

The Economic Implications of “Density-Based Rate Authority”

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1. Introduction

At the 23rd Postal Conference, Brennan and Crew (2016) proposed a formula to adjust postal rates under price cap regulation in the face of exogenous declining demand, in order to preserve the ability of a postal operator to support universal service and remain solvent. That formula was based on the elasticity of average cost with respect to volume—which, in simple terms, turns out to be the ratio of fixed to total cost—with an adjustment for demand elasticity since increasing price also reduces volumes. At the request of the Public Representative of the Postal Regulatory Commission (PRC), Brennan (2017, 2018) submitted declarations describing that formula and applying it to a number of regulated postal services, for the PRC’s statutorily mandated review of postal price caps.

In a final order, the PRC (2020) proposed allowing the US Postal Service (USPS) to use that formula to increase rates, but with two variations. One was to drop the elasticity adjustment based on a false distinction between adjusting rates to reflect higher costs and adjusting rates to preserve USPS’s ability to cover those costs; that is not the primary subject here. The main difference was to base the adjustment on changes in what the PRC called “density”: the ratio of volumes to service locations. The PRC called this “density-based rate authority”.

The purpose of this paper is to analyze the potential underpinnings and implications of using density. While one could in principle base adjustments on the elasticity of average cost with respect to density and not volume, that calculation requires incorporating service location costs as variable and not fixed costs, which is not done. Accordingly, there is a puzzle to solve.

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Section 2 summarizes the reasoning for the original adjustment formula based on changes in volume alone. Section 3 sets out the PRC's density-based adjustment and notes the differences between it and the proposal derived in Section 2. Section 3 also discusses the omission of the elasticity adjustment. Section 4 discusses qualitative implications of the PRC's finding that holding density constant holds average cost constant, in particular. One is that if there were a way for households and businesses to choose a postal provider, and there were a costless way to sort mail going to a location to the provider of their choice, one could have competition in mail. Even if that is implausible, a second implication is to raise the issue of why one has a single national postal operator rather than separate regional ones.

Section 5 contains a derivation of the formal implications of the PRC's density-based formula. Among the findings is that for it to work, the contribution to institutional cost from any service has to vary with locations. This may be factually accurate, but it is not clear that postal accounting practice shows this. Section 6 discusses some implications of the PRC's density-based approach for alternative methods of pricing postal service, specifically, adding volume-independent charges for each location. Section 7 summarizes and concludes.

2. Rationale and theory of rate adjustments

Since the passage of PAEA in 2006,¹ US postal services deemed "market-dominant" rather than competitive have been regulated by price caps. The main virtue of price caps over the primary alternative, regulation based on the average cost of service, is that divorcing rates from costs provides regulated firms with an incentive to control costs.² Some of the benefits of that costs control may be allocated in advance by a commitment (independent of realized costs) to reduce prices by some percentage per year. The regulated rate is allowed to rise by the general rate of inflation of prices in the economy. Thus, price cap regulation is often referred to with the terminology " $CPI - X$ ", where CPI refers to changes in the consumer price index as a general

¹ Postal Accountability and Efficiency Act, (PAEA), Pub. L. 109-435, 120 Stat. 3198 (2006).

² A second benefit is that having rates set by a predetermined formula means that regulators, regulated firms, and interested parties can avoid the time and expense of proceedings to ascertain the cost-of-service, including the appropriate rate of return the regulated firm should be allowed to earn on undepreciated invested capital.

measure of inflation, and “X” refers to the annual percentage by which rates are committed in advance to fall.³

Because a market-dominant service is regulated, a reasonable presumption is that it is a natural monopoly. Natural monopoly typically (although mathematically not necessarily) implies that marginal cost is less than average cost. If the regulated firm is to be solvent, the allowed rate under price caps should be at least as great as average cost. Putting these together, the allowed price under price caps should be exceed marginal cost. This means that if demand for the regulated service falls, the regulated firm will lose money. For political, legal,⁴ and economic reasons, losing money is unsustainable.

