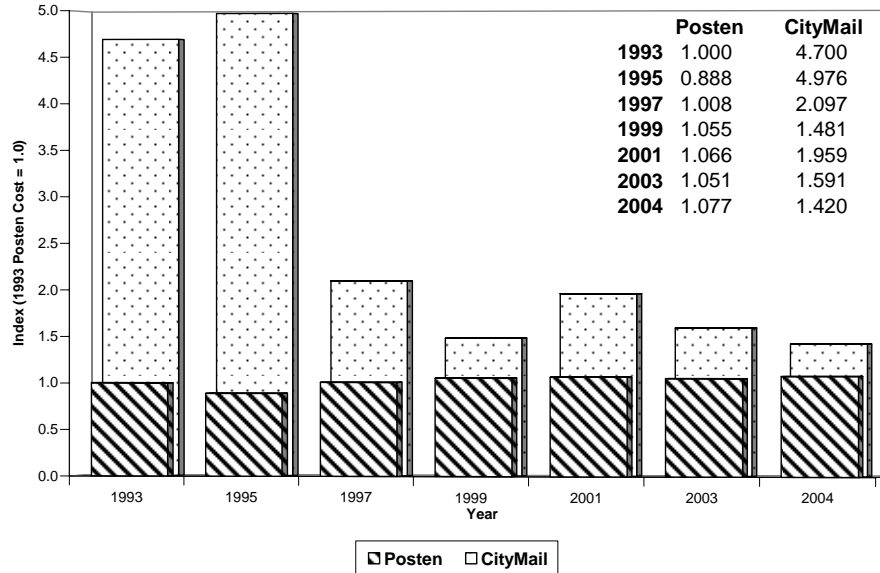
Figure 1 compares CityMail's unit fixed cost of delivery to Posten's. Both costs are indexed to Posten's cost in 1993. We observe that by delivering every third business day and increasing its volume per address, CityMail's unit fixed delivery cost is approaching Posten's. It should be noted that both unit fixed delivery costs vary from year to year because of fluctuations

⁹ The smaller the per capita volume of a post, the larger is the percentage of total cost that is represented by the fixed cost of delivery.

¹⁰ See Robert Cohen, et al., *The Role of Scale Economies in the Cost Behavior of Posts*, Proceedings of the Wissenschaftliches Institute für Kommunikationsdienste (WIK), 8th Koenigswinter Seminar on "Regulating Postal Markets-Harmonized Versus Country Specific Approaches," February 16-18, 2004 October 2006. This paper is available on the web site of the Postal Regulatory Commission, www.prc.gov.

in Posten's and CityMail's volumes.

Figure 1: Comparison of Posten and CityMail Fixed Cost of Delivery per Piece (Indexed to Posten's Cost in 1993)



4. Sweden Post's Response

Posten began to reduce its complement of employees in 1989. In the period between 1990 and 2005, Posten reduced its total work force by about one-third, from 49,000 down to 33,000. It achieved much of this reduction by substituting contract outlets for post offices, lowering its need for counter personnel. This substitution began in 1989 and continues to the present. Today, Posten has more retail outlets than it did in 1989, but only 15 percent of its 2,400 outlets are staffed by Posten employees.¹¹ The transfer of retail outlets to less expensive and more convenient locations for the consumer, such as supermarkets and gas stations, was brought about by the liberalization of the postal market.

The percentage drop in Posten's employment exceeds its 16 percent drop in mail volume. The change in labor productivity, however, could not be measured, because the drop in workload (owing to the increase in presorting by customers and the changing ratio of single-

¹¹ In 2001, Posten transferred its banking services, which made use of the postal retail outlets, to an entity fully separated from the mail business.

piece to bulk mail volumes) must be taken into account when measuring labor productivity.¹² These data were not available to the authors.

Table 2 displays the average annual and cumulative percent changes in Posten's volume, revenue, and CPI deflated prices since 1990. Single-piece volume has dropped at a rate of 3.7 percent a year, largely due to substitution by Internet-based communications, such as E-mail.

