

**Pricing Repositionable Notes (RPN) for Use in Postal Delivery Services:  
An Economic Analysis**

by

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## Executive Summary

It is theoretically possible for demand-based or “value” pricing of mail pieces with Repositionable Notes (RPN) attached to raise the revenues necessary to cover the Postal Service’s production costs with less welfare loss to mailers than uniform (cost-based) pricing of RPN-attached mail and conventional mail. Identifying prices that will actually accomplish this, however, is extremely difficult. It requires far more information about the demand for postal products and the competitiveness of the market for the goods produced by the downstream industries using these products than the Postal Service currently has or will obtain from the current RPN market test. If there are demonstration and learning effects that cause the intensity of use of RPN-attached mail in early periods to impact the demand for RPN-attached mail in later periods, this task becomes even more complex.

The Postal Service’s current experiment with value pricing charges a positive price increment to process RPN-attached mail without a corresponding reduction in the price of conventional mail of the same subclass. This approach cannot increase the welfare of the consumers of that subclass. This form of value pricing for RPN-attached mail is also likely to reduce (rather than increase) Postal Service revenues relative to uniform pricing of RPN-attached and conventional mail if conventional mail and RPN-attached mail are close substitutes. Accurate information on the responsiveness of the demand for RPN-attached and conventional mail with respect to the prices of both products is necessary to determine if the current approach to value pricing or any form of value pricing can increase overall Postal Service revenues. Even more detailed and accurate demand information is necessary for the Postal Service to identify differential prices for the two products that increase Postal Service revenues (relative to uniform pricing) without reducing the total welfare of mailers.

The current RPN market test will not yield the information necessary to determine if value pricing will increase Postal Service revenues or increase the welfare of mailers. If the prices of conventional and RPN-attached mail do not change over the course of the market test, it is impossible to measure the responsiveness of the demand for these two products to changes in their prices. For this reason, the Commission and Postal Service may wish to consider extending the RPN-market test for another year under the prices of conventional mail to be implemented on January 8, 2006. Extending the current market test for another year would be significantly more likely to identify rates that would increase both postal revenue and consumer welfare if a uniform price for RPN-attached and conventional mail were charged.

There are also legal challenges associated with making value prices for RPN-attached mail permanent. There are a number of previous Postal Rate Commission decisions and opinions that appear to prohibit or at least severely restrict the use of value pricing. Establishing a permanent value price for RPN-attached mail could make it difficult for the Postal Rate Commission to prevent many other forms of price discrimination by the Postal Service. Widespread price discrimination by the Postal Service could undermine the ability of the Commission to carry out its mandate under the Postal Reorganization Act.

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## **1. Purpose and Scope of Report**

I have been asked by the Postal Rate Commission to provide an economic analysis of the implications of value pricing in general and its specific application to the pricing of Repositionable Notes on postal products. A Repositionable Note (RPN) is a Post-It<sup>®</sup>-type note that can be attached to letters and flats. Because of its construction and how it is applied to a mailpiece, an RPN is unlikely to come off during mail processing. Because it is attached to the outside of a mailpiece, an RPN is typically used to display an advertising message that encourages the recipient to act on the contents of the mailpiece.

The United States Postal Service (“Postal Service”) has run extensive operational tests to determine the cost implications of processing letters and flats with RPNs attached. The Postal Service has also worked with companies that produce RPNs to design a product that can be machine-processed at the same cost to the Postal Service as the host mail piece without an RPN attached. In December of 2004, the Postal Rate Commission (henceforth, the Commission) approved of a one-year market test by the Postal Service to confirm that letter and flat mail with an RPN attached will not cause operational problems or result in higher mail processing costs under actual operating conditions. The Postal Service would also like to determine if mailers derive sufficient value from the use of RPNs to allow it to impose an additional charge for processing these mailpieces. For the purposes of this market test, the Postal Service implemented a 0.5 cent charge for an RPN attached to a First-Class mailpiece and 1.5 cents charge for an RPN attached to a Standard Mail or Periodical mailpiece.

These charges are based on what the Postal Service calls “value pricing” of an RPN attached to a mailpiece. The price of this mail characteristic is based on the Postal Service’s estimate of its value to the mailer, because there is no additional cost to the Postal Service of processing an RPN-attached mailpiece. Value pricing is an example of price discrimination—charging consumers different prices for the same commodity. In this case, the Postal Service is selling the same product (delivery of a mailpiece of a specific subclass) to different mailers (those that attach an RPN to the mailpiece and those that do not) at different prices. Because the cost to the Postal Service of processing an RPN-attached mail piece is the same as the cost of processing the same type of mailpiece without an RPN attached, a higher price for processing RPN-attached mail fits the definition of price discrimination.

Price discrimination is commonly used by firms to enhance their revenues and overall profitability. A necessary condition for price discrimination to succeed is that the seller be able to segment customers to prevent those paying the lower price from becoming resellers competing to serve the higher-priced customers. Because the RPN is attached to the outside of a mailpiece, it is an ideal mechanism to prevent competition from RPN-attached mail not provided by the Postal Service. If a competitor attempts to send a mailpiece with an RPN attached using a conventional Postal Service mail class, the Postal Service can easily verify this visually and foil the competitor's attempt to profit from the Postal Service's higher prices for RPN-attached versus conventional mail. Because the Postal Service can easily prevent third-parties from arbitraging higher prices charged for processing RPN-attached mail versus convention mail, value-pricing or price discrimination has the potential, but is not guaranteed, to increase Postal Service revenues.

Price discrimination can be consistent with economically efficient price regulation. Historically, regulated prices for electricity supply and telephone service differed by customer characteristics, for example, whether the location was a business or residence. Within each of these customer classes, the price paid for an additional unit of consumption also differs depending on that customer's current level of consumption. Similar pricing mechanisms exist for urban water and natural gas supply. However, as I discuss below, the regulator must have a substantial amount of information about the nature of the production process and structure of demand to set discriminating prices that benefit consumers and/or the monopolist relative to the case of a uniform price that raises the same amount of revenue for the monopolist. Limited information on mail processing costs and the structure of demand for RPN-attached and conventional mail is a major challenge for the design of consumer and producer welfare-enhancing value prices for RPN-attached mail.

From a pure economic efficiency perspective, the goal of price regulation is to maximize the sum of net benefits accruing to the owners of the firm and to consumers from the sale of the regulated firm's products. The net benefit to the owners of the firm is typically called producer surplus. The net benefit to consumers from the products sold by the firm is typically called consumer surplus. Setting prices that maximize the sum of producer and consumer surplus subject to the requirement that the firm earns a nonnegative economic profit, maximizes the total surplus that owners of the firm and consumers can share subject to the constraint that the firm remains financially viable.

Although such prices are economically efficient, the regulator is typically required to take into account other factors in setting prices, such as protecting low income households or the elderly from high prices, despite the fact that they may have very inelastic demands for some or all of the firm's products. For example, the Postal Reorganization Act requires that rates and classifications be "fair" and not "make any undue or unreasonable discrimination among users of the mails" [see Sections 3622(b)(1) and 403(c)]. Respecting these fairness and equity constraints can result in prices that reduce the aggregate amount of surplus that producers and consumers have to share.

Starting from the case of uniform pricing, the consumer and producer welfare impacts of allowing price discrimination are generally indeterminate. There are circumstances when allowing price discrimination can increase total consumer surplus relative to uniform pricing. Allowing a profit-maximizing firm to price discriminate will typically increase its profits. This increase in profits occurs only if the firm possesses the unilateral market power necessary to maintain prices to some customers above the marginal cost of the last unit sold. The total surplus implications of allowing price discrimination are generally ambiguous because price increases reduce consumer surplus but typically increase producer surplus and price decreases typically reduce producer surplus but increase consumer surplus.

Section 2 presents a graphical model of differential pricing of RPN-attached mail to illustrate these points. This model shows that a necessary (but not a sufficient) condition for price discrimination to increase total surplus is that total output of the firm increases. This analysis also demonstrates that raising the price of RPN-attached mail without concurrently reducing the price of conventional mail, as the current RPN market test does, cannot increase total welfare relative to the case of uniform pricing of RPN-attached and conventional mail of the same subclass.

Section 3 discusses three secondary effects that further complicate the process of determining whether a regulated monopolist producing an intermediate good such as postal delivery services can increase total welfare through price discrimination. The first effect is that discriminatory prices for an intermediate good such as postal delivery services can amplify output price distortions, and therefore amplify welfare losses that occur in downstream markets if some producers in the downstream markets have unilateral market power. Specifically, firms that possess unilateral market power in downstream markets set prices a given percentage above their marginal cost of production. If these marginal costs are higher because of differential pricing of RPN-attached mail, the prices

these firms charge will be higher (and demand for their products even lower) than would be the case with uniform pricing of conventional and RPN-attached mail. This change in the price of a good produced using RPN-attached mail is called a “flow-through effect to downstream markets” from differential pricing of RPN-attached mail.