Demand for regulated postal services, particularly letter delivery, has fallen in the US, and pretty much in many if not most developed economies, over the last couple of decades. This is largely because of the attractiveness of Internet-based alternatives such as email, online bill payment, and electronic commerce. Consequently, a price-cap regulated postal service, such as that in the US, will lose money if nothing is done. One could return to cost-of-service regulation, but doing so would give up the benefits of having price caps.

An alternative would be a formula to adjust the price cap to preserve the postal service’s level of profit from a given product—including that product’s contributions to covering the postal service’s universal service obligations—when facing a decline in demand. Such a formula would adjust rates by some percentage, based on the percentage by which demand fell.⁵ To leave the postal service’s overall financial position unaffected, that percentage change in rates should equal the percentage change in average cost, where cost includes these contributions to what are called in the US “institutional costs”.

³ Under PAEA, §3622(d)(1), the advance committed reduction in price due to anticipated productivity increases is 0.

⁴ *Bluefield Water Works v. Public Service Comm'n*, 262 U.S. 679 (1923), *FPC v. Hope Nat. Gas Co.*, 320 U.S. 591 (1944).

⁵ This decline in demand has to be exogenous, that is, independent of choices of the postal operator. One would not want to insulate a postal operator from service quality reductions that reduce demand by providing an automatic increase in prices.

This rate formula has a major part and a relatively minor adjustment (Brennan and Crew, 2016). The major part is to derive the elasticity of average cost with respect to output, since the percentage change in average cost—the desired change in rates—would equal that elasticity times the percentage change in output, that is, the decline in demand. In general, the elasticity of average cost (e_{AC}) with respect to output is given by

$$e_{AC} = \frac{QC' - C}{C},$$

where $C(Q)$ is cost as function of output Q and C' is marginal cost. For a natural monopoly, marginal cost pricing (setting price equal to C') will fail to generate enough revenue to cover total cost, so the numerator of this expression is negative. That implies that when demand falls, average cost rises, which is consistent with the intuition for an upward rate adjustment. If marginal cost C' is constant, then this elasticity of average cost can be expressed simply as the fraction $-F/C$, where F is the revenues of the postal product net of marginal cost, and C is the total cost of the product.⁶ The rate adjustment would be found by multiplying this by the percentage by which demand fell.⁷

Finding this elasticity is key, but it is not the entire story. If rates are adjusted upward to take into account of a decline in demand, demand will fall further (unless the price elasticity of demand for the postal product is zero, that is, that increasing price does not reduce sales).⁸ In the extreme, if the price elasticity of demand is sufficiently large, this rate adjustment would reduce demand by so much that the postal operator would be worse off than if no adjustment had been

⁶ If $F = 0$, there would be no adjustment, and no need for it, as price equals marginal cost and the regulated firm therefore loses no profit when demand falls. It also should be noted that in practice, because each postal product makes a contribution to overall USPS operations, the measure of “cost” as a practical matter is overall revenue. In effect, “cost” includes profit attributable to that service.

⁷ One of many wrinkles I will not go into here is that the change in demand has to be the result of factors outside the control of the postal operator. If demand fell because the quality of service fell, a rate adjustment of this sort would insulate the postal operator from any harm to users from reducing service quality.

⁸ Brennan and Crew (2014) pointed out that demand for a postal product could fall because of electronic substitution, but that fall could be largely independent of relative prices of postal products and electronic alternatives. They termed this the distinction between “gross” and “marginal substitutes”; electronic alternatives are “gross” substitutes for postal products in that people switch from one to the other, but that switching may have little to do with price, hence they are not “marginal” substitutes. This is relevant for postal policy because although there has been extensive substitution from postal products to electronic alternatives, a postal operator may retain considerable market power over the remaining users.

made at all. Taking the price elasticity of demand for the postal product makes the formula slightly more complicated than the simple $-F/C$; it becomes

$$\frac{-F}{C+Fe_D},^9$$

where e_D is the elasticity of demand, also a negative number.

The larger is the elasticity of demand (in absolute value), the greater the price adjustment has to be. However, for reasonably low demand elasticities with respect to price and exogenous changes in demand, the price adjustment is not all that great. For example, using data from the US Postal Regulatory Commission, the price adjustment under this formula for a 5.8% reduction in the quantity of first-class mail would imply a 3.65% rate adjustment, given an elasticity of average cost ($-F/C$) of $-.524$ and a price elasticity of demand of $-.321$ for letter mail (Brennan, 2018).

