Economics and Postal Pricing Policy

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EXECUTIVE SUMMARY

- Welfare economic theory holds that prices are the key to economic efficiency. It is prices that determine the allocation of society's scarce resources by guiding the supply of goods and services, the demands and consumption of consumers, and the investment decisions of old and new enterprises.

- Economic reasoning establishes that socially efficient prices are based upon marginal costs and also reflect demand conditions. They are thus responsive to cost changes, to introductions of new technologies, and to changes in consumer preferences.

- Postal pricing policies--stemming partially from court decisions during the 1970's--overemphasize what are economically arbitrary allocations of costs to the various postal services, and underemphasize economic marginal costs and demand factors.

- Current postal classification and rate schemes may not provide an accurate reflection of marginal costs because mail matter with unlike cost characteristics may be grouped together in the same rate categories, and because all of the costs of delivery functions that are properly imputed to recipients of mail are instead attributed to mailers.

- Charging similar prices for mail matter exhibiting different cost characteristics, and improper imputation of

delivery costs cause some postal services to be "underpriced" and some "overpriced."

- "Overpricing" some postal services invites socially unwarranted entry by competitors. "Underpricing" creates subsidized users who may have incentives to use political and legal processes to prevent efficient pricing and to bar the competitive entry that would eliminate their sources of subsidy.

- Failure to price separately for supra-basic delivery services causes 1st and other classes of mail to be over-priced. This can lead to socially inefficient diversion of mail volume to competing information transfer systems, a situation which will worsen as new technologies increase the number and applicability of such systems.

- The most effective way to price delivery services more efficiently (in order to avoid inappropriate diversion to socially inefficient suppliers) would be to establish a guaranteed "basic" level of delivery service quality, where quality is to include frequency and proximity dimensions. Individual consumers may purchase various higher quality delivery options for prices that reflect cost and demand conditions.

- Local political bodies could choose the design and levels of supra-basic services which would be contracted on a community level from the USPS (or others) on the basis of a standardized schedule of compensatory prices.

I.   Introduction

Why study the economics of postal prices?   There are
four reasons.   First, postal services are an important part of
the infrastructure of the economy, and if they are not priced
in accordance with economic principles resources will be wasted,
not only in the postal service, but in other parts of the
economy as well.   Second, postal services are at the eye of a
cyclone of technological developments in the information services
industries.   Third, the structure of the postal service as an
institution -- questions of monopoly or competition, frequency
of delivery, closing of post offices -- is the subject of policy
debate.   As we explain below, pricing in accordance with economic
principles can do much to clarify and resolve such issues.
Finally, postal services are provided by a quasi-government
agency, and many postal policy decisions involve frankly political
considerations. 1/ These debates would best serve the general
public interest if they were conducted in an atmosphere that
allowed the interest groups to concentrate on "splitting up the
pie," with the size of the pie already maximized.   Economically
efficient pricing would ensure that the pie is as big as possible,

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1/ Our emphasis in this paper will be on pricing alone, not
a general attempt to address institutional issues.   For a
review of recent political issues concerning the U.S. Postal
Service, see Joel Fleischman, Postal Policy and Public Account-
ability: Is the 1970 Bargain Becoming Unglued? (Cambridge,
Massachusetts: Harvard University Program on Information
Resources Policy, forthcoming).

so that the greatest benefits are available to society as a whole. 2/

In this paper, we will try to delineate what is entailed in economically proper postal pricing policy. We will start with a very brief review of some important economic principles that serve as guidelines for pricing policies that promote general economic welfare. This is followed by an examination of present postal pricing patterns for some important classes of mail in light of the economic principles. We shall see that deviations from these principles may cause policy and political difficulties. Finally, we make some specific suggestions for changes in methods of pricing. The most important of these suggestions is that the postal service begin to charge directly for delivery service.

Postal pricing that takes account of basic principles of welfare economics can reduce the acrimony of many of the policy debates surrounding the postal service, including such issues as Saturday delivery, electronic mail, and postal subsidies. Such pricing can also help to steer the communications revolution along the most socially beneficial route.

II. Some Principles of Welfare Economics Applied to Postal Services

Welfare economics is the study of the relationship between the economic well-being of society and its members, and the rules

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2/ For a discussion of the history of postal pricing see R. Sherman, "Pricing Policies of the U.S. Postal Service," presented at the EIASM-IIM Symposium on Public Policy for Regulated Monopolies and Public Enterprises, Brussels, June 14-15, 1979.

by which goods and services are produced and allocated. The objective is to find procedures and rules that maximize a carefully defined concept of social well-being, while taking account of limited resources and other constraints.

In an economy that is, like ours, based on consumer sovereignty, prices are the key to economic efficiency. Prices guide consumers and firms in the production of goods and services and in their allocation. Prices also act as signals to guide investments needed for the development and introduction of new goods and services. The guidance provided by prices to individual economic agents for the allocation of society's scarce resources is conducive to efficiency to the extent that prices approximate the corresponding net social costs of those goods and services.

