# Discrimination by Waiting Time in Merit Goods

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Perhaps the most ubiquitous of all urban problems is that the cities' public facilities—their roads, airports, shopping streets, license bureaus, schools, parks, beaches, pools, day care centers and public health clinics—are frequently crowded in ways that inflict time costs upon users. Waiting time does allocate public services, rationing them, as would money prices, according to the tastes, income and opportunity costs of consumers.[1] Time prices differ from money prices, however, since they appear relatively lower to persons with a lower money value of time. While such persons are likely to be considered more deserving, time prices have a defect: queues are a burden. It is alleged that some people, English housewives for example, enjoy a good wait. Despite such assertions, we will assume that queuing raises the cost of acquiring the good with which it is associated and that the burden from queuing is a deadweight loss. Time spent in a queue cannot be used productively.

The deadweight loss produced by a queue depends directly on the opportunity cost of time of those who wait. Thus when two individuals who value their time unequally wait in the same queue, they face different prices. This departure from the usual equilibrium conditions implies, in itself, that a queue of persons with different opportunity costs of time is inefficient. If trade were possible among persons who are waiting, or who might be paid to wait, this particular manifestation of inefficiency would disappear. Those with a low opportunity cost of time would resell to those with a high opportunity cost. Still, individual differences in the opportunity cost of time will affect the burden imposed by queues, because such differences determine who will wait and the length of the queue.

Money prices may be preferred to time prices because the revenues generated usually constitute an accurate signal. *Ceteris paribus*, it would be desirable to avoid the deadweight loss and to add to seller receipts. For these reasons, economists often recommend the imposition of user charges set equal to marginal social cost. However, a congestion charge in money is likely to be regressive in its effects, and several writers have agonized over whether the charge is justified simply because efficiency is increased in the process.[2] An alternative is to offer a public service at a wide range of money and time prices in a way that makes everyone better off. Our intention in this paper is to refocus the discussion of the efficacy of user

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[1] For a general discussion of time in the household production function see Gary Becker.

[2] See, for example, John Meyer et al. (pp. 334–41) and C. Sharp. Implicitly, these authors believe that there will not be any compensating redistribution.

charges on such an alternative program. At issue is not simply whether there ought to be a user charge in money at a single congested public facility, but rather how to achieve some constrained efficient allocation which is equitable.

Our single chain of argument will yield three major conclusions. First, we note that public services are frequently offered at a zero money price and then rationed by the waiting time required of recipients; furthermore, waiting time varies with the number of recipients. Since time is more equally distributed than money, this rationing device may be thought to be desirable because of equity considerations even though it is known to be economically inefficient. Since such equity considerations play no part in providing goods in the private sector, we conclude that public facilities are often congested for a reason in addition to those which lead to congestion in the private sector.

Our second principal conclusion is that queuing may be efficient. For public or private goods, queuing can be efficient if waiting by customers permits greater output. The efficient combination of queuing and money prices depends, of course, on the value of the customers' time. Queuing for public goods can also be efficient if there is a cost and a value to discriminating among recipients according to the opportunity costs of their time. The advantage of queues in this case stems from the fact that they enable us to charge different money prices to different groups without administrative cost. Facilities with higher money prices will have lower waiting times. A choice is thus offered the buyers which allows them to pay for the service with that combination of money and time which is cheapest for them. To low income buyers, combinations involving relatively higher time costs and lower money costs will be cheaper.

Finally, we conclude that the use of money prices to provide product differentiation may simultaneously improve equity and efficiency. We examine some equity issues that are inherent in alternative schemes for dealing with congestion and show that in some cases equity is improved in one dimension while it is worsened in others. We conclude by examining those characteristics of the social welfare function which must be known before one can unambiguously recommend the use of many money prices to partition the market for some otherwise homogeneous government service. While we restrict this analysis to differentiation by money price, we urge that the public sector consciously consider varying its conditions of sale along many dimensions. The chain of argument is also important because it leads to interesting questions, each worth considering in its own right quite separately from its relationship to the others. For example: Is the emphasis upon the need for marginal cost pricing in the public sector misplaced? Does the greater opportunity cost of time of the rich throw them into the private sector while leaving the poor in the public sector for selected consumption goods? Why do we provide merit goods and how do we determine the optimal capacity at a public facility providing that service? Does the reason for providing a merit good suggest the terms under which the good ought to be distributed? More generally, which rules for distributing merit goods are fair and which are not? We suggest a framework in which these questions arise naturally and we provide answers to some of them.