Table 2: Percent Changes in Posten's Volume, Revenue, and CPI Adjusted Prices (1990-2004)

	Single Piece			Bulk			All Letters		
	Volume	Revenue	CPI	Volume	Revenue	CPI	Volume	Revenue	CPI
			Deflated Price			Deflated Price			Deflated Price
Average Annual Change	-3.7	0.4	2.1	-0.4	1.2	-0.6	-1.2	0.9	0
Cumulative Change	-41	6	34	-5	18	-8	-16	13	1

Because of price increases, Posten's single-piece revenue has grown 6 percent over the period, in spite of the drop in volume. The CPI deflated price of single-piece letters reflects the fact that Posten's input prices grew faster than inflation during this period.¹³

Almost immediately after CityMail entered the market, Sweden Post began to restructure its pricing by introducing discounts for bulk and presorted mail. Posten's bulk mail volume has declined only five percent over the period and unlike single-piece, its CPI deflated price has decreased, reflecting the intense competition from CityMail.¹⁴ Today, Posten's bulk mail prices are on the order of 37 to 40 percent less than single-piece. Key customers receive an additional discount of 22 to 30 percent on a negotiated basis

On average, bulk mail prices have declined eight percent on an inflation adjusted basis. In contrast, inflation adjusted prices for single-piece letters have increased 34 percent. This divergence would be expected considering the growth of input prices, the lack of competition for single-piece letters and the considerable competition for bulk mail. The average Swedish household spends about 200 SEK (25 to 30 U.S. dollars) per year on postage and thus has not

¹² In addition, any increase in capital and contract cost must be taken into account in order to measure total factor productivity.

¹³ Input prices are discussed below.

¹⁴ All of the drop in Posten's bulk mail volume can be attributed to gains in market share by CityMail. Total bulk volume in Sweden grew nine percent from 1991 to 2004.

been significantly affected by the increased price of single-piece letters. Overall, letter prices tracked consumer prices in Sweden during this period.

Sweden Post has maintained consistently high delivery quality. On time overnight delivery of single-piece in 1991 was 96.6 percent and on time delivery of economy letters was 95.0 percent. In 2004, overnight delivery of single-piece was 96.4 percent. Because of commercial sensitivity there are no other available delivery quality statistics for 2004.

5. Impact on Postal Prices

The intensely competitive market for bulk mail has forced Posten to keep its prices low through cost cutting and efficiency measures. We think that it is instructive to compare prices and the structure of prices between Norway Post and Sweden Post. Both serve countries with similar characteristics, but Norway Post enjoys a statutory mail monopoly. Moreover, our analysis revealed that the growth in the prices of postal inputs (e.g., labor and transportation) was virtually the same in both countries for the period 1990 to 2004.¹⁵ In 1991 Norway Post's price for single-piece was 18 percent higher than the Sweden Post's price (2.95 SEK in Norway vs. 2.50 SEK in Sweden). By 2002 Norway Post's price was 37 percent higher than the Sweden Post's price (4.92 SEK in Norway vs. 3.60 SEK in Sweden).¹⁶ Thus, between 1991 and 2002 the percentage price difference for single-piece mail between the two countries doubled.

Table 3 compares the prices charged by Sweden and Norway Posts in 2002 based on purchasing power parities. We see that the level of postal prices is much lower in Sweden than in Norway and bulk prices are much closer to single-piece prices in Norway than in Sweden. Norway Post does not offer additional discounts to key customers, while Posten has very low prices for them. We do not intend to commit the fallacy of *post hoc ergo propter hoc*, so we do not definitively ascribe cause and effect. However, we can think of no reason why Posten's prices have changed so dramatically as compared to Norway Post, other than in response to competition.

¹⁵ Between 1990 and 2004, Sweden Post's input prices grew at an the average annual rate of 3.4 percent and Norway Post's input prices increased at a rate of 3.7 percent.

¹⁶ We have used purchasing power parities to convert prices from Norwegian Krone (NOK) to Swedish Krona (SEK). For converting 1991 prices we used 1990 purchasing power parities and for converting 2002 prices we used 2006 purchasing power parities.

Table 3: Sweden Post Rates Compared with Norway Post Rates in 2002
Rates in SEK per 20 Gram Items, Excluding Value Added Tax (VAT)

Number of Pieces	Single Piece Stamped		List Price Bulk		Key Customer Bulk Price	
	Sweden	Norway	Sweden	Norway	Sweden	Norway
	Post	Post	Post	Post	Post	Post
5000 - 10000	3.60	4.92	2.26	4.05	1.66	4.05
10001- 25000	3.60	4.92	2.23	3.98	1.64	3.98
25001- 50000	3.60	4.92	2.21	3.92	1.62	3.92
50001- 75000	3.60		2.18		1.60	
50000-100000		4.92		3.80		3.80
75001 & Over	3.60		2.16		1.58	
100000 & Over		4.92		3.73		3.73