The other two potentially significant secondary effects arise because RPN-attached mail is a new product. For this reason, there is uncertainty about the future cost of producing RPNs and attaching them to mailpieces and the future demand for RPN-attached mail. Whether allowing price discrimination between RPN-attached and conventional mail increases or reduces total surplus will depend, in part, on how these uncertainties are resolved. For example, if greater initial usage of RPNs allows mailers to learn how to produce and attach RPNs more cheaply or how to improve their design and use to increase the profits of downstream firms, initially charging a zero incremental price for processing RPN-attached mail or even subsidizing the use of RPNs might actually increase the discounted present value of total surplus the Postal Service and consumers have to share. Reductions in the cost of producing and attaching RPNs as a function of the cumulative volume of RPN-attached mail are called learning effects. Increases in the demand for RPN-attached mail as a function of the cumulative volume of RPN-attached mail processed are called demonstration effects.

Section 4 describes the information the Commission will need to determine if a set of discriminating prices increases consumer, producer, or total surplus. This section demonstrates that the information currently available to the Commission, even combined with the anticipated results of the ongoing RPN market test, are inadequate for determining whether a given set of prices for RPN-attached and conventional mail will increase consumer, producer, or total surplus relative to uniform pricing. An alternative approach to differential pricing of RPN-attached mail is for the Commission to delegate this authority to the Postal Service subject to constraints on the RPN-attached and conventional mail prices the Postal Service can set. This approach can allow price discrimination to increase both consumer and producer surplus while imposing fewer informational requirements on the Commission. Section 5 discusses two mechanisms for delegating pricing authority to a regulated monopolist, one of which leads to an increase in consumer surplus. This section also demonstrates that the current RPN market test will not yield the information necessary

for the Commission to implement a mechanism for delegating pricing authority that increases consumer surplus.

Section 6 discusses a number of broader questions that argue against allowing the Postal Service to discriminate in its pricing of RPN-attached mail. First, value pricing of RPN-attached mail is likely to increase the uncertainty in the future revenue stream of the Postal Service. Second, it could speed the search for substitutes for postal products and reduce the demand for high margin postal products. If the Commission establishes a formal precedent for value pricing, there are many other observable characteristics of the mailpieces that could be used by the Postal Service to engage in value pricing. This form of price discrimination will further stimulate third parties to develop products that compete with value-priced Postal Service products. Finally, value pricing may be contrary to the Commission's legal mandate for pricing postal products under the Postal Reorganization Act.

This report concludes with an assessment of the advisability of permanent differential pricing of RPN-attached mail. Because of the substantial informational requirements and analytical complexity in setting consumer surplus-increasing differential prices for RPN-attached versus conventional mail, differential pricing of RPN-attached mail on a permanent basis is unlikely to benefit mailers. A more likely outcome from a positive incremental price for processing RPN-attached mail is that both mailers and postal consumers receive far less net benefits from the use of RPN-attached mail and the Postal Service receives a modest, if any, increase in total postal revenues from this differential pricing. The net effect is a reduction in the total surplus from the production and consumption of postal products and other goods that use postal delivery services as inputs into their production processes. There also appear to be formidable legal and regulatory challenges to overcome in making value pricing of RPN-attached mail permanent.

## **2. Differential Pricing of RPN-Attached Mail as Price Discrimination**

By the well-known logic of Ramsey pricing, price discrimination can allow a price-regulated monopoly to recover product-specific fixed costs and common costs with a smaller loss in total surplus relative to the case of uniform pricing. Price discrimination involves exploiting differences in the willingness to pay of different customers by setting a higher price for consumers with a higher willingness to pay.

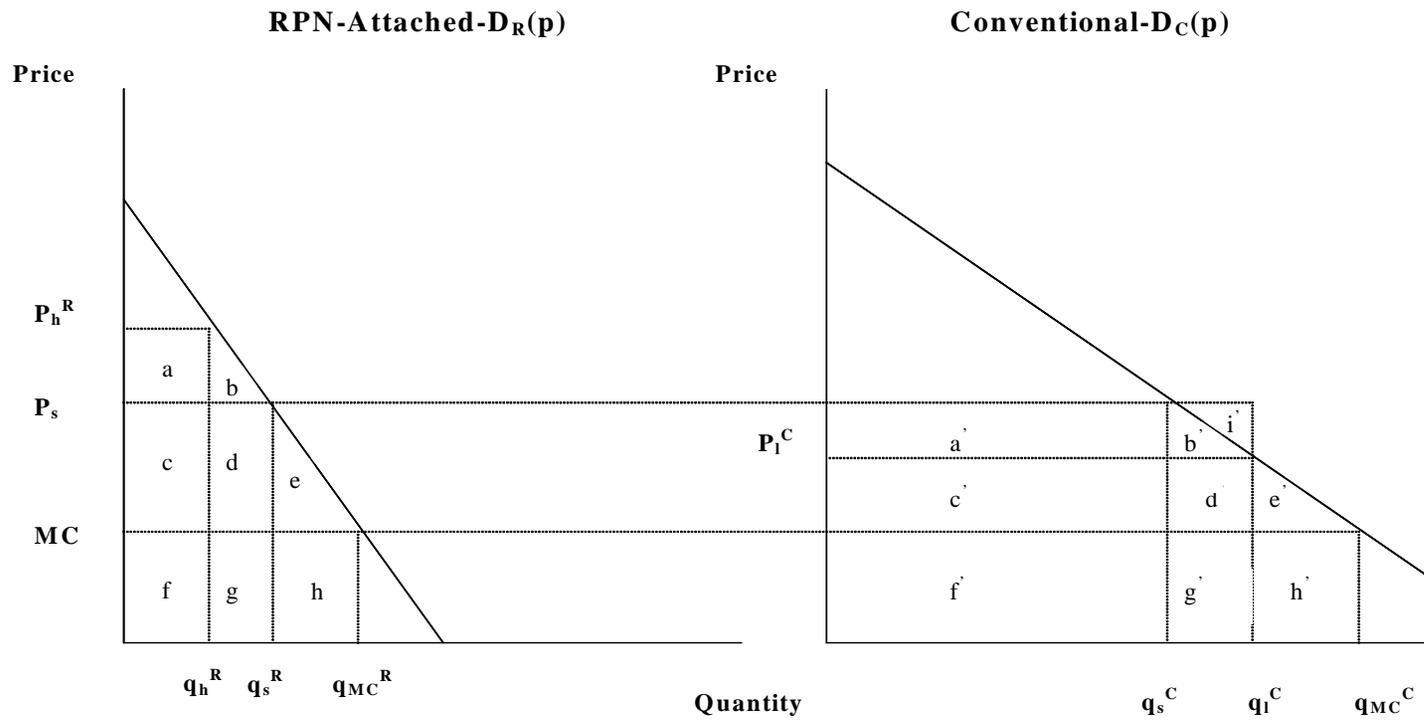
In general, efficient pricing requires setting the price each consumer pays equal to the marginal cost of the last unit sold. However, in an industry with substantial fixed costs of production—either product-specific or common costs—price equal to the marginal cost of the last unit sold may not yield enough revenue for the firm to recover these fixed costs. Consequently, the regulator is faced with the challenge of raising the necessary revenue in a manner that entails the least loss in consumer welfare. Price discrimination has the potential to provide the necessary revenue with less welfare loss to consumers than a higher uniform price. This section explains the consumer and producer welfare impacts of allowing price discrimination.

By raising the price above the marginal cost of the last unit sold more for those customers with a higher willingness to pay, the reduction in aggregate consumer welfare is less than would be the case if the prices all consumers paid were raised by the same percentage. This result occurs because consumers with a higher willingness to pay to reduce their consumption less for the same percentage increase in price than consumers with a lower willingness to pay. Economists quantify the marginal willingness to pay of a group of consumers using the own-price elasticity of their demand curve. Let  $D_i(p)$  equal the aggregate demand for the good by customers of type  $i=1,2$  as a function of  $p_i$ , the price charged to type  $i$  customers. The elasticity of demand for customers of type  $i$  evaluated at  $p_i$  is equal to:

$$\epsilon_i(p_i) = \frac{dD_i(p_i)}{dp_i} \frac{p_i}{D_i(p_i)} = \frac{[\text{Percentage Change in } D_i(p_i)]}{[\text{Percentage Change in } p_i]}.$$

The price elasticity of a demand curve quantifies the percentage reduction in the quantity demanded by customers of type  $i$  for a one percent increase in the price customers of type  $i$  pay. Because demand curves slope downwards,  $\epsilon_i(p_i)$  is negative. If  $\epsilon_i(p_i)$  is less than one in absolute value, then the demand curve is inelastic at  $p_i$ . If it is greater than one in absolute value, the demand curve is elastic at  $p_i$ . The smaller in absolute value  $\epsilon_i(p_i)$  is, the less is the percent reduction in the quantity demanded for a one percent increase in the market price. Consequently, less consumer surplus will be lost as a result of the same percentage price increase for less elastic demand curve than for a more elastic demand curve. Figure 1 plots two sample demand curves for mail delivery—one mail and

Figure 1



the other for conventional mail of the same subclass, for example, First-Class, Standard Mail or Periodical Mail. Let  $MC$  denote the constant marginal cost of processing the RPN-attached mail or conventional mail of the same subclass. At a  $p_i = MC$ , for  $i=R$  (RPN-attached mail) or  $C$  (conventional mail), the demand for each type of mail is  $q_{MC}^R$  and  $q_{MC}^C$ , respectively. Increasing the price for each product from  $MC$  to  $p_s$  results in a significantly greater welfare loss for type  $C$  consumers versus type  $R$  consumers. Specifically, the aggregate welfare loss to type  $R$  consumers is the sum of areas  $c$ ,  $d$ , and  $e$ , and the aggregate welfare loss to type  $C$  consumers is the sum of areas  $a'$ ,  $b'$ ,  $c'$ ,  $d'$ , and  $e'$ . The welfare loss for type  $C$  consumers is much greater because the elasticity of demand for type  $R$  consumers is smaller in absolute value than elasticity of demand for type  $C$  consumers for all prices between  $MC$  and  $p_s$ .