Socially optimal production and allocations of goods and services require that the social benefit of the last unit produced (i.e., the marginal social benefit) be just equal to the social cost of producing that unit (i.e., the marginal social cost). 3/ Each purchaser of postal services, having a finite amount of money to spend, will only purchase units of mail service until the value to him of the last unit purchased just equals the value of other goods foregone by the purchase of the mail service. The value of the goods foregone is measured in monetary terms by the price paid for mailing. Then, if the social benefit of consuming postal service is entirely appropriated by the purchaser, the marginal social benefit of postal service will, as a result of consumers' actions, be

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3/ This follows because if the marginal social benefit were greater (less) than the marginal social cost, net social benefits could be increased by additional (less) production.

equal to the price. If, further, the cost to society of producing the postal service is entirely captured in the cost of the utilized materials, labor, etc., then the equality of marginal social benefit and marginal social cost can be achieved by setting postal prices equal to marginal production costs.

It is not commonly recognized that if the rule of pricing postal services at marginal costs were adhered to, there would be nothing to fear on welfare grounds from private introductions of new competing services. The reason, pathologies aside, is that even though some postal rates might be thereby driven up, the consequent losses to postal customers would be exactly matched by savings in production costs. And, while these savings would accrue to some individuals in the economy, balancing out the losses, yet others would gain from the self-supporting availability of the new services. 4/

However, despite the appeal of the marginal cost pricing rule, complications can arise in a variety of realistic circumstances. For instance, if there are benefits to society from postal services that are external to the individual purchaser (e.g., the social benefit of an informed public resulting from distribution of magazines) then the price of the service ought

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4/ For an impassioned legal and policy defense of marginal cost pricing, see Wilkey, J., dissenting in _Aeronautical Radio, Inc. v. FCC_, ____ F.2d ____, D.C. Cir., 1980.

to be lowered to stimulate further consumption until the
marginal benefit to the consumer (still equal to the price)
plus the marginal external benefit to society equals the
marginal production cost. If, as another example, the present
distribution of income is held to be inequitable, then, in the
absence of direct income transfers, prices may be used to improve
directly the allocation of income. Specifically, prices could
be lowered on those items which are consumed in greater proportion
by those groups to whom income should be transferred, and raised
on items consumed more heavily by groups from whom income should
be transferred. Prices under control of the public authority
may, as another example, have to be altered to compensate
partially for incorrect pricing in other sectors that are not
under control.

Finally, unconstrained welfare optimal prices may not
generate adequate revenues. It is a fact that in an enterprise
with economies of scale, prices equal to the marginal costs of
production cannot earn enough revenue to cover the entire cost
of production. 5/ If sufficient direct subsidies from the
government are not available, then the second-best policy in
such circumstances is that first derived by the economist
Frank Ramsey: 6/ Establish prices that maximize welfare,

5/ See J. Panzar and R. Willig, "Economies of Scale in Multi-Output Production," Quarterly Journal of Economics, August 1977, pp. 481-494

6/ F. Ramsey, "A Contribution to the Theory of Taxation," The Economic Journal, March 1927, pp. 47-61.

subject to the financial constraint that the enterprise at least break even. Such policy is now termed "Ramsey Optimal Pricing." Marginal cost prices can be Ramsey optimal if they do provide adequate net revenue to satisfy the financial constraint. Otherwise, Ramsey optimal prices deviate from marginal costs in a manner that minimizes the welfare losses caused by the financial needs of the enterprise. These deviations simply take account of demand conditions in a way that allows prices to exceed marginal costs the least for products whose consumption would be most affected by such departures.

There are two classes of welfare concerns about pricing in this context. The first is the static problem of allocating the burden of the break-even constraint, or the deficit, over services in a way that leaves society as well off as possible. The other, and probably more important concern is that prices be efficient signals for investment decisions by the USPS and by potential and actual competitors. This dynamic concern will be discussed later in the paper.

The inverse elasticity rule (henceforth IER) of pricing that was once proposed by the U.S.P.S. 7/ is one characterization

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7/ For example, Docket No. R-74-1, ". . . USPS Changes in Rates of Postage and Fees for Postal Services," Washington, August 20, 1974. The use of IER prices was later rejected by the D.C. Circuit Court of Appeals; see n. 12, infra, and the discussion in Fleishman, op. cit.

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of Ramsey prices that is appropriate in a particular set of economic circumstances. In all cases, the philosophy, the methodology, and the definition of the Ramsey optimum are the same. However, in different economic environments, when different effects are prevalent, different considerations affect the levels and the mathematical characterizations of the Ramsey optimal prices. For example, as mentioned above, concerns about income distribution or externalities can, when they are relevant, cause modifications in the appropriate pricing rules.

In Appendix A to this paper there is a technical description of the derivation of Ramsey optimal prices from some standard but not value-free first principles. It is necessary in general to take formal account of the possibility of externalities, second-best problems, regulation, income redistribution goals, and so on. The inverse elasticity rule that is a special case of Ramsey pricing is derived in Appendix B for cases where some of these complications can be assumed away. It is also possible to derive special cases of the rule that pertain to any particular combination of assumptions. But as the assumptions become more general and more "realistic," and as attempts are made to use the structure of postal prices as a policy tool to correct problems elsewhere in the economy, the pricing formulae become increasingly complicated and unwieldy, and they require data that are not readily available. Empirically

tractable pricing rules require some effort to circumscribe the number of social goals relevant to postal prices.