Purchasing Power Parity (PPP), OECD 2006: 1 Norwegian Krone (NOK) = 1.22 Swedish Krona (SEK)

6. Welfare Effects

In order to measure the impact on consumer surplus as a result of competition in the Swedish postal market, we use an aggregate input price index developed for Posten to deflate its prices for letters.¹⁷ Because of Posten's exposure to competition, one expects the (nominal) prices it charges for letters to reflect both changes in the prices of inputs used for processing, transporting and delivering letters, as well as changes in efficiencies of any kind, especially production efficiencies (i.e., productivity). For example, increases in input prices will place upward pressure on Posten's prices for letters. On the other hand, gains in efficiencies will likely be passed on to consumers in the form of lower letter prices. Deflating the price of letters by using the aggregate input price index, effectively removes the impact of changes in input prices. This yields real prices for letters that reflect only the effects of gains (or losses) in efficiencies. Because the objective is to determine the change in consumer surplus over time due to changes in real efficiencies, the impact of input price changes must be removed.

From 1990 to 2004, Sweden has seen very large increases in its input costs. Labor cost for blue collar manufacturing, as measured by its Employment Cost Index (ECI), rose almost 70 percent and its transportation cost index rose 45 percent.¹⁸ The deflated letter prices are shown in Table 4 and deflation tables are presented in the Appendix. The aggregate cost of all inputs, used to deflate letter prices, increased by 59 percent while the CPI rose only 34 percent during the period.

¹⁷ The development of the index is presented in Table A-4 of the Appendix.

¹⁸ Labor costs constitute 70 percent and transportation costs constitute 12 percent of the total cost of Sweden Post.

**Table 4: Percent Change in Posten's Aggregate Input Price
and Deflated Letter Prices
(1990 to 2004)**

	<u>Aggregate Input Price</u>	<u>Deflated Letter Prices</u>		
		<u>Single Piece</u>	<u>Bulk</u>	<u>All</u>
Average Annual Change	3.4	0.9	-1.8	-1.2
Cumulative Change	59	13	-22	-15

We used Posten's volumes and the deflated prices of single-piece and bulk letters to calculate the change in consumer surplus. Own price elasticities for mail products in Sweden do not appear to be available, at least publicly. Consequently, we assumed values based on analysis of U.S. mail volumes in rate proceedings before the Postal Regulatory Commission. We use an elasticity for single-piece First-Class of -0.25. Carrier route presorted advertising mail is the closest analog to Posten's bulk mail product in the U.S., so we use its elasticity of -1.0 as our elasticity for Posten's bulk mail product. We would expect that a competitive product like bulk mail in Sweden would have a high elasticity. Thus, we believe that we have chosen a conservative value for our calculation. Moreover, we find that our consumer surplus results are relatively insensitive to the actual elasticity values.¹⁹

Table 5 presents our estimate of the change in consumer surplus for the period 1990 to 2004, based only on Posten prices and mail volumes. It shows a sizeable gain in consumer surplus (welfare) of 1.745 billion SEKs, approximately \$238 million, for Sweden's mailers in 2004.

**Table 5: Change in Consumer Surplus 1990-2004
Based Only on Posten Letter Prices and Volumes
(SEK in Millions, Base Year 2004)**

Single Piece Letters	-623
Bulk Letters	2,368
Net Change	1,745

¹⁹ The sensitivity results are presented in Table A-5 of the Appendix.

We do not have a good estimate of producer surplus owing in part to the fact that Posten no longer reveals its profits from letter mail, but instead publicly reports profits only for the entire enterprise.²⁰ It is our judgment that, if letter profits were deflated by the input prices for the period 1991 through 2005 (and adding CityMail's minimal profits), the deflated profits would have remained essentially unchanged.²¹ Using profits as a rough measure of producer surplus, we infer that there has been no change in the Swedish letter mail market. Thus, the welfare effect from liberalizing the market is simply the consumer surplus.

The Appendix to this paper presents the method we used to calculate the gains in consumer surplus shown in Table 5. The Appendix also shows Sweden Post's volume revenue and price data used in our calculation and the construction of aggregate input price index used for deflating the letters' prices.

7. Final Observations

(1) It is worth noting that both entrant and incumbent posts are now endorsing competition. For example, the current owner of CityMail, Norway Post, recently announced its intention to enter the Danish letter market. (2) Posten's Sture Wallandar told the authors that "Liberalization was the best thing that has happened to Sweden Post; it made us a good post office."