Setting two different prices above  $MC$  in order to raise the revenues necessary to cover total production costs can reduce consumer surplus less than setting a single price above  $MC$  to cover total production costs. Taking this idea to its logical extreme by choosing these two prices to maximize total consumer surplus subject to covering total production costs yields Ramsey prices, named for the economist Frank Ramsey (1927) who first proposed this mechanism. Under the unrealistic assumption that the demands for both types of consumers do not depend on the price charged to the other type of consumers, the Ramsey prices for the two types of consumers solve the following equations:

$$\frac{p_i - MC}{p_i} = -\frac{k}{\epsilon_i(p_i)} \text{ for } i=R, C, \quad (1)$$

for some constant  $k > 0$ . As discussed below, these equations become much more complicated if the demand for each product depends on the prices charged for both products.

Schmalensee (1981) uses a version of Figure 1 to provide a graphical illustration of the necessary conditions for price discrimination to increase total surplus. Suppose that  $p_s$  is the uniform price for processing a specific class of the RPN-attached and conventional mail, each of which has the same marginal cost of delivery of  $MC$ . Figure 1 shows that at this price the demand for RPN-attached mail delivery is  $q_s^R$  and the demand for conventional mail delivery of the same subclass

is  $q_s^C$ . Assume that at this uniform price ( $p_s$ ) and the prices set for all other postal products, the Postal Service expects to recover its total production costs.

Starting from this uniform price for both postal products, increasing the price of delivering RPN-attached mail to  $p_h^R$  reduces total welfare for RPN-attached mail by the areas  $b$  and  $d$ . The areas  $a$  plus  $b$  equal the loss in consumer surplus and area  $d$  is the loss in producer surplus from this price increase. The area  $a$  is the transfer of surplus from consumers to producers (in this case the Postal Service) as a result of this price increase, implying a net loss in producer surplus of  $d$  minus  $a$ . Reducing the price of conventional mail from  $p_s$  to  $p_l^C$  increases the total welfare for conventional mail by the sum of areas  $b'$  and  $d'$ . The sum of areas  $a'$  and  $b'$  is the net increase in consumer surplus and the area  $d'$  is the increase in producer surplus. The area  $a'$  is the transfer of surplus from producers (the Postal Service) to consumers as result of the price reduction, implying a net gain in producer surplus of  $d'$  minus  $a'$ . The net welfare change from raising the price of RPN-attached mail and decreasing the price of conventional mail of the same subclass is the difference between the sum of areas  $b'$  and  $d'$  (the welfare gain in conventional mail) and the sum of areas  $b$  and  $d$  (the welfare loss in RPN-attached mail). The change in total surplus can be rewritten as

$$\text{Change in Total Surplus} = (b' + d') - (b + d) = [(b' + d' + i') - i'] - [b + d]$$

This expression can be re-written as:

$$\text{Change in Total Surplus} = (p_s - MC)(Q^D - Q^S) - (i' + b) \quad (2)$$

where  $Q^D = q_h^R + q_l^C$  and  $Q^S = q_s^R + q_s^C$ . Because  $i' + b$  is positive and  $(p_s - MC)$  is positive, a necessary, but not sufficient, condition for differential pricing of RPN-attached mail to increase consumer welfare is that total mail volume increases, meaning that  $(Q^D - Q^S) > 0$ . The above logic demonstrates that for total surplus to increase as a result of differential pricing, the increase in the sum of RPN-attached and conventional mail must be sufficiently large for the first term in (2) to be greater than the sum of the areas  $i'$  and  $b$ .

This diagram can be used to demonstrate that charging a higher price for RPN-attached mail only, as is the case under the current RPN market test, cannot increase total surplus relative to the case that a uniform price is charged for delivering RPN-attached and conventional mail. As described above, increasing the price of RPN-attached mail from  $p_s$  reduces both producer surplus

(net of the surplus transfer from consumers) and consumer surplus. A potential total welfare improvement is possible only if the price of conventional mail is reduced enough to increase the conventional mail surplus more than the welfare loss in RPN-attached mail, while still producing enough revenue from both products to achieve the same total contribution to fixed cost recovery that would exist under uniform pricing of the two types of mail.

Figure 1 also shows that price discrimination can increase consumer welfare if the own-price elasticity of demand for RPN-attached mail is smaller in absolute value than the own-price elasticity of demand for conventional mail of the same subclass and the quantity of conventional mail demanded is much greater than the quantity of RPN-attached mail demanded under both uniform pricing and price discrimination. If the demand for conventional mail is much higher and more price elastic than the demand at RPN-attached mail under uniform pricing, then the consumer surplus increase from reducing the price of conventional mail may be sufficient to dominate the reduction in consumer surplus from increasing the price of RPN-attached mail. Determining how to adjust the prices of RPN-attached mail and conventional to increase overall consumer surplus requires detailed knowledge of the demand for both types of mail.

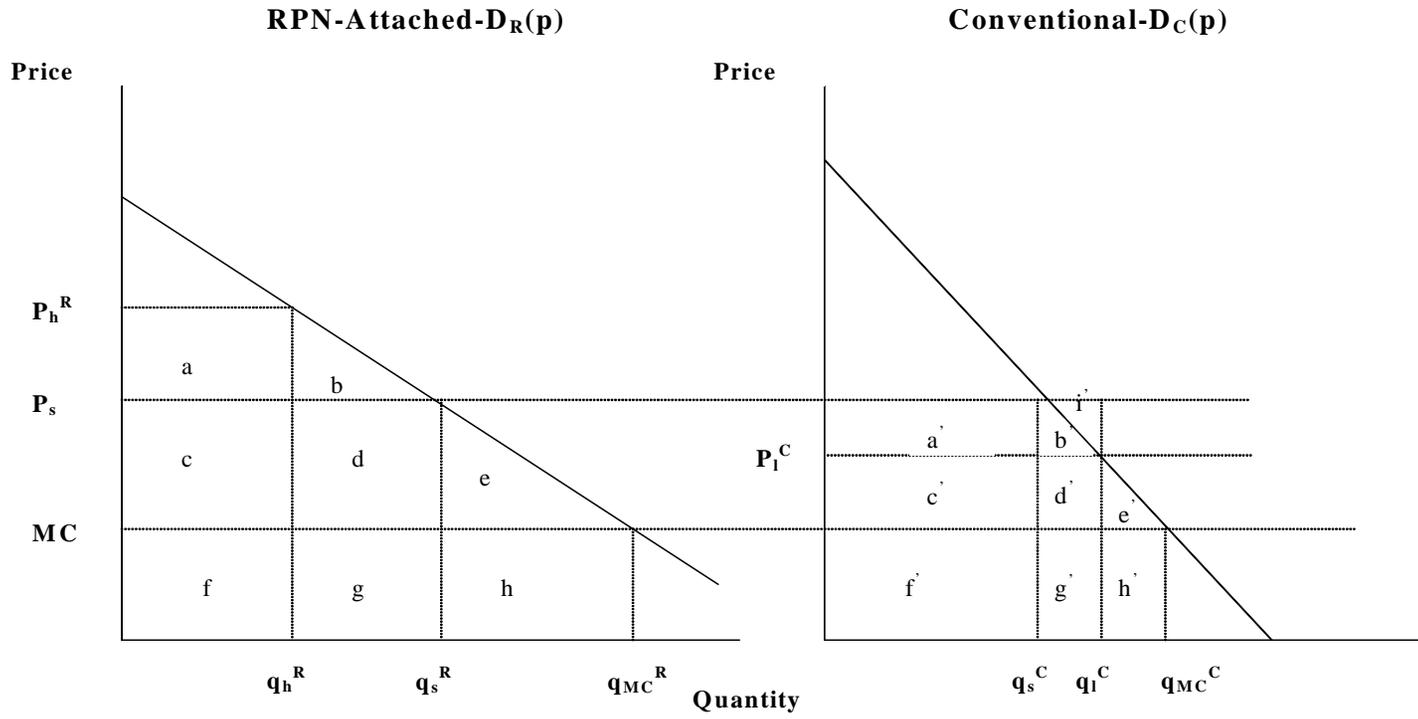
To clarify the information necessary to determine the welfare impacts of allowing price discrimination for this simple model of the demand for the two types of mail, consider the following two scenarios. The first is the best-case for allowing the Postal Service to engage in price discrimination and the second is the worst-case. Under the best-case scenario, the demand for RPN-attached mail is inelastic, meaning that the own-price elasticity of demand is less than one in absolute value, and the demand for conventional mail is price elastic, meaning that the own-price elasticity of demand is greater than one in absolute value. This case is drawn in Figure 1. To make this scenario more concrete, assume that  $p_s$ , the uniform price, is equal to 1 and the demand for RPN-attached mail is 100 and the demand for conventional mail is 500 at  $p_s$ . Total revenues from RPN-attached and conventional mail under uniform pricing is 600 ( $= 1 \times 100 + 1 \times 500$ ). Suppose that  $p_h^R$  is set equal to 1.2 and  $p_l^C$  is equal to 0.9. Because the demand for RPN-attached mail is inelastic, the percentage decrease in demand is less than the 20 percent increase in price of RPN-attached mail. Suppose that the demand for RPN-attached mail only falls by ten percent to 90. Because the demand for conventional mail is elastic, the increase in demand is greater than the price reduction for