3. The PRC's formula

In its 2020 order, the PRC adopted a formula that was superficially similar but, as we will see, has implications for the rationale for the national monopoly structure of postal operators and requires additional justification that may not have been apparent. To see this, we first need the PRC's (2020 at 79) adjustment formula:

$$-1 * ICT/TCT * \% \Delta D [T-1, T],$$

where

⁹ To see this, let $\Delta P/P$ be the change in price, equal to the change in average cost, and let $\Delta V/V$ be the exogenous change in volumes because, for example, of movement to electronic communication. In addition to this exogenous change in volumes, volumes will also change by $e_D * \Delta P/P$, that is, because of the price adjustment. To incorporate this effect into the change in price necessary to keep the postal operator solvent, one has to find the relationship between $\Delta P/P$ and $\Delta V/V$ that satisfies

$$\frac{\Delta P}{P} = e_{AC} \left[\frac{\Delta V}{DV} + e_D \frac{\Delta P}{P} \right].$$

Solving this gives

$$\frac{\Delta P}{P} = \left[\frac{e_{AC}}{1 - e_{AC}e_D} \right] \frac{\Delta V}{V}.$$

Substituting $-F/C$ for e_{AC} gives the adjustment factor in the text.

T = most recently completed fiscal year;
 T-1 = fiscal year prior to year T;
 ICT = institutional cost in fiscal year T;
 TCT = total cost in fiscal year T; and
 $\% \Delta D[T-1, T]$ = Percentage change in density from fiscal year T-1 to fiscal year T.

The -1 factor at the beginning is the PRC's way of translating a decrease in demand to an upward adjustment in rates. In our terminology, ICT is F , the institutional contribution (including revenues above marginal cost), and TCT is total cost C . In this respect, the PRC's formula was very close to the one derived in Brennan and Crew (2016). Using the notation here, it would use as a factor $-F/C$. In this regard, the adjustment factor is the same as above.

The key (but not only difference) is that the PRC defines the relevant percentage change as that of "density", not volume. The PRC defined density as the ratio of volumes to delivery points. Three important implications follow. The first is that if the number of delivery points do not change, the percentage change in density equals the percentage change in volumes, so the basis for the PRC's formula and the one in the previous section. The second is that if volumes and delivery points grow (or shrink) at the same rate, the PRC's formula implies that average costs do not change. The third is that $-F/C$, the adjustment factor (assuming constant marginal cost for volumes) needs to be the elasticity of average cost per volume unit with respect not to volumes, but to density.

Before getting to those implications of the PRC's use of density, note that the PRC's adjustment formula lacked an adjustment for the elasticity of demand. Its explanation was that it believed it was obligated not to preserve USPS solvency, but merely to adjust rates to reflect the effect of changes in demand on average cost. However, one needs to incorporate the effect of adjusting rates on sales, as that also affects average cost in the same qualitative way as does the effect of declining demand due to electronic substitution. I incorporated the demand elasticity adjustment to make the adjustment formula neutral regarding the amount the regulated firm was earning over marginal cost, regarding that as a separate policy question.¹⁰

¹⁰ Incorporating elasticity of demand is slightly more complicated under the PRC's approach. When average cost and the relevant measure of a change in demand are all based solely on volume, then one can adjust the measure by noting that the change in demand will go up by the elasticity of demand times the price adjustment. When the change in demand is not a change in volumes but a change in density, this multiplication step cannot take place without assuming, at least for purposes of this stage of the calculation, that the number of locations cannot change.

4. Density based costs and the scope of natural monopoly

As noted above, and leaving out the elasticity of demand adjustment, the formula proposed in Brennan and Crew (2016) works the same as the PRC's density-based formula, if the number of locations does not change year to year. Consequently, if the number of delivery locations does not change very much year-to-year, for example, that change is an order of magnitude less than the change in volumes, volume-based adjustment will work about as well, arguable within the margin of error of measurement for anything used in the practical application of the formula.