The inverse elasticity rule (IER) derived in Appendix B characterizes Ramsey optimal postal prices under four conditions. These are: (i) In the eyes of the social decision maker, an additional dollar of real income from postal sources is of equal social value no matter to whom it accrues. This could be because the decision maker is indifferent to income distributional concerns, because he or she finds the distribution of real income at IER prices to be optimal, or because there are available mechanisms that are more efficient than postal pricing in redistributing real income. (ii) No postal price significantly affects the output level of any non-postal good or service that has a price different than its marginal social cost. Further, there are no cross-elasticities of demand among the different U.S.P.S. services. (iii) Postal prices do not affect the output levels of any merit or externality goods or services; that is, goods and services that bring benefits or costs to individuals other than their purchasers. (iv) U.S.P.S. supplies all that is demanded from it, given the prevailing prices of its services.

Of course, it is evident that all these conditions are not likely to be met for the U.S.P.S., or for any other collection of items in the economy. The issues then are whether the conditions approximate reality closely enough for the IER to retain

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its value, and if not, whether a tractable modification of the IER can be derived for postal services.

The IER requires that the percentage deviations of prices from marginal costs be inversely proportional to the price elasticities of demand. Services whose demands are highly elastic, that is, very responsive to price, have Ramsey optimal prices close to marginal costs, while inelastically demanded services have their optimal prices well above marginal costs. Such prices assure that the corresponding quantities deviate in relatively uniform proportions from those that would be demanded at marginal cost prices. The IER prices raise the preponderance of the net revenues needed to meet the break-even constraint from the services whose demands will be distorted the least, dollar for dollar, from "first best" levels.

Thus, the IER prices are differentiated from one another on the basis of demand as well as cost factors. The presentation in the appendices show that the relevant demand elasticities are those that face the U.S.P.S. 8/ Consequently, if the market demand for a service were relatively inelastic, but the demand facing the postal service were relatively elastic due to actual competition, potential entry and market incursions,

8/ The statement applies to this version of the problem, where the burden of the break-even constraint has to fall only on U.S.P.S. customers.

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then the appropriate elasticity in the IER would be the latter higher one. And, as a result, the Ramsey price would be closer than otherwise to social marginal cost, under the assumptions that have been made. One possible related policy problem is that the competitors and potential entrants might complain about "predatory pricing." This concern is easily exaggerated, since the U.S.P.S. and its regulators are presumably not interested in maximizing the size of the postal service at the expense of consumers. If the provision of some postal services were properly competitive, there would be no reason for concern about Ramsey pricing so long as all prices were economically compensatory. If, instead, the provision of all postal services were subject to such economies as to make them natural monopolies, there will not be entry or competition if pricing were done properly. 9/

It is critical to recognize that the IER applies to any partition of U.S.P.S. services into rate categories; i.e., to any "rate classification schedule." However, a particular rate category may force equal prices on subcategories with markedly diverse marginal costs and/or demand elasticities. 10/ In such

9/ We leave aside any possible "sustainability" problems as there is no evidence that the cost conditions for these are present in postal services.

10/ Many dramatic examples of such cases in the U.S.P.S. classification schedule, circa 1975, are detailed in the Postal Service Staff Study, "The Necessity for Change," U.S. Government Printing Office, December 10, 1976.

a case, a finer rate structure that was responsive to the IER would require markedly different prices for those groups of services. The finer structure could yield a significantly higher level of social welfare, if the costs of administering the structure were not prohibitive.

IER pricing has been often criticized in regulatory proceedings 11/ and in courts 12/ for "allocating" too large a portion of total cost on the basis of (seemingly shaky) demand factors, rather than on the basis of (presumably firmer) cost factors. 13/ Strictly speaking, the IER, or any pricing rule that results in cost coverage, "allocates" costs only in that it determines revenues for each service category that sum to total cost. Conversely, any cost allocation scheme is equivalent to some rule for setting prices that generate financially adequate revenues. Then, it could be argued, since a Ramsey pricing rule explicitly seeks the set of prices that maximizes social welfare, any reasonable public interest standard would mandate this approach to "cost allocation."

11/ Chief Administrative Law Judges Initial Decision, Postal Rate Commission, Docket No. R74-1, Vol. I, May 28, 1975.

12/ National Association of Greeting Card Publishers v. U.S.P.S., [NAGCPI], 569 F.2d 570, 572, 582 (1976).

13/ See the discussion in Part One of Roger Sherman, Ed., Perspectives on Postal Service Issues (AEI, 1980).

There is another view of IER pricing that is useful.
We know that IER prices are not below marginal costs, 14/
and we know that for the IER to be applicable at all it must
be the case that marginal cost pricing leaves a gap between
costs and revenues. The size of that gap indicates roughly
the extent to which demand factors determine the IER prices.
The size of the gap is also a measure of the degree of scale
economies in the production technology. It is known that the
ratio of the revenues from marginal cost pricing to total cost
is equal to the elasticity of total cost with respect to pro-
portional changes in all the priced outputs of the enterprise. 15/
Thus, if all outputs are taken into account, if the marginal
cost measurements are accurate, and if the gap is large, it can
only be inferred that there are important economies of scale.
On the other hand, the combination of a large measured gap with
only moderate scale economies would indicate that something is
amiss. The fault would not lie with the use of the IER, but
rather with the structure of rate categories or with the marginal
cost measurements. Later, we will emphasize such a problem with
delivery service.

14/ This is true as long as no demand complementarities are
pathologically strong.

15/ See J. Panzar and R. Willig, op. cit.