conventional mail. Suppose that the demand for conventional mail increases by 15 percent (to 575) as a result of this 10 percent price reduction. Total revenues to the Postal Service under price discrimination are  $625.5 = (1.2 \times 90 + 0.9 \times 575)$ . Both the price increase for RPN-attached mail and the price decrease for conventional mail increase the revenues earned by the Postal Service. This occurs because the price of the inelastically-demanded product increases and the price of the elastically-demanded product decreases. Because the demand for RPN-attached mail is inelastic, increasing its price relative to  $p_s$  increases total Postal Service revenues, even if the price of conventional mail remains unchanged. Note that the necessary condition for price discrimination to increase total surplus also holds for this numerical example. The total volume of RPN-attached and conventional mail increases from 600 to 665.

The worst-case scenario for allowing price discrimination occurs if the demand for RPN-attached mail is elastic and the demand for conventional mail is inelastic. This case is graphed in Figure 2. As in the previous example, suppose that for  $p_s$  equal to 1, the demand for RPN-attached mail is 100 and the demand for conventional mail is 500. However, as a result of increasing the price of RPN-attached mail to 1.2, the demand for RPN-attached mail falls by more than 20 percent, because this demand is now price elastic. Suppose the demand for RPN-attached mail falls by 25 percent to 75. Because the demand for conventional mail is inelastic, reducing the price by 10 percent to 0.9 yields a quantity increase that is less than 10 percent. Suppose the demand for conventional mail increases by 4 percent to 520 as a result of this price decrease. Total Postal Service revenues fall to  $558 = (1.2 \times 75 + 0.9 \times 520)$ . Postal Service revenues fall because the price of an elastically-demanded product (RPN-attached mail) is increased and the price of an inelastically-demanded product (conventional mail) is decreased. Under these demand conditions, a higher price for RPN-attached mail would reduce total Postal Service revenues, even without an accompanying reduction in the price of conventional mail from  $p_s$ . This example fails the necessary condition for price discrimination to increase total surplus. The total number of pieces of RPN-attached and conventional mail falls from 600 to 595.

As discussed in Section 4, the Postal Service currently does not have the information necessary to determine the true demand conditions for these two types of mail. Nevertheless, two factors argue in favor of the worst-case scenario being closer to reality. First, mailers can readily

Figure 2



substitute to conventional First-Class or Standard Mail from RPN-attached First-Class or RPN-attached Standard Mail, so the demand for RPN-attached mail is likely to be significantly more elastic than the demand for conventional mail of the same class. Second, in the most recent rate case (Docket No. R-2005-1), the Postal Service presented evidence stating that the long-run demand elasticities for First-Class, Standard Mail and Periodicals are less than one in absolute value. Both of these factors favor the worst case scenario, where a higher price of RPN-attached mail reduces Postal Service revenues and price discrimination reduces total surplus.

Increasing the realism of the model of the demand for RPN-attached and conventional mail considerably complicates the process of determining total surplus-increasing differential prices. Under the more credible assumption that mailers use the price of conventional mail to decide whether to send a mailpiece and the price of RPN-attached mail to decide whether to attach an RPN to it, the demand for both RPN-attached and conventional mail will depend on both prices. For instance, the prices charged for First Class mail and RPN-attached First Class mail should determine the demand for each type of mail.

Suppose that the demand for type  $i$  ( $i=R,C$ ) is  $D_i(p_R, p_C)$ , where  $p_R$  is the price of RPN-attached mail and  $p_C$  is the price of conventional mail of the same subclass. This form of the demand for both types of mail requires estimating both the own-price and cross-price elasticities of the demand for both products to compute consumer welfare-improving prices. Under these conditions on the demand for the two types of goods, the Ramsey-pricing formula takes the form:

$$\frac{p_i - MC}{p_i} = -\frac{k}{S_i} \text{ where } S_i = \frac{e_{ii}e_{jj} - e_{ij}e_{ji}}{e_{jj} - \frac{p_j q_j}{p_i q_i} e_{ji}} \quad (3)$$

and  $e_{ij} = \frac{\partial D_i(p_R, p_C)}{\partial p_j} \frac{p_j}{D_i(p_R, p_C)}$  is the elasticity of the demand for good  $i$  with respect to the price of

good  $j$ ,  $p_i$  is the price of good  $i$ , and  $q_i$  is the quantity demanded of good  $i$ . The  $S_i$  are called super elasticities because they depend on all of the own-price and cross-price elasticities of all products. Note that when the cross-price elasticities are zero,  $e_{ij} = e_{ji} = 0$ , equation (3) reduces to equation (1).

Varian (1985) shows that Schmalensee's necessary condition for total surplus to increase holds for this more general model of the demand for the two goods.

It is also possible that the demand for RPN-attached Standard mail depends on the price of First Class or RPN-attached First-Class mail, because there are many instances when a mailer has the option to use either First Class or Standard mail to reach its customer. The expressions for the super elasticities in (3) become much more complicated under this demand assumption. These super elasticities now depend on the cross-price and own-price elasticities of all of these postal products. As I discuss in Section 4, there is little data available to the Commission to quantify even the own-price elasticity of demand for RPN-attached mail. Quantifying the magnitude of the cross-elasticities of RPN-attached mail demand with respect to the prices of conventional mail of the same class and other classes of conventional and RPN-attached mail would require significantly more data than is currently available to the Commission.

### **3. Enhancements to the Basic Model of the Welfare Impacts of Price Discrimination**

There are three major enhancements of the basic model that increase its applicability to the case of value pricing of RPN-attached mail. The first concerns the impact of flow-through effects of value pricing on the prices of products that use postal delivery services in their production process. The second enhancement is the impact of learning effects on the cost of producing and attaching RPNs to mailpieces. The third is the impact of demonstration effects on the demand for RPN-attached mail.

An important assumption underlying the analysis presented thus far is that both RPN-attached and conventional mail are only purchased by final consumers. To the extent that the two postal products are used as intermediate inputs, differential pricing of the two goods can have what are referred to as "flow-through effects" in the prices of goods produced using these products as inputs. All types of conventional mail and RPN-attached mail are likely to be used by businesses as inputs to their production process. If all downstream industries that use the two products are perfectly competitive, these "flow-through effects" do not impact the methodology used to determine consumer, producer, or total- surplus-increasing differential prices. Furthermore, the Ramsey-pricing formulae given in equations (1) and (3) are unaffected by the fact that these products are used as inputs into perfectly competitive downstream industries.

“Flow-through effects” alter the total-surplus-maximizing prices for the two postal products if the downstream industries that use these products are imperfectly competitive. If firms in these industries are able to set prices for their output in excess of the marginal cost of the last unit produced, then the prices set for the two postal products can be used to limit the market inefficiencies in pricing by the downstream firms with market power. Specifically, a lower price for the service intensively used by downstream firms with significant unilateral market power can limit the welfare losses to consumers that purchase the output of these downstream firms.

A simple example illustrates this point. Suppose that downstream industry A, with unilateral market power, uses RPN-attached mail and no conventional mail and perfectly competitive industry B uses only conventional mail. Setting a markup for RPN-attached mail that is higher than the markup for conventional mail based on the own-price and cross-price elasticities of demand for the two postal products, as is implied by equations (1) or (3), results in greater welfare losses to consumers through their purchases of the output produced by firms in industry A than a scheme that charges a lower markup over marginal cost (MC) for RPN-attached mail and a higher markup over MC for conventional mail. Reducing the markup over marginal cost of the price of RPN-attached mail improves overall consumer welfare. This is because the firms in industry A exercise unilateral market power by setting prices higher than their marginal cost of production, which depends on the price of RPN-attached mail. In fact, if the cost share of RPN-attached mail in the output of industry A is sufficiently high, and the markup over marginal cost in industry A is sufficiently high, then it may enhance consumer welfare to sell RPN-attached mail at less than MC and set the price of conventional mail higher above MC to recover the revenue shortfall. This result occurs because pricing RPN-attached mail above MC results in such large consumer welfare losses in the consumption of the goods produced by firms industry A. Reducing the price of RPN-attached mail and increasing the price of conventional mail of the same subclass raises the necessary revenues while balancing the welfare losses of pricing conventional mail above marginal cost against the welfare losses in the downstream industry, due to the market power of the downstream firms that intensively uses RPN-attached mail.