However, in principle if the number of delivery locations changes, a postal operator's cost will change, and likely increase. Qualitatively, that assumption seems plausible. To remain within the limits of practicality for using a density-based rate adjustment, the assumption that the cost of delivery for each location is the same is reasonable. Neither of those, however, leads to the conclusion that if the volume of mail and number of delivery locations both increase (or decrease) by the same percentage, the fall in average cost per piece delivered brought about by the former is exactly offset by the increase in average cost per delivered piece by the latter. The PRC's formula reflects that assumption.

Before getting to the implications of the PRC's assumption for rate adjustment, it is worth noting its implications for the natural monopoly in ("market-dominant") mail delivery. The general if somewhat informal basis for the natural monopoly assumption is simply that average cost declines with volume.¹¹ However, if costs are only a function of density, then two postal operators would have the same costs if they delivered the same volume of mail per location that they serve. In principle, one could have ongoing competition among postal operators if they signed up recipients to receive mail exclusively from one of the postal operators, in order to maintain the same density, that is, volume delivered by the selected operator to that location.¹²

This does not eliminate the need for the adjustment under the PRC's density-based approach. It shows only that it requires additional assumptions that may be inconsistent with the need for a density-based approach, specifically, that the number of deliver locations changes.

¹¹ Glass et al. (2021) recently assessed Panzar and Waterson's (1991) arguments for the natural monopoly status of postal service.

¹² Competition in parcel delivery, with non-exclusive abilities for carriers to deliver to a particular location, appears to imply that costs are not simply a function of density, as the PRC assumes they must be for market-dominant mail products. This may be because with parcels, beyond some point average cost of delivering parcels must rise, holding delivery locations constant, implying that costs rise with density.

For this to happen, the overall mailing system would require a virtually costless method for sorting mail not just by location, but by carrier to that location. For some communications technologies, computerized switching for telephones and routing protocols for the Internet, directing traffic to carriers selected by receivers of communications is relatively simple and cheap. This allows a system by which carriers can compete to be a recipient's telephone or Internet service provider. Were a similar system available for mail, postal operators could similarly compete. That they do not implies that if the PRC is correct regarding density as determining average cost, we do not see competition in postal carriers not because of declining average cost with respect to volume, but the impossibility of having a system in which recipients select exclusive carriers to deliver to their locations.¹³ Without such exclusivity, increasing carriers holding volumes per location constant reduces density and thus increases cost for each carrier.

Even if additional considerations satisfactorily explain the natural monopoly status of letter delivery (assuming equal delivery costs per location), they raise questions about the national status of that monopoly. Perhaps ongoing competition between carriers is unsustainable, but one could have different postal operators in different parts of the country. One could have different postal operators in New York and Los Angeles—or, for that matter, Paris and Marseilles, Madrid and Barcelona, and Rome and Florence—just as, at least in the US, one sees separate local monopolies in water delivery, electricity distribution, and natural gas delivery. Of course, if separate regional carriers would not face ongoing competition, one might not gain very much, although perhaps there would be some benefit to regulators from benchmarking price and performance of carriers under their jurisdiction against the service characteristics of other carriers.

I pose these possibilities not to advocate for them, but only to note that the PRC's assumption that density determines costs opens the door to considering them.

¹³ Other transaction costs of such a system may also be high. Presumably, competing carriers would want to attract customers which high density, that is, high volumes at their location. If carriers can do this, they would predictably compete either in payments to high density recipients or charges to low density recipients reflecting the different density costs for each location. (This ignores other location-specific costs, which the PRC's rate adjustment order also ignores.) The costs of the marketing, monitoring and verification to sustain such a system may well be prohibitive. In any event, this provides an additional reason why the reason we have only a single carrier per location are more complicated than the simple story of scale economies in letter delivery.

5. Specific formal implications of density-based rate setting

5.1. The form of the cost function

To understand the specific implications of the PRC's assumption that cost is purely a function of density, we define a postal operator's (e.g., USPS) cost as $C(q, n)$, where q is the total volume of mail delivered and n is the number of locations. In addition, following the PRC's order, we can define density k as the ratio of volume to locations, that is, $k = q/n$, which implies that, holding density constant, $q = kn$ and cost is $C(kn, n)$.