The IER provides a test for the efficiency of prices; if present prices satisfy the rule, the prices are optimal. But if the relationship does not presently hold, how is one to find the prices at which it does? Such a search would require knowledge of how marginal costs and demand elasticities change as prices move away from their present levels. Yet, cost and market analysts deserve congratulations when they succeed in determining marginal costs and demand elasticities even at the current point of operation. Thus, what is needed is a methodology for utilizing such current information to achieve goals that are more modest and practical than locating the global Ramsey optimum. Appendix C briefly summarizes such a method.

III. Diversion and Other Consequences of Non-Optimal Pricing

The discussion in the previous section should have made clear that sensible postal pricing guidelines can be derived, and that these guidelines say that prices must be responsive to marginal costs and to demand conditions. The prices can be designed to make the most efficient use of society's scarce resources in search of a public interest objective that is well-defined, and subject to whatever constraints and interdependencies are relevant. But what happens if prices are not set by such guidelines? After all, the courts have held that Congress did not wish the postal service to utilize an inverse elasticity rule that has

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some very attractive presumptive features. Instead, as in the
case of other utility regulators, the Postal Rate Commission
has gone off in search of the mythical grail of "proper" cost
allocation. Such a search is, according to the analysis provided
above, certainly going to result in society being worse off than
it would be with rational pricing rules. This section details
some of the consequences of failure to price postal services
on a rational economic basis.

The principal direct consequence of a failure to price
properly is to increase the quantity demanded of those services
that are underpriced and to decrease the quantity demanded of
those services that are overpriced, relative to the optimal
prices. This invites possibly unwarranted entry into those
markets where prices are too high. (It is "possibly" unwarranted
because entry might take place even if prices were set correctly).
In addition, the services that are underpriced will create an
associated interest group of "subsidized" users. These users
will have every incentive to use the political process, not just
to prevent efficient pricing, but even to perpetuate legal rules
barring entry into the service markets that are overpriced. The
creation of such interest groups with stakes in the status quo
pricing policy tends to cause difficulties on other fronts as well.
For example, changes in technology, classifications, service
quality or other dimensions will be resisted if they pose any
risk of altering the subsidy structure. There is unlikely to

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be a commercial substitute service available to carry on the subsidized service since it would be competing against a subsidized price. It may thus appear that only the postal service would offer the subsidized service at any reasonable price, and this stiffens opposition to a change in the subsidy structure.

A principal example of the economic irrationality of postal pricing policy is the failure to price delivery service separately. Up to 41% of the total non-administrative costs of the postal service are delivery-related. Yet, paradoxically, the postal service for decades has pursued a policy of charging only those patrons (box-holders) who do not wish to have their mail delivered.

Consider the following example of how diversion can occur under the present economically misguided pricing structure. Suppose that all the costs of mail pick-up, transport and sorting vary with volume, and that, hypothetically these costs add up to six cents per piece. Further, suppose that delivery costs are insensitive to volume, and that on some hypothetical typical route these fixed costs are $25,000 per year. If mail volume on that route is 180,000 pieces per year, the average delivery cost per piece is about 14¢. Average total cost per piece is then 20¢. Clearly, price must be 20¢ in order for the postal service at least to break even on this typical route. But delivery costs for some pieces and some customers are much less

than 14¢. Also, the costs of providing substitutes for postal service, such as electronic mail or electronic funds transfer, may be below 20¢ per equivalent piece. Suppose that one-third of the mail is comprised of pieces with low costs or low cost substitutes. There will be incentives for competitors to enter and to offer service only to the customers associated with this volume at some price less than 20¢. Postal service volume will fall by one-third. When this happens, average delivery cost per remaining piece _increases_ to about 21¢ per piece necessitating a U.S.P.S. price increase to 27¢. But at this higher price, there is still another group of customers that will be lost to competitors because the cost of serving them will be less than the price (27¢) charged by the postal service. Result: further diversion and still higher postal prices. This can go on until the U.S.P.S. is left with only the highest cost group of patrons.

It does not seem likely that the postal service can block competitive entry nor is it desirable that it should; what it should do is make sure that only appropriate entry signals are given. That requires economically rational pricing. In the example above, the appropriate price for _mailing_ a letter would be six cents, with separate pricing for delivery on a basis that reflects quality of service costs. Such prices would prevent the socially inefficient diversion of volume whose costs to an alternative supplier were greater than the six cent per piece costs of the postal service. These are the relevant costs of the postal service

because the fixed $25,000 cost of the route would be left undiminished by any diversion. Further, any diversion that would occur at a six cent price for mailing a letter would be socially efficient, because it would be diversion to an alternative with a genuinely lower cost. Moreover, such diversion would not necessitate increases in U.S.P.S. prices, because it would save costs (six cents per piece) equal to the loss in revenue (the price of six cents per piece).

Since delivery service costs are simply included in the price paid for _sending_ mail, studies suggest that there is an enormous potential for diversion of mail volume and revenue to competing media that can charge lower transmission prices. 16/ The revenues lost to the postal service in this way may be well in excess of the costs saved, depending on the structure of costs. Both consumers of traditional services, as well as overall social welfare, are adversely affected by the failure to charge for delivery service, by the consequent loading of volume insensitive delivery costs into the prices for sending mail. In addition, it is likely that both the postal service

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16/ For projections of the impact of mail diversion to competing media see "Impacts of Electronic Communications Systems on the U.S. Postal Service: 1975-1985," in _Report of the Commission on Postal Service_, Vol. 2, Washington, D. C., April 1977, pp. 425-619. Recent experience, however, has failed to confirm these and other similar projections.