## I. Congestion and Price Differentiation

### *Differentiating Products by Money Price*

In the private sector, one way in which products are differentiated is by the time required to purchase them. One can spend time searching out merchandise at a dis-

count store, examining it, and waiting in line at the cashier. Alternatively, the identical commodity can be bought rapidly at a retail shop with the assistance of a clerk. The good will be more expensive at the shop, of course, since it costs the shopkeeper money to save the buyer's time. If competition prevails in the retailing industry, profits will be zero for both discount stores and retail shops. Customers with a high opportunity cost of time will prefer the shops while those with lower costs will use the discount stores. The equilibrium number of shops relative to discount stores will depend on the technical ability of stores to substitute time for money and on the distribution of buyers according to the costs of time. Assume that the only difference among the firms in an industry is the amount of time customers must spend purchasing their output. Competitive equilibrium in such a differentiated industry will have two requirements: First the profit rate in each productive process must be zero in the long run; second, each buyer must patronize that supplier which sells the commodity most cheaply, where the purchase price consists of the money price plus the value of time spent making the purchase.

To be in equilibrium the buyer must solve the following problem. Many ways exist to buy a commodity, some of which have high money costs but low time costs while others have high time costs and low money costs. A continuous frontier of such possibilities, $FF$, has been drawn in Figure 1. The buyer must choose that point from $FF$ which minimizes his total cost. Following Becker, we assume the cost of the buyer's time to be his wage rate, and draw $AB$ such that $AO/BO$ is the buyer's wage.[3] The minimum cost point is $E$. Buyers with higher wage rates would prefer to pay with

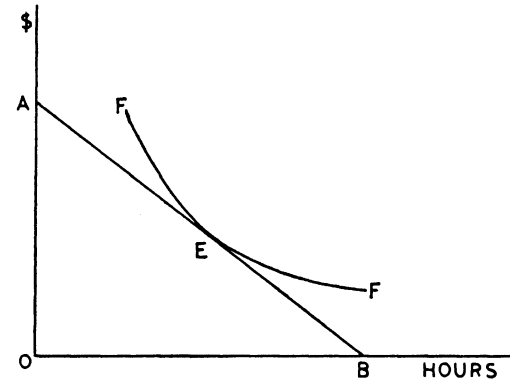


FIGURE 1

more money and less time. As the frontier is drawn, the technology of retailing is such that the store can save time for the buyer at some cost to itself. Buyers with high wage rates find it worth their while to save that time and pay the higher money price.

For producers, equilibrium requires that all points on $FF$ yield zero profit.[4] Free entry guarantees this result in the long run. As long as average cost curves are U-shaped, an efficient competitive equilibrium results. This equilibrium is Pareto-efficient since the problem posed here is no different from the standard case of a firm in pure competition deciding what product to produce. Similarly, the individual's maximizing process is the usual one. We can view the purchase of each commodity as an activity with diminishing returns to labor. For an individual to maximize the return to his labor, his marginal minute in each activity must yield the same reward. If he faces a constant wage rate in one market, he must take part in all other activities until the marginal product of labor equals that wage rate in each activity. Thus the solution we have described is merely a special case of the general com-

[3] For $AEB$ to be a straight line, we need to assume that the buyer faces a constant wage at which he may sell any amount of labor he chooses.

[4] If part of the frontier is non-convex, those points will not be observed as they represent inefficient processes.

petitive solution. Its efficiency depends on conditions which are well known.[5]

To illustrate the gains to buyers that result from differentiating a product by money price where previously differentiation had not existed, consider an example in which the money price is initially zero (to represent the conventional public provision of a service). The commodity is offered subsequently at both a zero and a positive price. The initial situation is represented by $A$ on Figure 2. At the zero money price, its use is rationed by the $OA$ man-hours in waiting time it costs to acquire it. Later the product is also offered at a second facility at money price $OB$. If no congestion resulted at the additional facility and therefore it took no time to buy the new commodity, it would be bought by all those whose wage rates exceed $OB/OA$. A more general result would involve some congestion, with point $C$ ultimately describing the cost of the commodity at the new facility. Since we are assuming capacity unchanged at the old facility, the demand withdrawn from it would result in a new time price such as $E$. Those whose wages exceed $DC/DE$ would find it cheaper to purchase at $C$; others would purchase at $E$. Thus from the buyers' viewpoint, differentiation by price which involves increasing money prices can lower the total cost of acquiring a service for *all* consumers, provided that capacity has been added.