The PRC's density-based adjustment formula implies that the average cost per unit of volume delivered, the basis for the rate, is constant if k does not vary, that is,

$$\frac{C(kn, n)}{kn} = H(k),$$

where $H(\cdot)$ is independent of n . This implies that if we hold density constant, the derivative of average cost with respect to the number of locations served is zero.

$$\frac{d\left(\frac{C(kn, n)}{kn}\right)}{dn} = 0.$$

Solving this gives

$$\frac{[kC_q + C_n]kn - kC}{[kn]^2} = 0,$$

where the subscripts indicate partial derivatives. Accordingly, the numerator of this expression must equal zero. This implies that

$$C(kn, n) = knC_q + nC_n.$$

Recalling that $q = kn$, this gives

$$C(q, n) = qC_q + nC_n.^{14}$$

¹⁴ If one thinks of q and n as inputs into some generalized measure of postal output, then the assumption that average cost is constant holding density constant is tantamount to saying that the postal production function has

and average cost per unit of volume becomes just

$$\frac{C(q,n)}{q} = C_q + \frac{n}{q} C_n = C_q + \frac{C_n}{k}.$$

(We will return to the average cost relationship when considering rate adjustment.)

We can simplify the cost function further. To get a simple formulation of the elasticity of average cost with respect to volumes, in particular, that the difference between total cost and marginal cost of the last output times volume just equals the institutional contribution, we can assume that the marginal cost of output C_q is constant, defined here as M . The PRC's Order's analysis adopted the simplification that the delivery cost to each location is identical, which here would entail that the marginal cost of serving an additional location, C_n , is constant, defined here as V .

Hence, the simple linear cost function

$$C(q, n) = Mq + Vn$$

is implied by the PRC's density-based ratemaking.

The PRC (2020 at 75) says that the institutional cost of USPS varies with the number of locations. We can go farther and say that density-based ratemaking says that all volume-independent costs vary with volume; there are no other fixed costs. This reinforces the finding above that the PRC's finding that average costs vary only with density removes simple scale economies as the explanation for the natural monopoly status of the delivery of market-dominant products. It also suggests the virtue of having volume-independent delivery "access" charges at each location to cover costs, rather than recovering costs entirely through, in effect, markups over the marginal cost of delivery. We return to this in Section 6.

constant returns to scale. If so, the cost function in general equals the sum of the products of the volume of each input times that input's marginal cost. The expression in the text could be considered an example of that relationship.

5.2. Average cost elasticity and rate adjustment

The crucial step in determining a rate adjustment formula is to calculate the elasticity of average cost per unit volume with respect to changes in some relevant variable. One then multiplies the change in that relevant variable by this elasticity to calculate the change in average cost per unit volume. This, in turn, becomes the basis for the change in the allowed rate for the postal product, since it is that cost (including contribution to overall institutional cost) that these rates must cover.

In the initial formulation, the relevant variable was changes in volumes. This made deriving the relevant elasticity relatively easy, as shown in Section 2. When the relevant variable is a change in density rather than volume, that calculation becomes more difficult. As shown above, average cost is given by

$$\frac{C(q,n)}{q} = C_q + \frac{C_n}{k}.$$

Because in general C_q and C_n both depend separately on q and n , they are not uniquely determined by density.

However, we can invoke the simplifications that marginal costs of volumes and of locations are each constant. In that case, average cost becomes

$$\frac{C(q,n)}{q} = M + \frac{V}{k}.$$

where M and V are both constants. This makes the elasticity of average cost with respect to density

$$e_{AC} = \left[\frac{d\left[M + \frac{V}{k}\right]}{dk} \right] \left[\frac{k}{M + \frac{V}{k}} \right] = \left[\frac{-V}{k^2} \right] \left[\frac{k}{M + \frac{V}{k}} \right] = \frac{-V}{kM + V}.$$

Multiply both the numerator and denominator by n , the number of locations, and recalling that $q = kn$, one gets

$$e_{AC} = \frac{-Vn}{Mq+Vn} = \frac{-Vn}{C(q,n)}.$$

This reproduces the PRC’s adjustment formula—with demand elasticity effects neglected—if one interprets the PRC’s “institutional cost” as Vn and its “total cost” as $C(q, n)$. The latter is reasonable. The former interpretation might be reconciled with standard US postal accounting definitions if Vn , the constant volume-independent marginal cost of adding a delivery location, V , times n , the number of locations, as the difference between total cost and the volume-variable cost (Mq) of delivering q units of that postal product. In my admittedly limited experience with US postal accounting, I have not seen “institutional cost” calculated on a per-location basis. Whether postal accounting will change to become more consistent with the PRC’s commitment to density-based cost measures is a question I leave to others.