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and competitors are led to make less than efficient investment decisions, leading potentially to very serious dynamic inefficiency.

In the next section, we discuss ways in which delivery services might be priced more efficiently, in order to avoid inappropriate diversion to socially inefficient suppliers, taking account of the pricing guidelines discussed in Section II.

IV. Pricing Delivery Services

Almost all of the aspects of the welfare economics of pricing that have been discussed above bear on the issue of whether and how to price delivery services. Why aren't delivery services priced today - are there any possible welfare economic rationales? There are conceivable rationales, but we shall indicate why they are ultimately unconvincing. And the requisite analyses can help significantly in the design of efficient pricing mechanisms for delivery. Most important, though, compensatory pricing of delivery services can resolve some of the evident financial and public interest dilemmas that seem to plague the postal service.

In this section we propose for consideration and for the sake of specificity a particular option for the pricing of delivery services. The proposal is that there should be some "basic" level of delivery service quality, where quality is to include frequency and proximity dimensions. 17/ This basic level of

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17/ Proximity dimensions include such factors as closeness to a post office and ease of carrier access to mail boxes.

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service is akin to and would be selected and financed in the same way as are local public services, such as fire, police and garbage services. Individual postal patrons would then be free to select various higher quality delivery options at prices that reflect cost and demand conditions.

One possible welfare economic rationale for not pricing delivery services is that they are strong producers of "network externalities." The argument is that if the price of delivery were higher, some households would choose to forego membership in the postal network. Such defections would impose large negative externalities on those who would have wished to reach these households by mail. Because these externalities are spread diffusely among many potential mailers, information and transactions costs make it impossible for them to internalize the effects themselves. Consequently, it is appropriate and welfare efficient to reflect the strong network externalities in a zero price for delivery. This is a serious argument that merits careful consideration. It has been shown elsewhere that network externalities can be measured, or at least conceptualized, by means of consumers' surplus tools. 18/ But whether or not network

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18/ R. Willig, "The Theory of Network Access Pricing," in Public Utility Ratemaking, H. Trebing (Editor), forthcoming. In particular, the external loss caused by the elimination of delivery services or by a decay in the quality of delivery services to a household is approximately equal to the consequent decrease in the consumers' surplus in complementary postal services demanded by all other mailers. This decrease in surplus, to the extent it exists, is brought about by inward shifts of the demand curves, rather than by increases in any price. The surplus calculation is performed with prices held constant at their market levels.

externalities are amenable to precise empirical analysis, it is clear that alterations in delivery have important negative external effects if they cause demands for the categories of mail delivered to decline significantly over a meaningful range of prices. Conversely, alterations in delivery that leave complementary mailing demands unaffected at present and higher levels of rates cause no network externalities.

We conjecture that some basic and far less costly level of delivery service to households can be defined such that the move from the present level of service to that basic level, combined with a special delivery option at a price that covers at least incremental cost, would cause negligible network externalities. [19] In this vein, a Postal Service Staff Study concluded from marketing studies that "most (90 percent) mail directed to householders could be delivered on an alternate day basis without adversely affecting the interests of the mailer or the recipient." [20] Note, however, that we are not suggesting that basic level delivery be imposed on anyone. Rather, we are trying to contain the network externality issue by arguing that while it may be important at sub-basic levels

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[19] In the consumers' surplus framework, the special delivery option removes any urgent mailings that would comprise an upper tail of the demand curve.

[20] Op. cit. at 37.

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of delivery, it is unlikely to arise at supra-basic levels of delivery to households.

The notion here is simple: whatever economies and network externalities exist in the provision of postal delivery services are likely to be exhausted at rather low levels of delivery frequency, proximity, and so on. This basic level of service quality is perhaps best chosen by and priced to a local political unit. Service quality above the basic level should be optional by customer and metered for pricing purposes. This is akin to the two-part tariff arrangement used to deal with a similar problem in the case of telephone service: 21/ a flat charge for access to the network that reflects, or in principle could reflect, the presence of any network externalities, plus a metering device and price schedule for use of the service at levels beyond whatever is defined as basic. One object of this is to avoid having consumers choose not to hook up to the system because of a price that exceeds their own private benefit when the social benefit of their having access in fact exceeds the social marginal cost. Pricing basic delivery service to a local political unit is somewhat less risky than the telephone two-part tariff paid directly by consumers in this respect, for reasons that are explored below.

21/ In addition, of course, the postal problem can be distinguished from the telephone problem in a number of other respects.

Unlike households, a large proportion of businesses may require premium delivery services. But subsidized rates are indicated on welfare grounds only when both externalities and demand elasticities are significant. If a move to non-subsidized rates fails to elicit a demand response, then there is no loss of external benefits to fear. To the extent that businesses find premium delivery vital, they will exhibit negligible price elasticity of demand for it.