²⁰ Table A-6 displays the annual profits (losses) for Sweden Post and CityMail for 1991-2006.

²¹ In 1991 Posten's letter mail profits were 898 million SEK. In 2005 Posten's enterprise profits were 1302 million SEK. It is believed that the letter profits were higher than the enterprise profits in recent years. In 2005, CityMail's profits were 50 million SEK.

Conclusions:

- It is very risky to enter the letter mail delivery market as bankruptcy is a distinct possibility.
- It is likely that incumbents will test the limits of legitimate competition when confronted with end-to-end entry.
- In order to become profitable under competitive prices, an end-to-end entrant must garner enough volume so that its unit fixed cost of delivery approaches that of the incumbent.
- City Mail has grown and is profitable, but it is likely to remain a niche player, primarily because of the limited amount of bulk mail dense enough to be efficiently presorted to the carrier route level, and to a lesser extent, because of the inherent service limitations of delivering mail every third business day. Moreover, not being a universal service provider with a long history of service is a constraining factor.
- The primary response of incumbents when confronted with significant competition will be to embark on a stringent cost reduction program, establish cost and volume based prices, and compete vigorously for large customers through aggressive negotiated prices.
- Liberalization of letter markets will result in a significant drop in the price of bulk mail relative to single-piece, owing to the intense competition for these mailings. It may mean an absolute increase in the price of single-piece letters. This will have a *de minimus* effect on most households, as their annual expenditure on letter mail is quite low.
- It appears that competition has brought about significantly lower postal prices in Sweden than would have occurred without it. It has also induced large cost savings in Sweden Post while not impacting service quality.
- It is likely that retail outlets will be reduced or franchised to save cost, since this is not a competitive area.
- Sweden has gained in consumer surplus (welfare) as a result of liberalizing its letter market.

A. Appendix: The Models

A.1 Consumer Surplus ²²

The impact on Swedish mailers of increases and decreases in postal rates is measured by the change in consumer surplus. Consumer surplus is a measure of the gain to mailers from the purchase of a mail service and is equal to the difference between the mailers' value of a mail service and the price that mailers must pay for that service. The value that mailers place on a postal product is measured by the demand curve for that product. Increases in postal rates reduce mailers surplus and decreases in postal rates increase mailers surplus.

The overall impact on mailers from the move from one rate schedule to another is measured by the total change in consumer surplus across all the mail services. Each price change affects consumer surplus in two ways. When the price of a mail service is reduced, mailers gain twice. First, they gain because they pay less for each piece that they previously mailed at the higher price. Second, mailers gain because the price decline causes them to increase their consumption. The increase in consumption increases consumer surplus because it involves mailing pieces with a value that exceeds the now lower price. Similarly, when price is increased, mailers lose in two ways, from the increase in money they must spend to mail pieces at the higher price, and from the decrease in consumption that occurs in response to the increase in price.

A.1.1 Elasticity of Demand

The elasticity of demand shows how quantity demanded changes when price changes. An increase in price of a mail service will cause mailers to purchase less of that service and possibly more of substitute services. The degree to which quantity demanded of a mail service falls, in response to an increase in that service's price, is measured by the own-price elasticity of demand. The degree to which quantity demanded of a mail service increases, in response to an increase in the price of a substitute service, is measured by the cross-price elasticity of demand. If demand is price elastic, it means that a change in price causes a large change in quantity demanded. If demand is price inelastic, then a change in price causes only a small change in the quantity demanded.

²² This Appendix uses the approach to estimating the change in consumer surplus employed by Peter Bernstein in recent rate proceedings before the Postal Regulatory Commission. See the following Direct Testimonies of Peter Bernstein: USPS-T-31 in Docket No. R97-1 and USPS-T-41 in Docket No. R2000-1 (available at www.prc.gov).

A.1.2 Calculation of Change in Consumer Surplus

Recall from above that the change in consumer surplus from a price change has two components: (1) the change in expenditures mailers make in order to send the previously mailed volume at the new price and (2) the net value of the change in consumption resulting from the change in price.

Considering the case where the new price (P_N) is less than the old price (P_o), the first part of this change in consumer surplus is:

$$(V_o) \cdot (P_o - P_N) \quad (1)$$

where V_o is the volume consumed at the old price of P_o . The second part of the change in consumer surplus is the net value of the additional consumption that occurs at the lower price. This gain in consumer surplus is equal to:

$$\frac{1}{2}(V_N - V_o) \cdot (P_o - P_N) \quad (2)$$

where the first term is the increase in volume, the second term is the change in price and the one-half is the last part of the formula for measuring the area of a triangle.