It is also possible for providers to prefer differentiation even with increased capacity. With the added capacity, total costs to the government increase. The new buyers brought into the government facilities by option $C$ and those who switch from option $A$ to option $C$ because it is a cheaper option, generate revenue for the government. It is an empirical question whether the revenue offsets the increased costs. It is at least possible. In the case where net costs increase, some social decision criterion must be consulted to see if the extra benefit is worth the extra cost.

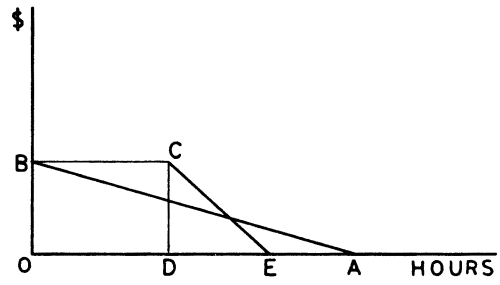


FIGURE 2

Each additional point which might be added to Figure 2 would entail a set of calculations like that above. In the limit a continuum of money prices would be created. Varying queues would exist with the longest queue associated with the lowest money price.

Fluctuations in demand are an important source of the money-time trade off. Consider a group of privately owned facilities using the same technology to produce a product which is differentiated only by the money price charged. Assume that demand fluctuates through the day and that it is administratively impractical to vary money prices as demand varies, so that queues form from time to time. Where the money price is low, congestion is more frequent and more severe, so that the average amount of time necessary to make a purchase is higher. Where the money price is high, there will be less congestion on the average and a lower time price. Thus fluctuations in demand can produce a frontier like $FF$ in Figure 1, simply because buyers respond to different money prices. If zero profits are still to exist at all points on the frontier, there must be some fixed factor which leads to

[5] Note that low wage buyers are not able to resell to high wage buyers because of the transaction costs involved. The ability to substitute cheap labor for expensive labor has already been exploited in the frontier, and is in fact, the reason for its very existence.

higher costs when the number of buyers is small. This would result, for example, from the existence of capacity that went unused at non-peak times. Buyers who wish to reduce the likelihood of queues must pay the costs of capacity which is not needed at non-peak times.[6]

Our concern is with publicly provided goods, but nothing said so far uniquely applies to them. Nor can public goods be introduced at this point by assuming insignificant long-run marginal costs, for if long-run marginal costs were insignificant there would be no congestion problem. To provide a rationale for public action it will be sufficient to assume that the commodity being provided is a merit good, i.e., that there is some public benefit from each unit sold. If such public benefits exist, and if those benefits do not depend on who consumes the commodity, then the efficient prices to charge individuals are given by a uniform downward shift of *FF* by the amount of the public benefit. For some publicly provided goods, however, merit value is related to characteristics of the consumer. Consider health services, for example. The poorer a person is, the more willing the public is to provide him with health services. It is this desire to differentiate among consumers according to income which undoubtedly provides the most satisfactory rationale for queues in the public sector, even though the time costs that result involve a dead-weight loss.

## II. Queues that Deliberately Discriminate Among Merit Good Recipients

If the money cost of waiting time increases with the wage rate, any commodity that is rationed by a queue will be more expensive to those with high wage rates than to others. When confronted with alternative combinations of money and time prices, those with high wage rates choose the offering with a high money price and a low time price, while those with low wages choose the reverse. Thus if the public wishes to subsidize the money cost of a commodity to those with low wage rates only, they may offer it to all with a low (perhaps zero) money price, but offer such a small amount that a substantial queue results. To the low wage people, the money cost of the queue is minimal and they will receive a substantial benefit due to the lower money price. The high wage people will find the costs of the queue greater than the value of the money subsidy and they will not use the commodity even though its money price is low. Thus queues can be used to discriminate among users according to the opportunity costs of time. Even though the queue has an inefficient aspect in that the time of those who pass through it might have been used to raise total output without adversely affecting the buyer, nevertheless it is efficient overall if the alternative costs of discriminating—an equally effective means test—are higher. A queue is a decentralized way to discriminate according to the opportunity costs of time; it allows low wage people to select themselves as recipients of the money subsidy. Of course, if any alternative means of discrimination is cheaper, the queue remains inefficient.

Since queues may be the most efficient means of discrimination for some purposes, it is useful to discuss the nature of the problem faced by the government when determining the optimal length of a queue of a non-tradeable, non-storable commodity.[7] Queue lengths are determined in-

[6] This happens, for example, at supermarkets where product differentiation is effected by varying the number of cashiers employed. The more cashiers, the less often queues occur but the higher money prices must be.