On these grounds the network externality argument for zero-priced delivery services is not compelling. Instead, we suggest that businesses (above a certain size) be charged compensatory rates for delivery, and that households and small businesses be charged, perhaps indirectly, but at a compensatory level, for whatever supra-basic delivery services they collectively elect. 22/

Another conceivable rationale for zero-priced delivery services is that they are local public goods and incur negligible marginal costs, at the level of the household. This is not to say that there are not marginal costs of delivery with respect to mail volume, with respect to frequency, or with respect to the number of routes served. But it seems possible that once a neighborhood is being served, and holding volume constant, that the extra cost may be negligible for the delivery person to stop at a box rather than to pass it by and, indeed, to have to know

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22/ The rationale for the suggested treatment of small business is based on the likely difficulty of distinguishing their demand characteristics and the cost of serving them from the characteristics and costs of serving households.

that it is to be passed by. If this is the case, then it may in fact be senseless to price basic delivery service at the household level, especially when administrative and billing costs are taken into account.

It would not follow, however, that it is senseless to price delivery service. Rather than at the household level, delivery service should be priced at the level of local political units - at that level where delivery is no longer a public good. There are no doubt considerable marginal costs associated with various choices of quality and frequency of delivery at some level of geographical aggregation where such decisions can be made with reasonable independence from the choices of neighboring areas.

Individuals can express their preferences and tradeoffs concerning postal delivery services through regular political and administrative processes, as they do for most other local public services. The local political unit would purchase a package of delivery services on behalf of its citizenry. To expedite this choice process, the U.S.P.S. could have a standardized schedule of prices that would pertain to various circumstances, and that would cover a spectrum of delivery options, and perhaps retail service options as well. 23/

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23/ Some possible delivery service options have been proposed in Waldau, G., M. Hasan, and L. Merewitz, Peak Responsibility, Population Density, and Fair Allocation of Mail Delivery Costs, U.S. Postal Service Research Paper, July 1980, pp. 51-59.

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And in view of the discussion of network externalities, the prices would perhaps only be sufficient to cover marginal costs for supra-basic levels of delivery services.

With a system of this kind, the appropriate locus of receipt of federal rural communications and public service subsidies would shift from the U.S.P.S. to the local political units themselves. In view of the postal service choices open to the local communities, and the newly forthcoming communications technologies, it need not be stipulated that the subsidy funds be utilized for postal communications.

From the viewpoint of the welfare economics of postal pricing, the great potential benefit of pricing delivery services is that it might enable all postal rates far more closely to approach the associated marginal costs. If it is the case that the preponderance of delivery costs are insensitive to volume (i.e., that when marginal costs of delivery of particular categories of mail are multiplied by the corresponding volume figures, the sum falls far short of total delivery cost), then the U.S.P.S. is carrying an unnecessarily heavy burden of common cost. In fact, much of that cost is not common at all but is, instead, the cost of delivery that is variable with respect to the number of routes served and to the various quality dimensions of service. Then, with prices levied on at least large business and supra-basic household and small business delivery services, and perhaps on the provision of supra-basic

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rural retail services as well, the "common cost" burden on all other services could be considerably lightened. Such pricing policy would limit diversions of volume and revenue to more efficient, lower cost competing communication technologies. Moreover, it would encourage efficiency in the investment decisions of customers, competitors, and the U.S.P.S. itself, and it would avoid the destabilization of rates inherent in progressive diversion of revenue.

There are clearly a number of practical difficulties that must be worked out to implement this particular option. One obvious problem is that the optimal size and extent of the basic delivery service area may differ according to demographic and geographic characteristics that have nothing to do with local political units. 24/ In some states there is a well-developed system of special districts designed to deal with analogous problems. The districts are of different sizes, depending on the particular service -- schools, water, fire protection, police -- that is being selected and financed. Other states have a less flexible approach. Another problem is likely to be the possibility that business entities other than the U.S.P.S. will bid for the right to provide "basic" services as well as suprabasic service. It is not obvious that such bidding "for the market"

24/ For example Waldau, Hasan, and Merewitz, op. cit. have suggested that optimal derivation of delivery charges should be based on the density of population in the service area.

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would not be preferable to a U.S.P.S. monopoly. But such considerations raise very difficult political issues.

There seems to be considerable urgency for steps like those incorporated in our proposed option to be taken in the very near future. As an empirical matter, the welfare costs of static pricing inefficiencies seem likely to grow rapidly in significance as potential entry drives up the price elasticities of the U.S.P.S. services. The shedding of unnecessary common costs, through revisions of the rate structure to include delivery and the provision of retail services, however, could bring all U.S.P.S. prices much closer to marginal costs and thereby ameliorate static inefficiencies.

Even more important in this era of communications revolution is the increased dynamic efficiency that would result from pricing delivery and other postal services in a manner that more closely reflects marginal costs. Without such steps, alternative delivery modes would be needlessly stultified by underpriced postal delivery and, more dramatically, overpriced first class mail would take an undeserved beating in the market, to the detriment of nearly everyone. The almost marginal cost pricing that may be attainable would assure that the market signals guide the communications revolution along socially more desirable paths.

Appendix A

Characterizations of Ramsey Optimal Prices

The normative stance underlying the analysis of statically welfare optimal prices is a social decision maker's social preference ordering that respects individuals' preferences and that reflects the Pareto principle. As such, the public interest objective function takes the form of a Bergson-Samuelson social welfare function, W, whose arguments are the levels, ℓ^i of each individual's utility:

$$W = W(\ell^1, \ell^2, \ldots, \ell^n) \tag{1}$$

Here,

$$\ell^i \equiv \ell^i(\hat{p},\ \bar{p},\ X_M,\ m_i + \sum_{h \varepsilon f} \alpha_{ih} \Pi(\hat{p},\bar{p})) . \tag{2}$$

Some of the symbols utilized here and below are defined as follows:

$\hat{p}$ = vector of prices for services produced by U.S.P.S.