Combining (1) and (2) yields the formula for the total change in consumer surplus:

$$CCS = (V_o) \cdot (P_o - P_N) + \frac{1}{2}(V_N - V_o) \cdot (P_o - P_N) = \frac{1}{2}(V_N + V_o) \cdot (P_o - P_N) \quad (3)$$

If the new price (P_N) is less than the old price (P_o), the above expression is positive, showing a gain to mailers from a decline in price. If P_N is greater than P_o , there is a loss to mailers from an increase in price. The total change in consumer surplus is the sum of the individual changes across all mail services considered. In this paper, we use equation (3) to estimate the change in consumer surplus due to the deregulation of Swedish mail market.

The above measure of the total change in consumer surplus must be considered an estimate for two reasons. First, the econometrically estimated demand equations used in calculating consumer surplus are usually exponential or logarithmic instead of linear demand curves, as assumed for the derivation of equation (3). A second reason why equation (3) provides only an estimate of the change in consumer surplus is that the exact measure is complicated by the interrelation among the demands of many postal products. The demand curve for a given mail service will shift in response to changes in the price of substitute mail

services, but equation (3) does not account for such shifts. Therefore, the estimated consumer surplus for Swedish mailers presented in this paper ignores the effect of shifts in the demand curve resulting from changes in the prices of substitute mail services. However, because substitution among postal products is very small or non-existent, the resulting shifts in the demand curves are also quite small²³. Consequently, the actual change in Swedish consumer surplus will not substantially differ from the estimated measures presented in this paper.

Table A-1 shows Posten's volume, revenue, price, and elasticity data for single-piece letters used in the calculation of the change in consumer surplus for the period 1990 to 2004. The volume, revenue and price data are presented in the form of indices. Table A-2 presents Posten's data for bulk letters used in the calculation of the change in consumer surplus. Table A-3 combines the data in Table A-1 and Table A-2. Table A-4 shows the construction of the aggregate input price index using Swedish labor, transportation and the CPI indices. We use the aggregate input index in Table A-1 and Table A-2 to deflate the nominal prices of single-piece and bulk letters before we use them to calculate the change in consumer surplus.

Finally, Table A-5 presents a sensitivity analysis of the gains in consumer surplus reported in Table 5, using own-price elasticities of different magnitudes for single-piece and bulk letters. It shows the case presented in the paper (baseline case) and twelve newly simulated cases (numbered 1 through 12) of calculating changes in consumer surplus. In each case, we executed equation (3) using an alternative set of own-price elasticities for letters, and we compared the calculated gains in consumer surplus with those of the baseline case. We limited the values of own-price elasticities to the inelastic range, -1 to 0, based on the results of extensive econometric studies in the U.S. that show the demand for mail services to be price inelastic. The results of the analysis show that, within the inelastic demand range, the gains in consumer surplus are not very sensitive to changes in the magnitude of the own-price elasticities. Therefore, we conclude that the elasticities that we used in our paper are as good as any of the alternative elasticities that would be plausible for mail services. For example, Case 12 involves the most radical changes in the two elasticities compared to baseline case. In Case 12, the elasticity of single-piece letters is assigned to bulk and the elasticity of bulk to single-piece. Nevertheless, switching the elasticities produced a gain in consumer surplus only about 12 percent lower than the gain reported in Table 5 of the paper. Table A-6 displays the annual profits (losses) for Sweden Post and CityMail from 1991 to 2006.

²³ Extensive econometric studies of the demand of postal services in the U.S. have shown that the cross-price elasticities, which measure substitutability among postal products, are generally quite small or non-existent. See the following Direct Testimonies of Thomas E. Thress: USPS-T-7 in Docket No. R97-1, USPS-T-7 in Docket No. R2000-1, USPS-T-8 in Docket No. R2001-1, USPS-T-7 in Docket No. R2005-1 and USPS-T-7 in Docket No. R2006-1 (available at www.prc.gov).