Another important determinant of the consumer, producer, and total-surplus impacts of differential pricing of RPN-attached versus conventional mail is the fact that RPNs are a new product and firms may not know how to best use RPN-attached mail versus conventional mail to maximize

the profits they earn from the goods and services that they sell. Using RPN-attached mail requires the mailer to incur additional fixed and variable costs. The mailer is also uncertain about the level of the fixed and variable costs of using RPN-attached mail. A customer considering whether to use RPN-attached mail is also uncertain about the impact this will have on the demand for its output.

This logic implies that if the Postal Service sets the price for RPN-attached mail higher than the price of conventional mail, it may discourage a number of potential demanders of this new product who would ultimately realize substantial net benefits from its use. For example, a mail-order company may discover that a certain type of RPN attached to its catalogue yields significant sales increases. Over time the firm may also learn how to reduce the cost of producing and applying RPNs to its catalogues. However, because of the current up-front costs of attaching RPNs to its catalogues, the per unit cost of applying them, and the additional costs of postage from sending an RPN-attached catalogue, the firm may decide not to try this new good.

To capture any learning effects that impact the cost to the mailer of producing mailpieces with RPNs attached, or demonstration effects that teach the firm how to use RPNs to achieve increased sales, the Postal Service should set the price of RPN-attached mail lower in order to induce more firms to experiment with this new postal product. If these learning effects in the cost and downstream benefits of using RPN-attached mail are sufficiently large, it may increase the discounted present value of consumer welfare and Postal Service revenues to have an introductory period when the price RPN-attached mail is set below conventional mail. This would allow the Postal Service to realize these demand-side and supply-side benefits of high levels of initial volume of RPN-attached mail. Setting a higher price for RPN-attached mail discourages use of this new product and slows the process of learning how to reduce the cost of making RPN-attached mailpieces and how to use this new postal product in the most profitable manner.

To understand how to account for this learning effect in pricing RPN-attached mail, consider a simple two-period model. Let  $D_R^1(p_R^1)$  be the demand for RPN-attached mailpieces in period 1, where the superscript “1” on a variable denotes a period 1 value. Let  $D_R^2(p_R^1, p_R^2)$  denote the period 2 demand for delivering RPN-attached mailpieces. To account for the customer learning and cost reduction effects of period 1 use of RPN-attached mail, the period 2 demand for RPN-attached mail depends on the prices of RPN-attached mail in period 1 and period 2. The two-period revenues earned by the Postal Service from RPN-attached mail are:

$$TR^{12} = p_R^1 D_R^1(p_R^1) + p_R^2 D_R^2(p_R^1, p_R^2)$$

The change in total revenue across the two periods to the Postal Service from increasing the period 1 price of RPN-attached mail is

$$\frac{\partial TR^{12}}{\partial p_R^1} = D_R^1(p_R^1) \left[ 1 + \epsilon_R^{11} + \epsilon_R^{21} \frac{p_R^2 D_R^2(p_R^1, p_R^2)}{p_R^1 D_R^1(p_R^1)} \right] \quad (4)$$

where  $\epsilon_R^{11}$  is the elasticity of demand for RPN-attached mailpieces in period 1 with respect to the price in period 1 of RPN-attached mail and  $\epsilon_R^{21}$  is the elasticity of demand for RPN-attached mailpieces in period 2 with respect to the price in period 1 of RPN-attached mail. Because of the demonstration and learning effects associated with using RPN-attached mail,  $\epsilon_R^{21}$  is assumed to be negative, meaning that higher period 1 prices reduces period 2 demand. The presence of the term involving  $\epsilon_R^{21}$  in equation (4) implies that the two-period total revenue increase associated with raising the price of RPN-attached mail in period 1 is less than would be the case without these

learning and demonstration effects ( $\epsilon_R^{21} = 0$ ), because  $\frac{p_R^2 D_R^2(p_R^1, p_R^2)}{p_R^1 D_R^1(p_R^1)}$  is positive. Therefore, learning

and/or demonstration effects imply a lower price for RPN-attached mail in period 1 than would be justified by the period 1 own-price demand elasticity.

Even if the period 1 demand for RPN-attached mail is inelastic, so that  $1 + \epsilon_R^{11} > 0$ , if revenues from RPN-attached mail in period 2 are sufficiently high relative to those in period 1, then the existence of learning or demonstration effects ( $\epsilon_R^{21} < 0$ ) could cause total revenue across the two periods to fall as a result increasing the price of RPN-attached mail during period 1. Consequently, if demonstration and learning effects are sufficiently large, then a policy of a higher initial price for RPN-attached mail relative to conventional mail could run counter to the goal of increasing total Postal Service revenues.

This logic does not rule out the Postal Service eventually setting the price of RPN-attached mail higher than conventional mail. The change in total Postal Service revenues across periods 1 and 2 with respect to price of RPN-attached mail in period 2, is equal to:

$$\frac{\partial TR^{12}}{\partial p_R^2} = D_R^2(p_R^1, p_R^2)[1 + \epsilon_R^{22}].$$

This expression implies that if the own-price elasticity of demand for RPN-attached mail in period 1 equals the own-price elasticity in period 2, and the demand for RPN-attached mail in period 1 equals the demand in period 2 [ $\epsilon_R^{11} = \epsilon_R^{22}$  and  $D_R^1(p_R^1) = D_R^2(p_R^1, p_R^2)$ ], the two-period revenue increase due to raising the price of RPN-attached mail in period 2 is greater than the two-period revenue increase due to raising the price in period 1 because there are demonstration and learning effects associated with using RPN-attached mail in period 1 (meaning that  $\epsilon_R^{21} < 0$ ). Thus, a higher price for RPN-attached mail in period 2 versus in period 1 should yield greater revenues for the two periods than any constant price for RPN-attached mail across the two periods that yields the same level of consumer surplus across the two periods.

#### **4. Information Required to Compute Total Surplus-Increasing Value-Prices**

The discussion in Sections 2 and 3 illustrates the significant technical challenges associated with designing welfare-improving discriminatory prices for RPN-attached and conventional mail. Detailed knowledge of the structure of demand for both types of mail is required. How the demand function for each good in future periods is affected by the prices of RPN-attached and conventional mail in previous periods is also necessary. To the extent that either RPN-attached mail or conventional mail is an input to the production of goods or services sold to final consumers, knowledge of the demand and production costs for these products and the competitiveness of these industries is necessary to design welfare-increasing value prices. The limited amount of data currently available on the demand for Postal Service products and the downstream uses of postal products makes it very unlikely that the Postal Service would be able to design welfare-improving prices with any degree of confidence.

The information collected from the current RPN-market test is also not likely to be informative about price responsiveness of the demand for RPN-attached mail relative to conventional mail. In order to identify own-price or cross-price elasticities, it is necessary to observe the demand for the product for at least two distinct prices. For example, a crude estimate of the own-price elasticity could be computed by observing the demand for RPN-attached mail at two different prices.

The current RPN market test fixes the price of RPN-attached mail for a given class for the entire test period. This identifies a single point on the demand curve for RPN-attached mail, but provides no information about the elasticity of this demand curve. The observed demand for RPN-attached mail is consistent with any theoretically possible own-price effect.

Similar logic applies to estimating the cross-price elasticity of the demand for RPN-attached mail with respect to the price of the same class of conventional mail or the cross-price elasticity of the demand for conventional mail with respect to the price of the same class of RPN-attached mail. The level of demand for both RPN-attached and conventional mail must be observed for at least two different prices for RPN-attached and conventional mail of the same class in order to construct even crude estimates of these cross-price elasticities. The price of First-Class, Standard Mail and Periodicals has been fixed for the entire RPN-market test period, so data on the demand of RPN-attached and conventional mail for the test period is insufficient to construct these cross-price elasticity estimates.

The postal price increases effective January 8, 2006 can provide the second price observation for RPN-attached and conventional mail necessary to estimate the own-price and cross-price effects associated with both RPN-attached and conventional mail. Because the prices of all classes of conventional mail that can use RPNs will increase, the total price of RPN-attached mail will also increase, even if the incremental price of attaching an RPN to each class of mail does not increase. Data on postal volumes under these new prices would need to be collected for a sufficiently long period of time to be comparable with the postal volumes collected under the current market test. This could require the Commission to maintain the RPN-market test for as long as another year to obtain the necessary data under the new mail prices.