I = set of services produced by U.S.P.S.

$\bar{p}$ = vector of prices for all goods and services in the economy other than those produced by U.S.P.S.

0 = set of services not produced by U.S.P.S.

M = set of merit and externality goods and services.

X_M = vector of total output levels of the goods and services in the subset M.

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m_i = non-dividend income of the ith consumer.

C = the set of all consumers.

F = the set of all firms.

U = set of all economic units.

R = index of U.S.P.S.

N = set of all firms besides U.S.P.S.

α_{ih} = the share of the profits of hth firm that accrue to the ith consumer, such that $\sum_{i \in C} \alpha_{ih} = 1$ for all $h \in F$.

$\Pi^h(\hat{p}, \bar{p})$ = total profit of the hth firm, assumed distributed as dividends.

The function ℓ^i (....) is the indirect utility function of the ith consumer. It represents the optimal utility achievable by consumer i through purchases at prices $(\hat{p}, \bar{p})$ when his/her budget is constrained by the income level of $(m_i + \sum_{h \in F} \alpha_{ih} \Pi^h(\hat{p}, \bar{p}))$ The argument X_M enters the utility function when the individual's welfare is affected by certain overall levels of consumption in the economy, regardless of how much the individual himself/herself consumes. An example relevant to postal services might be magazines and newspapers: if the individual benefits from informed public decision-making and if the dissemination of useful information is improved by the distribution of newspapers and magazines, the individual's welfare would be affected by the overall level of consumption of magazines and newspapers. The function W is specified to include as an argument each ℓ^i for $i \in C$ and to be increasing in each argument.

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Statically welfare optimal and feasible prices of postal services $(\hat{p})$ maximize the above welfare function subject to a possible minimum constraint on the profits of U.S.P.S. The constraint imposed here is that $\Pi^R \geq z$, where Z is some minimum profit level. (Z = 0 would mean that deficits are forbidden, while z<0 would allow the Postal Service a deficit limited to Z). The necessary conditions that characterize such Ramsey optimal prices can be derived from (1) and (2) by standard techniques and by employing standard properties of utility functions. These conditions are equivalent to the geometric requirement of tangency between the surface of postal prices that permit $\Pi^R = z$ and the highest iso-welfare surface which it intersects. The resulting equations, the basis of statically welfare optimal pricing policy, are:

$$\sum_{j \in I, 0} \frac{dp_j}{dp_k} [\sum_{h \in U} d_h x^{jh}] + \sum_{h \in F} \sum_{\substack{j \in I, 0 \\ x^{jh} > 0}} d_h (p_j - c_{jh}) \frac{dx^{jh}}{dp_k}$$

$$+ \sum_{j \in M} e_j d_j^e \frac{dX_j}{dp_k} = 0, \text{ for } k \in I. \quad (3)$$

Here,

c_{jh} = marginal cost to the hth firm of the jth output.

x^{jh} = net supply of the jth good by the hth unit. (Note that $x^{jh} < 0$ if product j is used by firm h or if it is consumed by individual h).

d_h = marginal social welfare value of an additional dollar of income (profit) to the hth consumer (firm).

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(Note: For $h \epsilon N$, the marginal social welfare derives from the impact of distributing the extra profit to the shareholders:

$$d_h = \sum_{i \epsilon C} \alpha_{ih} d_i .$$

For the regulated firm, $d_R = \sum_{i \epsilon C} \alpha_{iR} d_i + \lambda$ where λ is the Lagrange multiplier on the profit constraint. It has the interpretation of the marginal social welfare gain from relaxing the profit constraint by one dollar.

e_{ij} = the dollar value to consumer i of the external marginal benefit per additional unit of good j.

$$e_j = \sum_{i \epsilon C} e_{ij} .$$

$$d_j^e \cdot e_j = \sum_{i \epsilon C} d_i \cdot e_{ij} = \text{external marginal social}$$

benefit of good X_j, $j \epsilon M$.

Note that X^{jh} is a function of all prices $(\hat{p}, \bar{p})$ and that the derivatives dX^{jh}/dp_k (and dX^j/dp_k) represent the rate of change in X^{jh} (or X^j) induced by a change in p_k, including both the direct effect of p_k and the effects induced through any changes in the other prices $\bar{p}$ caused by a change in p_k. Also note that the middle term of (3) includes only those firms h which are net <u>suppliers</u> of good j (X^{jh} 0).

In (3) $dp_k/dp_k = 1$, $dp_j/dp_k = 0$ for $j \in I$, $j \neq k$, and dp_j/dp_k for $j \in O$ is determined by an unspecified market mechanism - which also allots total market demand for good j among firms.

The only assumptions on market behavior made in the derivation of (3) are that there is only one price in each market, that each firm minimizes the costs of producing its outputs, and that direct redistribution of income via transfer payments is not an available policy option.