**Table A-1: Consumer Surplus Model for Sweden
Based Only on Posten Letter Prices and Volumes
(Base Year 2004)**

		Single		Total							
		Piece	Bulk	Piece	Bulk						
Change in Consumer Surplus 1990-2004 (Millions of SEK)		(622.9)	2,367.8	1,744.8							
Sweden Post (Posten) - Single-Piece Letters											
Year	Volume Index	Revenue Index	Nominal Price		Aggregate Input Price		Real Price		Own Price Elasticity	Cross Price Elasticity	Volume Forecast Index
			Growth Rates	Index	Growth Rates	Index	Growth Rates	Index			
1990	1.000	1.000		1.000		0.628		1.000	-0.25	0.10	1.000
1991	0.979	0.979	0.0%	1.000	6.1%	0.667	-6.1%	0.941			1.011
1992	0.937	1.049	11.3%	1.120	4.8%	0.700	6.5%	1.004			0.991
1993	0.914	1.065	3.9%	1.165	-0.3%	0.698	4.2%	1.048			0.979
1994	0.958	1.116	0.0%	1.165	4.1%	0.727	-4.1%	1.006			0.984
1995	0.968	1.150	2.0%	1.188	4.6%	0.762	-2.7%	0.979			0.984
1996	0.938	1.160	3.9%	1.236	5.2%	0.802	-1.2%	0.967			0.983
1997	0.837	1.242	18.2%	1.483	3.3%	0.828	15.0%	1.123			0.941
1998	0.779	1.271	9.5%	1.631	2.0%	0.845	7.5%	1.211			0.928
1999	0.752	1.226	0.0%	1.631	2.0%	0.862	-2.0%	1.188			0.935
2000	0.714	1.165	0.0%	1.631	3.4%	0.891	-3.4%	1.148			0.942
2001	0.667	1.088	0.0%	1.631	2.7%	0.915	-2.7%	1.118			0.954
2002	0.635	1.036	0.0%	1.631	3.2%	0.946	-3.2%	1.083			0.959
2003	0.603	1.082	9.5%	1.794	3.2%	0.976	6.3%	1.153			0.938
2004	0.590	1.058	0.0%	1.794	2.4%	1.000	-2.4%	1.126			0.947
Change											
Average Growth		-3.7%	0.4%	4.3%	3.4%	0.9%					-0.4%

**Table A-2: Consumer Surplus Model for Sweden
Based Only on Posten Letter Prices and Volumes
(Base Year 2004)**

Sweden Post (Posten) - Bulk Letters											
Year	Volume Index	Revenue Index	Nominal Price		Aggregate Input Price		Real Price		Own Price Elasticity	Cross Price Elasticity	Volume Forecast Index
			Percent Change	Index	Percent Change	Index	Percent Change	Index			
1990	1.000	1.000		1.000		0.628		1.000	-1.00	0.05	1.000
1991	1.006	1.023	1.7%	1.017	6.1%	0.667	-4.4%	0.957			1.041
1992	0.952	0.984	1.7%	1.034	4.8%	0.700	-3.2%	0.927			1.079
1993	0.964	0.978	-1.9%	1.015	-0.3%	0.698	-1.6%	0.913			1.098
1994	0.961	0.958	-1.8%	0.997	4.1%	0.727	-5.9%	0.861			1.162
1995	0.954	0.939	-1.3%	0.984	4.6%	0.762	-6.0%	0.811			1.232
1996	0.972	0.961	0.5%	0.989	5.2%	0.802	-4.7%	0.774			1.290
1997	0.959	0.921	-2.9%	0.961	3.3%	0.828	-6.1%	0.728			1.383
1998	0.965	0.992	6.8%	1.028	2.0%	0.845	4.8%	0.764			1.323
1999	0.979	1.059	5.1%	1.082	2.0%	0.862	3.1%	0.788			1.281
2000	1.027	1.135	2.2%	1.106	3.4%	0.891	-1.2%	0.779			1.294
2001	0.972	1.171	8.6%	1.205	2.7%	0.915	5.9%	0.826			1.218
2002	0.962	1.160	0.1%	1.206	3.2%	0.946	-3.1%	0.801			1.254
2003	0.948	1.115	-2.5%	1.177	3.2%	0.976	-5.7%	0.756			1.333
2004	0.950	1.176	5.1%	1.238	2.4%	1.000	2.7%	0.777			1.296
Change											
Average Growth		-0.4%	1.2%			3.4%	-1.8%				1.9%