6. Implications for the structure of postal pricing

This analysis of the PRC’s rate adjustment formula was based on a simplified cost model,

$$C(q, n) = Mq + Vn,$$

as the constant marginal cost version of the more general cost function

$$C(q, n) = qC_q + nC_n.$$

We showed that the above follows from the PRC’s assumption that average cost per item delivered ($C(q, n)/q$) is constant as long as density (q/n) does not change.

The reason rate adjustment is necessary is that costs are recovered solely by charges per item delivered, that is, postage, which must be above the marginal cost of delivering an item in order to cover costs. However, this cost function implies an alternative based on marginal cost pricing: Charging marginal cost C_q to deliver an item, and charging an access fee C_n to each location so it can obtain mail.

This kind of pricing would be an improvement over purely volumetric pricing. It would be more efficient, as senders and receivers would compare the value of sending and receiving mail to the marginal cost of doing so. Moreover, if the PRC is correct regarding its assumption

regarding density-based average cost, marginal cost pricing for delivery and location would cover costs. This would mean that all costs are covered, eliminating the need for adjusting price when demand falls (or rises), other than to reflect differences in marginal cost that the price adjustment methods assume away.¹⁵

These compelling advantages lead to the question of why postal service is not priced this way. A few related possibilities come to mind, with some responses:

Variation in delivery and political opposition. Locations vary in how much mail they get. Charging a constant fee to be able to receive mail will imply that some locations will pay the same fee as others, but get fewer mail items. One can predict that those low-volume recipients will balk at paying that fee. The US had a similar experience in the 1980s when regulators attempted to rationalize pricing of (then exclusively wireline) telephone service away from volumetric surcharge on (then separate) long distance service toward non-volumetric (then called “non-traffic sensitive”) monthly charges to cover the cost of the physical phone line to one’s location (Kaserman and Mayo, 1994). An argument made at the time was that if one does not make or receive many calls, why should that person have to pay the same fixed fee as one who does? The economic answer is fairly obvious; a politically acceptable answer may be harder to come by.

Universal service. The mission of postal operators around the world includes an obligation to provide universal service, that is, service to all at some minimum level of quality. If locations have to pay a uniform fee to receive mail, some recipients may drop out. This may be exacerbated if these location-based access or reception fees were to be based on the cost of serving a particular location, rather than uniform as implied by the PRC’s adjustment formula.¹⁶ The obvious method for doing this would be to subsidize service to such high cost or low-income

¹⁵ An open question, pointed out by Bruno Basalisco, is whether this fixed fee should be set by a regulator on a cost-of-service basis or regulated by a price cap to be independent of realized cost. Notably, the price adjustment method proposed in Brennan and Crew (2016), with implementation in Brennan (2017 and (2018), presumed that the average variable cost of a market-dominant mail service was known. However, this leaves the fixed fee as something that could be set by a price cap, giving the postal operator the incentive to realize location-based efficiencies.

¹⁶ Cigno et al. (2021) noted that USPS examines postal cost and service quality by separate regions in the US. One might imagine that these regions might have different per-location costs and fees.

locations through reductions or waivers of the fixed fee. Whether the cost of those universal service subsidies should be covered through general taxation, surcharges on postal services, or other means is an extensively analyzed topic that will not be reviewed here. I point out only that meeting a universal service obligation could be done within a pricing structure that included marginal-cost based prices for delivery and, separately, for delivery locations.

Network externalities. The marginal cost pricing structure implied by the PRC's density-based rate adjustment assumptions would leave senders paying the full price of to deliver mail and recipients the full price for being able to receive mail. This is efficient only if senders are the sole beneficiaries of sending an individual piece of mail, and recipients are the sole beneficiaries of being able to receive mail. Under this pricing structure, senders would mail letters only if the marginal benefit to them of doing so exceeds the marginal cost of delivery, and recipients would choose to be able to get mail only if the marginal benefit to them of doing so exceeds the marginal cost of adding a location for the postal operator to deliver mail.