This single price change allows estimation of own-price and cross-price effects for RPN-attached and conventional mail. Because they are each based on a single price change, these estimates are not likely to be very accurate. In addition, estimating these price effects would require abstracting away from the three enhancements to the basic model described in Section 3. Specifically, the structure of demand for both products would have to be assumed to be the same across the two time periods except for the impact of zero mean unobservable shocks to the demand for both products. The impact of learning effects or demonstration effects on the demand for these

two postal products could not be identified from this data without further assumptions about the functional form of these demands.

Even if demonstration effects and learning effects do not influence the demand for RPN-attached mail, these estimates will still be subject to other potential sources of error. For example, to the extent that mailers perceive that their behavior under the RPN-market test will impact the price ultimately charged for RPN-attached mail, the price effects estimated by extending the test period for another year could reflect the strategic behavior of mailers rather than their true response to changes in the price of RPN-attached mail. Another complication in obtaining valid estimates of these own-price and cross-price effects arises if a mailer's demand for RPN-attached mail depends on its relative scarcity in a household's daily mail bundle. If the number of pieces of mail a customer receives each day that have RPNs attached reduces the likelihood that she will act on the message written on any single RPN, this implies that the value mailers derive from sending a piece of RPN-attached mail is also likely to decline. This logic implies that one determinant of the benefits that mailers receive from a piece of RPN-attached mail is its relative scarcity in a household's daily mail bundle. Deriving a credible model of demand that accounts for the impact of the scarcity value of RPN-attached mail on its demand is extremely challenging.

The above discussion emphasizes how difficult it is to measure the structure of demand for RPN-attached and conventional mail. However, as shown in Section 2, this information is a crucial input to the design of prices for RPN-attached and conventional mail that will increase the total surplus available to the Postal Service and to mailers as a result of the introduction of RPN-attached mail. From the discussion in this section and that in Sections 2 and 3, it seems reasonable to conclude that the data available at the end of the current RPN-market test provides little useful information about how to design welfare-improving prices for RPN-attached and conventional mail.

Focusing on the less ambitious goal of maximizing the revenue gain to the Postal Service from the introduction of RPN-attached mail still requires an estimate of the structure of demand for both types of mail. This logic implies that data from the current RPN-market test also provides little useful information about how to design prices for RPN-attached mail that maximize the increase in the Postal Service revenues from charging a higher price for RPN-attached mail. The question of whether a higher price for RPN-attached mail will increase Postal Service revenues also depends on the own-price and cross-price elasticities of demand for both types of mail. (As discussed in Section

2, charging a positive incremental price for RPN-attached mail is guaranteed to reduce the welfare of mailers and consumers who purchase goods and services produced using RPN-attached mail.)

To derive the conditions necessary for this price increase to increase Postal Service revenues within a given time period, let  $D_j(p_R, p_C)$  denote the demand for type  $j$  mail, where  $j = R$  or  $C$ . Note that this demand curve differs from the demand curves analyzed in Figures 1 and 2 in Section 2 because the demand for each product depends on the prices of both conventional and RPN-attached mail. This demand curve also differs from the one considered in Section 3 because it only depends on prices in the current period, not on prices in future periods. Consequently, this demand curve assumes away the existence of demonstration and learning effects in the demand for RPN-attached mail.

The single period revenues earned by the Postal Service from processing RPN-attached and conventional mail of a given subclass are:

$$TR = p_R D_R(p_R, p_C) + p_C D_C(p_R, p_C). \quad (5)$$

A necessary condition for an increase in  $p_R$  from the point that  $p_R = p_C = p$  to increase total revenues from processing RPN-attached and conventional mail of a given subclass is:

$$1 + \epsilon_{RR} + \epsilon_{CR} \frac{D_C(p, p)}{D_R(p, p)} > 0, \quad (6)$$

where  $\epsilon_{RR}$  is the own-price elasticity of demand for RPN-attached mail and  $\epsilon_{CR}$  is the cross-price elasticity of demand for conventional mail with respect to the price of RPN attached mail, where both elasticities are computed at the point  $p_R = p_C = p$ . The term  $\frac{D_C(p, p)}{D_R(p, p)}$  is the ratio of the quantity

demand of conventional mail divided by the quantity demanded of RPN-attached mail when both types of mail are priced at  $p_R = p_C = p$ .

Equation (6) demonstrates that if the demand for RPN-attached mail is elastic, even if conventional mail is substitutable for RPN-attached mail ( $\epsilon_{CR} > 0$ ), total revenues can fall if the volume of RPN-attached mail with equal pricing of the two products is substantially larger than the volume of conventional mail. Section 2 showed that when conventional and RPN-attached mail are neither substitutes nor complements ( $\epsilon_{CR} = 0$ ), an inelastic demand for RPN-attached mail is a

sufficient condition for Postal Service revenues to increase as a result of a higher price for RPN-attached versus conventional mail. In a more realistic demand framework that allows RPN-attached mail and conventional mail to be substitutes ( $\epsilon_{CR} > 0$ ), a revenue increasing price can exist if RPN-attached mail is elastically demanded. If the demand for RPN-attached mail is price elastic, then  $1 + \epsilon_{RR} < 0$ . If conventional mail is a substitute for RPN-attached mail and the quantity demanded of RPN-attached mail under uniform pricing is a small enough fraction of the quantity demanded of conventional mail, then equation (6) can still hold if  $\epsilon_{CR} \frac{D_C(p,p)}{D_R(p,p)}$  is larger than the absolute value of

$$1 + \epsilon_{RR}.$$

Putting some numbers to this example, suppose that the own-price elasticity of demand for RPN-attached mail is -2.0 and the cross-price elasticity of demand for conventional mail with respect to the price of RPN-attached mail is 0.5. If the volume of conventional mail at equal pricing is more than twice the volume of RPN-attached mail, then postal revenues can be increased as a result of differential pricing of RPN-attached mail. Consequently, if the own-price elasticity of demand of RPN-attached mail is not too large and the demand for RPN-attached mail under uniform pricing is not too large, a positive cross-price elasticity of demand between conventional and RPN-attached mail implies that it is possible to raise Postal Service revenues by charging a higher price for RPN-attached mail.

## 5. An Analysis of Methods for Delegating Pricing Discretion to Postal Service

An alternative approach to implementing welfare-improving differential prices for RPN-attached and conventional mail is to delegate pricing authority to the Postal Service subject to constraints on the individual prices it can charge. Although it is uncertain whether it is lawful under the Postal Reorganization Act for the Commission to delegate pricing authority to the Postal Service, this approach has the potential to limit the information requirements needed to implement welfare-improving differential prices. If delegated the authority to price discriminate, the Postal Service management has strong incentives to set prices for RPN-attached mail and conventional mail to maximize the revenues earned from processing this mail. Consequently, a major concern in allowing the Postal Service pricing discretion is whether mailers will be harmed as a result. Armstrong and

Vickers (1991) study the consumer welfare effects of allowing price discrimination by a regulated monopolist subject to a cap on the weighted average of the individual prices chosen.

Consider the following two methods for computing the weights used by Armstrong and Vickers (1991). The first uses the quantity shares of RPN-attached and conventional mail computed under uniform pricing. The second uses the quantity shares computed under discriminatory prices. The cap on the weighted-average of individual prices can be taken over a pair of postal products (an RPN-attached mailpiece and a conventional mailpiece of the same subclass) or the entire set of pairs of postal products that could have RPNs attached. For expositional ease, my analysis will be restricted to the case of two products. As Armstrong and Vickers demonstrate, the results presented below extend to the case of an arbitrary number of products.

Let  $D_j(p_R, p_C)$  denote the demand for type  $j$  mail, where  $j = R$  or  $C$  for given subclass of mail as a function of the prices charged for each type of mail. Let  $D_T(p_R, p_C) = D_R(p_R, p_C) + D_C(p_R, p_C)$ , the total amount of RPN-attached and conventional mail demand for a given subclass at prices  $(p_R, p_C)$ . Define  $W_j(p_R, p_C) = D_j(p_R, p_C)/D_T(p_R, p_C)$  as the share of total subclass volume that is type  $j$  mail at a price of  $p_R$  for RPN-attached mail and a price of  $p_C$  for conventional mail. Recall the prices given in Figures 1 and 2. Let  $W_j^S = W_j(p_S, p_S)$  be the share of mail type  $j$  when the price of RPN-attached mail and conventional mail are both equal to  $p_S$ . Because both  $p_R$  and  $p_C$  are evaluated at the uniform price,  $p_S$ ,  $W_j^S$  is the uniform-pricing weight for type  $j$  mail. Let  $W_j^D = W_j(p_h^R, p_l^C)$  be the share of mail type  $j$  when the price of RPN-attached mail is equal to  $p_h^R$  and the price of conventional mail is equal to  $p_l^C$ . Because the price charged for RPN-attached mail differs from the price charged for conventional mail,  $W_j(p_h^R, p_l^C)$  is the discriminatory price weight associated with type  $j$  mail. For both cases, the weighted-average price that the Postal Service can charge must be less than  $p_S$ .