**Table A-3: Consumer Surplus Model for Sweden
Based Only on Posten Letter Prices and Volumes
(Base Year 2004)**

Year	Sweden Post (Posten) - Total Letters										
	Volume Index	Revenue Index	Nominal Price		Aggregate Input Price		Real Price		Own Price Elasticity	Cross Price Elasticity	Volume Forecast Index
			Percent Change	Index	Percent Change	Index	Percent Change	Index			
1990	1.000	1.000		1.000	0.0%	0.628		1.000	-0.77	1.000	
1991	0.997	1.007	1.0%	1.010	6.1%	0.667	-5.1%	0.950		1.032	
1992	0.947	1.007	5.2%	1.063	4.8%	0.700	0.3%	0.953		1.052	
1993	0.949	1.009	0.0%	1.064	-0.3%	0.698	0.3%	0.957		1.062	
1994	0.960	1.014	-0.7%	1.056	4.1%	0.727	-4.8%	0.912		1.107	
1995	0.959	1.014	0.1%	1.058	4.6%	0.762	-4.5%	0.872		1.156	
1996	0.962	1.031	1.4%	1.073	5.2%	0.802	-3.8%	0.839		1.195	
1997	0.922	1.035	4.6%	1.123	3.3%	0.828	1.3%	0.851		1.247	
1998	0.908	1.091	6.8%	1.202	2.0%	0.845	4.8%	0.893		1.202	
1999	0.909	1.118	2.3%	1.230	2.0%	0.862	0.4%	0.896		1.175	
2000	0.931	1.146	0.1%	1.231	3.4%	0.891	-3.3%	0.867		1.186	
2001	0.878	1.142	5.4%	1.300	2.7%	0.915	2.8%	0.891		1.137	
2002	0.861	1.116	-0.3%	1.296	3.2%	0.946	-3.6%	0.860		1.163	
2003	0.841	1.103	1.2%	1.311	3.2%	0.976	-2.1%	0.843		1.211	
2004	0.839	1.134	3.0%	1.351	2.4%	1.000	0.7%	0.848		1.188	
Change											
Average Growth	-1.2%	0.9%		2.2%		3.4%		-1.2%		1.2%	

**Table A-4: Consumer Surplus Model for Sweden
Development of Aggregate Input Price Index**

Year	Annual Growth Rates of Input Prices						Cost Shares of Inputs			Aggregate Input Price	
	Labor (ECI) 1/		Transportation (TCI) 2/		Other Inputs (CPI) 3/		Labor Share	Transp- ortation Share	Share of Other Inputs	Annual Growth Rates	Index
	Annual Growth Rates	Index	Annual Growth Rates	Index	Annual Growth Rates	Index					
1990		1.000		1.000		1.000	70.0%	12.0%	18.0%		0.628
1991	6.6%	1.068	-1.2%	0.988	8.9%	1.093	70.0%	12.0%	18.0%	6.1%	0.667
1992	5.3%	1.127	5.8%	1.047	2.3%	1.118	70.0%	12.0%	18.0%	4.8%	0.700
1993	-1.4%	1.111	-1.1%	1.036	4.5%	1.170	70.0%	12.0%	18.0%	-0.3%	0.698
1994	4.6%	1.163	3.9%	1.077	2.2%	1.196	70.0%	12.0%	18.0%	4.1%	0.727
1995	5.4%	1.227	3.8%	1.118	2.5%	1.226	70.0%	12.0%	18.0%	4.6%	0.762
1996	7.1%	1.317	1.1%	1.130	0.5%	1.232	70.0%	12.0%	18.0%	5.2%	0.802
1997	4.2%	1.373	2.1%	1.154	0.5%	1.238	70.0%	12.0%	18.0%	3.3%	0.828
1998	2.7%	1.411	1.0%	1.166	-0.1%	1.237	70.0%	12.0%	18.0%	2.0%	0.845
1999	2.1%	1.440	3.5%	1.207	0.5%	1.242	70.0%	12.0%	18.0%	2.0%	0.862
2000	3.4%	1.489	7.1%	1.296	1.0%	1.255	70.0%	12.0%	18.0%	3.4%	0.891
2001	3.0%	1.535	0.9%	1.308	2.4%	1.285	70.0%	12.0%	18.0%	2.7%	0.915
2002	3.4%	1.588	4.0%	1.361	2.1%	1.313	70.0%	12.0%	18.0%	3.2%	0.946
2003	3.8%	1.650	1.7%	1.385	1.9%	1.338	70.0%	12.0%	18.0%	3.2%	0.976
2004	2.5%	1.692	4.6%	1.450	0.4%	1.344	70.0%	12.0%	18.0%	2.4%	1.000
Average Growth		3.8%		2.7%		2.1%					3.4%

1/ Swedish Employment Cost Index (ECI) for Blue Collar Manufacturing Labor

2/ Swedish Transportation Cost Index (TCI)

3/ Swedish Consumer Price Index (CPI)