It is unlikely if not inherently impossible that benefits fall in exactly this pattern. For at least some mail, the recipients benefit from getting it, whether correspondence from a friend, a magazine to read, notification of a government benefit, a bill to pay to ensure continuation of a service, or advertising for products of interest. Without such benefits, recipients would be unlikely to place any value on being able to receive mail. Similarly, senders benefit from having a larger number of recipients and perhaps some specific ones as well; this is an economic justification for ensuring universal service.

It is not clear what this implies. One could say in principle that senders should pay something for each location of their mail to subsidize recipients signing up to get mail. However, one could also say that recipients should pay a surcharge for signing up to subsidize senders for mail the recipients want to receive. If these subsidies fall within the revenue requirements of the postal operator, it is not clear which direction of the subsidy is the biggest. They could in principle cancel out, leaving the same marginal cost pricing structure as before. Which way they should go could be a worthwhile topic for empirical research.

Opting out: The wrong cost function? Having recipients at delivery locations pay a fixed fee for the ability to get mail invites the possibility, if not the inevitability, that some will choose not

to get mail. Along with the network externality issue posed above, this possibility forces a more careful consideration of the PRC's implicit cost function. Its definition of delivery locations does not distinguish between locations the postal operator passes and locations to which the postal operator delivers. Under the current postage-only pricing structure, all locations receive mail without having to pay a fee to do so.

This distinction matters because the marginal cost of delivering to a location a postal operator is already passing—an office in a building, an address in a community postal box, a house along a street—may be much lower than the cost of adding a location, such as a new street or office building, not already along a route. One could and probably should interpret the PRC's measure of density as based on volume per location passed, not volume per location electing to get mail, because there is no measure of the latter.

This does not eliminate the efficiency of covering postal costs through both volume-based postage and volume-independent location charges. At minimum, this allows marginal cost pricing of delivery, presumably more efficient than current surcharge-based methods. However, if the marginal cost of delivering to a location already along a served route is low, there is little to be gained by letting people decline delivery. Charging a volume-dependent marginal delivery fee based on the PRC's cost function would provide too great an incentive to opt out.¹⁷ This suggests that a delivery fee has merit, but not one where a recipient could opt out, but would rather be mandatory. Such a fee, essentially a location tax to fund postal service, is likely to be politically controversial, for reasons presented above in this section.

7. Conclusion

The US Postal Regulatory Commission recently concluded a statutorily mandated review of the pricing system used to cover the cost of the US Postal Service, the US postal operator. In its Order No. 5763, the PRC (2020), among many other things, adopted a formula to adjust postal rates in light of declining mail volume. Brennan and Crew (2016) proposed a formula to do this, and the PRC's formula was similar in many respects, but not identical. It omitted any adjustment

¹⁷ Ability to opt-out of subscription could lead recipients to share a postal delivery location, e.g., one house on a residential block. On the other hand, one could imagine different fees for home delivery, delivery to a shared box, and picking up mail at a post office.

of rates to take into account the possibility that adjusting rates upward will induce a further decline in volume.

More importantly, the PRC based its formula not on changes in volumes but in changes in “density,” that is, volumes per location. The PRC’s use of density implies that average cost per unit of providing mail service is constant as long as density is constant. This implies that the cost of mail delivery is the sum of two things: the marginal cost of delivering a letter times the quantity of letters, and the marginal cost of serving a location times the number of locations. No fixed costs are included. This implication first raises issues regarding rationales for having a monopoly postal provider, both locally and nationally. The PRC’s rate adjustment formula is correct given its density-based method, assuming marginal costs of deliver and of locations are constant and that what it refers to as “institutional costs” equals the product of the number of locations times the marginal cost of serving a location. However, this measure suggests consideration of funding the postal service not through surcharges on postage above marginal cost, but using marginal cost pricing of letters along with marginal cost based fixed charges for locations, the latter perhaps mandatory.

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