For Case 1, the Postal Service can choose  $p_R^*$  and  $p_C^*$  subject to the constraint that with quantity weights based on a uniform price, the weighted-average price must not exceed  $p_S$ :

$$p_R^* W_R(p_S, p_S) + p_C^* W_C(p_S, p_S) \leq p_S. \quad (7)$$

For Case 2, the Postal Service can choose  $p_R^*$  and  $p_C^*$  subject to the constraint that with quantity weights based on discriminatory prices, the weighted-average price must not exceed  $p_S$ :

$$p_R^* W_R(p_R^*, p_C^*) + p_C^* W_C(p_R^*, p_C^*) \leq p_S. \quad (8)$$

For the assumptions on consumer preferences specified in their paper, Armstrong and Vickers (1991) demonstrate that for Case 1, both consumers and the Postal Service are better off by allowing the Postal Service to set the prices of the two types of mail, subject to the price constraint given in equation (7). The logic for this conclusion is that equation (7) allows the firm to achieve at least the same profits it did under uniform pricing. Consumers achieve at least as much utility as they did at the uniform prices, because the prices chosen by the Postal Service must satisfy equation (7). As a result, consumers can purchase the bundle they would choose under uniform prices  $[D_R(p_S, p_S), D_R(p_S, p_S)]$ , under discriminatory prices. In general, mailers can improve their welfare if the Postal Service engages in price discrimination subject to equation (7), because the mailer can afford to purchase a combination of RPN-attached and conventional mail that achieves a higher level of consumer welfare than the bundle it would choose under uniform pricing.

For Case 2, Armstrong and Vickers (1991) demonstrate that the Postal Service increases its profits as a result of having the discretion to price discriminate subject to equation (8). This follows from the fact that the Postal Service always has the option to set uniform prices, because  $p_S W_R(p_S, p_S) + p_S W_C(p_S, p_S) = p_S$  satisfies equation (8), but will generally be able to earn higher profits from differential pricing. However, Armstrong and Vickers also show that consumers cannot increase their welfare beyond the level they can obtain under uniform pricing if the discriminatory prices must be chosen to satisfy the inequality in (8). This result implies that delegating the authority to set discriminatory prices to the Postal Service subject to the inequality in (8) cannot improve the welfare of consumers relative to the case of uniform pricing of RPN-attached and conventional mail.

The general conclusion from the Armstrong and Vickers (1991) analysis is that if the constraint on the two prices is based on the no-price-discrimination quantity weights, then allowing the Postal Service pricing flexibility increases both consumer welfare (in this case consumer surplus) and the Postal Service's profit. If the constraint on the individual prices set by the Postal Service is based on the price discrimination quantity weights, then price discrimination increases the profits of the Postal Service, reduces consumer surplus, with ambiguous total surplus implications.

The Commission does not currently have the information needed to estimate the weights for Case 1. The Postal Service's one-year RPN-market test will not provide this information because it

uses discriminatory prices for RPN-attached and conventional mail. Therefore, the results of the current RPN-market test cannot be used to determine the quantity-weights that would yield an increase in consumer welfare from delegating pricing discretion to the Postal Service. It would still be possible to delegate pricing discretion to the Postal Service subject to discriminatory price weights, but data from the current RPN-market test is not required to do this. The Commission could simply require that Postal Service adjust the prices of conventional mail and RPN-attached mail so that the resulting quantity-weighted average price is less than the former price of conventional mail.

From the perspective of gaining useful information for subsequent pricing decisions, a year-long experiment with uniform pricing of RPN-attached and conventional mail would have been more useful. This market test would have yielded the information needed to set the price weights for Case 1 described by Armstrong and Vickers. At the end of this one-year uniform price experiment, the Commission could have used the annual volumes of each type of mail over that period to set the price weights governing the extent of discrimination that the Postal Service would be allowed to implement in pricing RPN-attached mail versus conventional mail in subsequent years. This logic, combined with the discussion in Section 4, suggests that if the Commission and Postal Service decide to run the RPN market test for a second year, it should be done under uniform pricing of RPN-attached and conventional mail of the same subclass. This would accomplish the two goals. It would provide demands for both types of mail at the second set of prices of RPN-attached and conventional mail needed to estimate own-price and cross-price demand elasticities. It would also yield estimates of the uniform-pricing quantity weights needed to delegate to the Postal Service the authority to engage in price discrimination.

## **6. Broader Issues Associated with Allowing Price Discrimination by the Postal Service**

The decision to allow the Postal Service to price RPN-attached versus conventional mail differentially raises several broader issues. The most important is that there are many other observable dimensions of postal products that do not impact the cost of delivering the mailpiece along which the Postal Service could price discriminate. For example, the Postal Service could price discriminate based on the color of the envelope that it delivers. The Postal Service could also price discriminate based on the font used to print the sender and/or receiver's mailing address or if additional text is printed on the outside of the envelope. Many companies include their corporate logo on the envelope or print a message to customers. Because the sender of this mailpiece derives

value from printing this message on the envelope or including the company logo, the Postal Service could charge a higher price for delivering mailpieces with these identifying features. All of these features of the mailpiece are easy to verify visually so that the Postal Service can easily prevent third-parties from using conventional mail to provide competing services and undermine its ability to price discriminate. If the Postal Service is allowed to price discriminate based on whether an RPN is attached to a letter, it could be difficult for the Commission to prevent price discrimination based on many other mail characteristics that do not impact mail processing costs.

If the decision to allow the Postal Service to engage in price discrimination with respect to RPN-attached mail is interpreted broadly as an authorization for price discrimination generally, the ability of the Commission to set the prices of postal products consistent with its mandate under the Postal Reorganization Act may be undermined. If it were authorized to price discriminate across all postal products, the Postal Service would have a strong incentive to create many “high value” mail categories and charge higher prices for processing this mail based on the willingness of mailers to pay. Even if the prices of all conventional mail subclasses were set above the average incremental cost of providing these products, an increasing share of Postal Service revenues would likely come from the sales of value-priced products. Because it would not have the necessary demand and cost data, the Commission would have little ability to determine the appropriate prices for these new postal products. It would have little choice but to rely on the Postal Service to select the appropriate value prices, similar to what occurred with the RPN-market test.

Although allowing price discrimination by the Postal Service could potentially raise the necessary revenues with less loss in consumer welfare, there are several factors in addition to the lack of adequate demand data that argue against it. First, it increases the uncertainty in the revenue stream of the Postal Service. Second, it could speed the search for substitutes for the value-priced postal products. Third, it could be contrary to the legal mandate of the Postal Reorganization Act for pricing postal products.

Setting a uniform price for products that are close substitutes builds an automatic stabilizer into the revenue stream of the firm. Setting the uniform price for both products too high may cause customers to substitute into the higher value product as opposed to not purchasing either product. For the case of price discrimination, there is a risk that the prices of both products are set too high so that customers purchase neither product, which significantly reduces the revenues that the firm

earns. There is also a risk that both prices are set too low, which can also reduce the revenues that the firm earns. Consequently, for a given amount of information about the nature of demand for the two products, setting a single uniform price entails significantly less revenue risk than setting differentiated prices. By this logic, as more price discrimination is permitted, the riskiness of the revenue stream of the Postal Service increases.

Allowing the Postal Service to set prices higher for RPN-attached mail versus conventional mail, or to engage in price discrimination along other product dimensions that do not impact mail processing or delivery costs, will encourage the entry of competing modes for providing the same service as the postal product being sold at a higher price. Any revenue increase from charging higher prices for RPN-attached mail may therefore be short-lived because these higher prices increase the incentive of mailers to search for lower cost alternatives to Postal Service products. Consequently, widespread value pricing could more rapidly erode the long-term financial viability of the Postal Service as more and more alternatives to Postal Service products are introduced.

The goal of Ramsey pricing is to set prices to recover the total costs of the Postal Service with the least amount of consumer welfare loss. Price discrimination based on whether an RPN is attached to a mailpiece can be consistent with the goals of Ramsey pricing. However, pursuing the goals of Ramsey pricing for all Postal Service products appears to be inconsistent with the Postal Reorganization Act, as it has been interpreted by the Postal Rate Commission.

Specifically, charging for mail characteristics that impose no costs on the Postal Service to process must be reconciled with a number of goals of the Act. For example, the Act requires that postal costs be apportioned in a way that does not “impair the overall value of [postal] service to the people” and on “a fair and equitable basis.” (See Sections 101(a) and (d).) Section 403(a) states that classifications and rates should not “make any undue or unreasonable discrimination among users of the mails.”

The Act contains a number of criteria that are specific to ratemaking and several more that are specific to classification. Particular attention is paid to fairness and value. Several kinds of “value” must be considered under the Act: value to the “sender” [Section 3622(b)(2)], value to the “recipient” [Section 3622(b)(2)], and value to the “people,” [Section 3623(c)(2)]. Although the Commission is required to interpret these subjective concepts as part of the price-setting process, it is difficult to see how its interpretation could imply that discriminatory prices satisfy these criteria.