Table A-5: Sensitivity Analysis of Consumer Surplus
Simulation of Changes in Consumer Surplus Using Alternative Sets of Own-Price Elasticities
Change in Consumer Surplus 1990-2004 (Millions of SEK)

Cases	Single Piece				Bulk				Total	
	Own Price Elasticity	Percent Change from Baseline	Change in Consumer Surplus	Percent Change from Baseline	Own Price Elasticity	Percent Change from Baseline	Change in Consumer Surplus	Percent Change from Baseline	Change in Consumer Surplus	Percent Change from Baseline
Baseline 1/	-0.250	0.0%	-623	0.0%	-1.000	0.0%	2,368	0.0%	1,745	0.0%
1	-0.375	50.0%	-618	-0.7%	-1.500	50.0%	2,548	7.6%	1,929	10.6%
2	-0.125	-50.0%	-627	0.7%	-0.500	-50.0%	2,209	-6.7%	1,582	-9.3%
3	-0.250	0.0%	-623	0.0%	-0.500	-50.0%	2,209	-6.7%	1,586	-9.1%
4	-0.250	0.0%	-623	0.0%	-0.750	-25.0%	2,286	-3.5%	1,663	-4.7%
5	-0.250	0.0%	-623	0.0%	-1.500	50.0%	2,548	7.6%	1,925	10.3%
6	-0.500	100.0%	-614	-1.4%	-0.750	-25.0%	2,286	-3.5%	1,672	-4.2%
7	-0.500	100.0%	-614	-1.4%	-0.500	-50.0%	2,209	-6.7%	1,595	-8.6%
8	-0.750	200.0%	-605	-2.8%	-0.750	-25.0%	2,286	-3.5%	1,681	-3.7%
9	-0.750	200.0%	-605	-2.8%	-0.500	-50.0%	2,209	-6.7%	1,604	-8.1%
10	-1.000	300.0%	-597	-4.1%	-0.750	-25.0%	2,286	-3.5%	1,689	-3.2%
11	-1.000	300.0%	-597	-4.1%	-0.500	-50.0%	2,209	-6.7%	1,612	-7.6%
12	-1.000	300.0%	-597	-4.1%	-0.250	-75.0%	2,137	-9.7%	1,540	-11.7%

1/ Baseline is the case presented in the paper.

Table A-6: Annual Profit (Loss)
for Sweden Post (Posten) and CityMail
(Millions of SEK)

Year	Posten 1/	CityMail 2/
1991	898.0	
1992	748.0	
1993	1,131.0	
1994	1,405.0	
1995	1,266.0	3/
1996	537.0	
1997	1,103.0	
1998	1,155.0	4/
1999	1,155.0	
2000	1,069.0	5/
2001	1,420.0	6/ (138.0)
2002	69.0	6/ (75.0)
2003	78.0	6/ (55.0)
2004	1,007.0	6/ 5.0
2005	1,302.0	6/ 50.0
Average Annual	956.2	(14.2)

1/ Posten earnings from letter mail service after interest expenses

2/ CityMail Earnings Before Interest and Taxes (EBIT)

3/ Posten 1995 earnings were adjusted to 708 MSEK in 1996

4/ Posten 1998 earnings were adjusted to 1,480 MSEK in 1999

5/ Posten Earnings Before Interest and Taxes (EBIT)

6/ Posten earnings from letter mail, express, logistics and cashier services

A.2 Development of Delivery Cost for Posten and CityMail

The Postal Delivery Cost Model developed in Cohen *et al.* (1998), can be modified for other posts with delivery schedules that fundamentally resemble that of the model post, but where delivery occurs less regularly. We accept the variable costs of the model, and use the model to develop fixed costs per capita for Posten and CityMail. The fixed cost per capita is driven by the method and frequency of delivery. Since both Posten and CityMail have delivery methods that closely resemble that of the model post (door-to-door with travel time in between), we are able to determine the fixed cost of delivery on a per-delivery day basis, by taking one-sixth of the fixed cost of the model post. This amount is then multiplied by the days of delivery to determine the fixed cost of delivery per capita. The results are presented in Table A-7.

**Table A-7: Cohen, et al Postal Cost Model - Delivery Only
(1999 U.S. Dollars)**

	<u>Frequency of Delivery</u>	<u>Variable Cost Per Piece</u>	<u>Fixed Cost Per Capita</u>
USPS	6 Day	0.0525	42.24
Posten	5 Day	0.0525	35.20
CityMail	Every 3rd Day	0.0525	11.73