Appendix B

Derivation of the Inverse Elasticity Rule (IER)

The basic "inverse elasticity rule" can be derived as
a special case of the generalized Ramsey pricing rule (3)
under the following conditions:

(i) The marginal social utility of income is the same
for all consumers. Thus, $d_i = d_j \equiv d$ for all i, $j \in C$.
This condition means that the income distribution among consumers
satisfies the marginal conditions for optimality, and thus that
the Postal Service pricing need not be altered to serve income
redistribution goals. Since social utility in this case is
equally well served by a dollar of extra income to any consumer,
the social welfare improvement of an additional dollar of profit
to any firm is independent of the distribution of ownership
shares in the firm. Thus, $d_h = d$ for all firms $h \neq R$, and
$d_R = d + \lambda$ for the U.S.P.S.

The result of condition (i) is that the first term of (3)
collapses to λx^{kR} , because the net supply of each good and
service over all consumers and producers is zero.

(ii) The price of any one postal service does not affect
the output of any other good or service in the economy whose
price deviates from its marginal cost. That is, there are
zero or negligible net cross-elasticities of demand between
each postal service and every other good and service, including
other postal services, that is noncompetitively priced.

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As a result of condition (ii), together with condition (i), the second term of (3) becomes simply

$$(d+\lambda)(p_k - c_{kR}) \frac{dX^{kR}}{dp_k} .$$

(iii) The prices charged by the Postal Service do not affect the quantities consumed of any merit or externality goods. As a result, $e_j \neq 0$ implies that $dX_j/dp_k = 0$ for $k\epsilon I$, so that the third term of (3) vanishes.

(iv) The Postal Service meets all market demands for its goods and services, at the prices that prevail for them. Consequently, the rates of change with respect to prices of the supplies of U.S.P.S. are equal to the corresponding rates of change in market demands. That is:

$$\eta_k = \frac{dX^{kR}}{dp_k} \frac{p_k}{X^{kR}} = \text{the price elasticity of demand}$$
$$\text{faced by U.S.P.S. for service k.} \quad (4)$$

Given conditions (i) - (iv), (3) becomes

$$\lambda X^{kR} + (d+\lambda) (p_k-c_{kR}) \frac{dX^{kR}}{dp_k} = 0, \ k\epsilon I .$$

Algebraic rearrangement now yields the inverse elasticity rule:

$$\frac{(p_k-c_{kR})}{p_k} \eta_k = \frac{-\lambda}{\lambda+d} \quad \text{for all } k\epsilon I . \quad (5)$$

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Appendix C

The Economic Gradient Method 1/

The economic gradient method is designed to provide
guidance for the analysis and recommendation of change when
information is available over too narrow a range to permit
a credible calculation of the global optimum. The output of
the method in our context is the direction of change in prices
from a given base point in which profit remains constant while
social welfare increases most rapidly. This best feasible
local direction of price change can be calculated (via equations
provided in Appendix A) from information pertaining only to the
base point of operation. For example, under the conditions
that validate the IER, the only pieces of information needed
for the calculation are the marginal costs, price elasticities
of demand, quantities, and prices at the base point. In con-
trast, calculation of prices that satisfy the IER would require
these same pieces of information at every conceivably relevant
point of operation.

While the gradient method identifies a locally optimal
direction of movement, it does not suggest how large a step
should be taken in that direction. And it may be the case that
a step of significant size would alter the level of profit.
Thus, the profit consequences of actual moves should be assessed
by means additional to the gradient method.

1/ See R. Willig and E. Bailey, op. cit.

Another output of the method is the local rate of change in the welfare objective function with respect to the size of the step taken in the locally optimal direction. This quantity, denoted by ϕ, is an indicator of the welfare gains obtainable from feasible price changes. In particular, if the welfare and profit functions globally have the second order curvature that they must have locally at the Ramsey optimum, then an upper bound on the welfare gain from any feasible movement in prices of a given distance is given by ϕ times that distance. Thus, if ϕ is small at a particular set of prices, it can be inferred that there is little to be gained from moderate sized feasible price changes. And a large value of ϕ indicates that meaningful gains can be achieved.

The analytics of the gradient method must be based on a metric formula that specifies how the sizes of price movements are to be measured. Here we use the Euclidean metric over the percentage changes in the prices. Thus, equal percentage changes in different prices count equally, and large percentage changes count proportionately more than do small ones.

When this method is applied in the framework that validates the IER, there emerges a "critical Ramsey number" that is a weighted average of the Ramsey numbers,

$$\left(\frac{P_k - C_{kR}}{P_k} \right) n_k \quad ,$$

of the services involved. 1/ The weights in this average
are increasing in the dollar value of the sales of the
services. The best local direction of price change has the
price of a service rising if its Ramsey number is smaller in
absolute value than the critical Ramsey number, and conversely.

And ϕ, the measure of potential welfare gains, is related
to the dispersion of the Ramsey numbers of the services about
the critical Ramsey number. Thus, the closer are the Ramsey
numbers to the equality stipulated by the IER, the less there
is to gain from price movements. The other key determinant of
the size of ϕ is the size of the critical Ramsey number. If
the price elasticities of demand or the percentage deviations
between prices and marginal costs are small for the services
with large values of sales, then the critical Ramsey number
will be small, and ϕ will be correspondingly small even if
the Ramsey numbers exhibit considerable variation. However,
for the same level of variation, ϕ will be large if the price
elasticities of demand are big enough.

1/ For the theory and for applications see R. Willig and
E. Bailey, op. cit., and "Ramsey Optimal Pricing of Long Dis-
tance Telephone Services," in Pricing in Regulated Industries,
J. Wender (Editor), 1977.