Although the Commission approved the prices for RPN-attached mail on an experimental basis, its opinion summarizes potential conflicts with the Act that would need to be resolved if RPNs were to be approved on a permanent basis. (See pages 13-16 of the Commission’s Opinion in Docket No. MC2004-5.) As the Commission appears to interpret the Act, only classes and subclasses are entitled to have non-cost characteristics reflected in their prices. To qualify for subclass status, mail must have cost and demand characteristics that are significantly and intrinsically different from other mail. (See the Commission’s Opinion in Docket No. MC95-1 on page II-19.) In the past, the Commission has concluded that it is inconsistent with the Act to base a classification or rate on differences in relative demand alone. (See the Commission’s Opinion in Docket No. R2000-1 on pages 210-211.) Approving Ramsey-type pricing of mail along non-cost dimensions, as would occur with value pricing of RPN-attached mail, appears to require the Commission to change its interpretation of the Act to allow differences in relative demand alone to warrant applying a separate markup to RPN mail.

The Commission has previously rejected proposals to adopt “pure” Ramsey prices for the Postal Service. It has also rejected proposals that Ramsey prices be used as a “benchmark” set of rates, deviations from which should be minimized when the other pricing criteria are considered. (See the Commission’s Opinion in Docket No. MC95-1, Appendix F, on pages 18-19 and Docket No. R87-1 pages 108-115.) The Commission has instead identified fairness and the avoidance of undue discrimination as the foremost objectives of the Postal Reorganization Act. The Commission has even declined to adopt “Ramsey-like” prices for large mailers at the subclass level in order to retain their volume, concluding that “without demonstrated significant demand elasticity, [it would] only force additional institutional cost burdens onto the monopoly subclasses” and onto single-piece mailers. (See the Commission’s Opinion in Docket No. MC95-1 on page II-45.) The Commission has also refused to apply demand-based prices below the subclass level, out of concern that doing so will shift institutional cost burdens from bulk mailers to single-piece mailers. (See the Commission’s Opinion in Docket No. MC95-1 on pages II-42 to II-45.)

The above discussion indicates that there are significant legal issues that must be resolved before a permanent classification and differential price can be reconciled with the Commission’s interpretation of the Postal Reorganization Act.

## 7. Summary and Recommendations

Price discrimination can allow the Postal Service to raise the revenues necessary to cover its production costs with less consumer welfare loss than no discrimination, if done properly. However, designing prices that raise the necessary revenue with the minimum welfare loss to consumers is extremely difficult and requires far more information about the demand for postal products and the competitiveness of the market for the goods produced by the downstream industries using these products than the Postal Service currently has. If the demonstration and learning effects discussed in Section 3 impact the demand for RPN-attached mail, this becomes even more complex. In addition, differential pricing also entails more revenue risk than pricing under the current approach, which places primary emphasis on the cost of providing the product or service.

The analysis of Section 2 demonstrates that the current approach to value pricing, which charges a positive price increment to process RPN-attached mail without a corresponding reduction in the price of conventional mail of the same subclass cannot increase the welfare of the consumers of that subclass. Consumer welfare could be increased, if a discount for conventional mail accompanied the premium charged for RPN-attached mail within that subclass. A consumer welfare increase occurs if the demand for conventional mail in the subclass is sufficiently large relative to the demand for RPN-attached mail under uniform and differential pricing and this demand is sufficiently price elastic, so that the discount for conventional mail offsets the loss in consumer surplus from raising the price of RPN-attached mail within that subclass. The general conclusion from this analysis is that Postal Service revenue, consumer welfare, and total welfare could be increased if the demand conditions discussed in Sections 2 and 4 are met and appropriate combinations of RPN premiums and conventional mail discounts within a subclass are implemented.

Section 4 discusses the substantial informational requirements needed to compute these premiums and discounts with any degree of confidence. The Commission would at least need an estimate of the own-price and cross-price elasticities of demand for RPN-attached mail and conventional mail within a subclass. This section describes why the RPN market test currently underway would not yield useful information about these own-price and cross-price elasticities of demand. Because the prices of conventional and RPN-attached mail do not change over the course of the experiment it is impossible to measure the responsiveness of the demand for these two products to changes in their prices. For this reason, the Commission and Postal Service may wish to consider

extending the RPN-market test for another year under the prices of conventional mail to be implemented on January 1, 2006. This second year of demand data at a different set of prices, will provide the minimum information needed to compute estimates of these own-price and cross-price elasticities.

Section 5 introduces an alternative approach to implementing differential pricing of RPN-attached versus conventional mail that delegates pricing authority to the Postal Service, subject to a constraint on the weighted average of the two prices charged. This approach has the potential to yield welfare-improving differential prices with less informational requirements imposed on the Commission. This section demonstrates that if the weights used to set the constraint on the prices the Postal Service sets for the two types of mail are the quantity shares of RPN-attached and conventional mail of the same subclass under uniform pricing, then granting pricing discretion to the Postal Service is likely to improve both producer and consumer welfare relative to the case of uniform pricing of the two products.

Because the current RPN-market test sets a higher price for RPN-attached mail of the same subclass, it cannot yield useful information about the quantity weights for the two products under uniform pricing. Consequently, if the Commission and Postal Service decide to extend the RPN-market test for another year, this would be most usefully done with uniform pricing of conventional and RPN-attached mail. The resulting demand information would allow calculation of a cap on the weighted average price of both types of mail (RPN and conventional) within a subclass that would increase the likelihood that price discrimination by the Postal Service results in an increase in total welfare.

There are a number other challenges associated with implementing value prices for RPN-attached mail permanently. Section 6 argues that allowing value pricing for RPN-attached mail would make it difficult for the Commission to prevent other forms of price discrimination by the Postal Service. Widespread price discrimination by the Postal Service could significantly undermine the ability of the Commission to carry out its mandate under the Postal Reorganization Act. Section 6 also provides a description of previous Commission decisions and opinions that appear to prohibit or at least severely restrict the use of value pricing.

For the reasons summarized above, it is very unlikely that the Postal Service will be able to find prices for RPN-attached mail and conventional mail of the same subclass that it can demonstrate

with an acceptable degree of confidence will achieve an increase in its revenues and consumer welfare. The structure of demand for RPN-attached and conventional mail is extremely complex and the data currently available or likely to be available to the Postal Service at the conclusion of the current RPN-market test is inadequate to estimate it. These data would also be inadequate to design a mechanism for delegating pricing authority to the Postal Service in a manner that increases both consumer welfare and Postal Service revenues. In addition, even if adequate demand information were available, setting discriminatory prices increases the uncertainty in Postal Service revenues relative to the case of uniform prices. Finally, the short-term and long-term legal and regulatory complications associated with the Commission allowing value pricing of RPN-attached mail appear to be substantial. Given the many pre-existing mechanisms available for increasing Postal Service revenues, the expected costs of allowing value pricing could be substantially higher than the expected benefits to the Postal Service or its customers.

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### **Short Biography of Frank A. Wolak**

Frank Wolak is a Professor of Economics at Stanford University. He received his undergraduate degree from Rice University, and an S.M. in Applied Mathematics and Ph.D. in Economics from Harvard University. His fields of research are industrial organization and empirical economic analysis. He specializes in the study of privatization, competition, and regulation in network industries such as electricity, telecommunications, water supply, natural gas and postal delivery services. He is the author of numerous academic articles on these topics. A number of these articles can be downloaded from his web-site at <http://www.stanford.edu/~wolak>. He also teaches undergraduate and graduate courses on Antitrust and Regulatory Economics. He is a Research Associate of the National Bureau of Economic Research and a Visiting Researcher at the University of California Energy Institute in Berkeley. Professor Wolak has served as a consultant to the California and U.S. Departments of Justice on market power issues in the telecommunications, electricity, and natural gas markets. He has also served as a consultant to the Federal Communications Commission and Postal Rate Commission on issues relating to competition in network industries.

Since April of 1998 he has been Chairman of the Market Surveillance Committee (MSC) of the California Independent System Operator. In this capacity, he has testified numerous times at the Federal Energy Regulatory Commission (FERC), and at various Committees of the US Senate and House of Representatives on issues relating to market monitoring and market power in electricity markets. Topics addressed in this testimony include: FERC's role in the design of the California electricity market, the factors leading to the California electricity crisis, the role of the Enron trading strategies in the California electricity crisis, and lessons from the California electricity crisis and Enron bankruptcy for the design of effective regulatory oversight of wholesale energy markets.

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January 5, 2006

Mr. Steven Williams  
Secretary  
Postal Rate Commission  
901 New York Avenue, N.W., Suite 200  
Washington, D.C. 20268-0001

Dear Mr. Williams:

On December 13, 2004, I entered into Contract No. 109909-05-Q-1313 with the Postal Rate Commission. Among other things, it requires me to write a paper analyzing economic issues raised by the Postal Service's charging of fees for attaching Repositionable Notes (RPNs) to mail.

Please find enclosed the finalized paper entitled "Pricing Repositionable Notes (RPN) for Use in Postal Delivery Services: An Economic Analysis." It is intended to satisfy that portion of my obligations under the contract.

Sincerely,



Frank A Wolak