[7] We have in mind here goods like visits to a health clinic, where the opportunity to reduce waiting time by buying more of the good each trip is virtually impossible.

directly, of course, since the control variables are the money prices charged and the quantities provided per time unit. The responses of individuals to these prices and to the resulting queues determine their lengths. For a given set of money prices, queues can be reduced by increasing the quantities of the services available.

The optimal quantity of the product to offer at any price is that amount at which the social cost of an additional unit just equals the social benefit. Comprehension of the relevant benefits and costs yields an understanding of the optimal solution.

Consider the problem of a government which wishes to subsidize the consumption of a commodity by low wage individuals and can offer a fixed subsidy to all potential consumers. For one consumer, the problem is simple. It is well known that such a subsidy must equal the value of the utility gained by other persons from the last unit of the commodity consumed by the individual. In Figure 3, $DD$ represents an individual's demand curve for a commodity and it is known by the government. At each quantity, however, there are marginal external benefits to the general public which when added to the individual demand schedule produce the total marginal benefit curve $D'D'$. Given marginal production cost of $MC$, $AB$ becomes the appropriate subsidy. With subsidy $AB$, the individual chooses to consume $OC$ while he would choose $OE$ in the absence of that subsidy.

If, as may be assumed, the same subsidy must be given to different individuals, there will be some welfare loss since the amount of public benefit, at the quantity he consumes, varies from one individual to another. For the individual pictured in Figure 4, the subsidy $AB$ is not large enough to induce consumption of $OH$, the optimal amount, and a welfare loss represented by triangle $AGF$ results. For some consumers, the subsidies will be too large

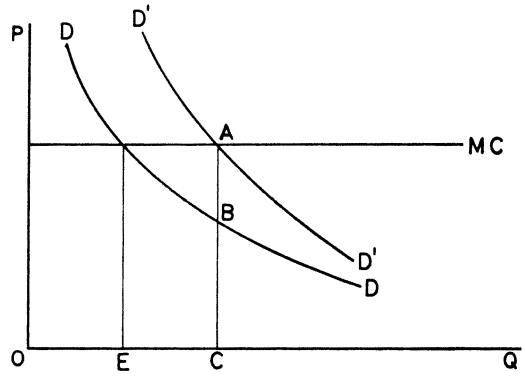


FIGURE 3

and corresponding triangles $AG'F'$ will appear below the cost line, representing the fact that the value of the commodity to the individual plus its value to the government is less than its cost. If we continue to ignore the possibility of queues, the problem of the government is to select a subsidy scheme which minimizes the sum of triangles such as $AGF$ and $AG'F'$ over all individuals.

The use of queues to discriminate among users adds an additional source of welfare loss to that already represented by the triangles. This follows from the assumption that the opportunity cost of time is the wage rate, for by that assumption buyers would be indifferent between spending their time in the queue and paying out

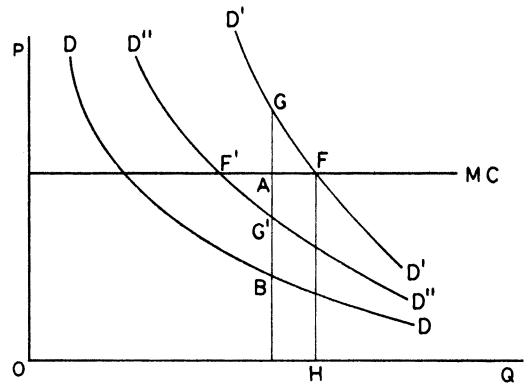


FIGURE 4

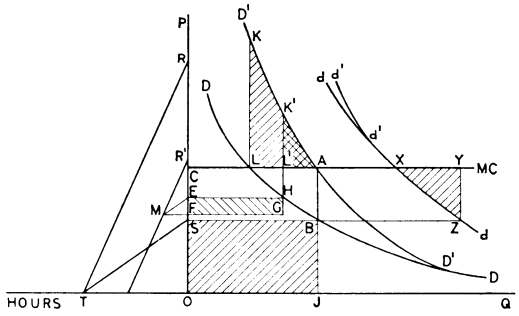


FIGURE 5

of the wages earned at their productive jobs. Nevertheless, the effect of the queues on the subsidies received by different individuals may reduce the total welfare loss. Queuing may lower the subsidy to those with high wages and raise it to low wage people. If this is the desired effect, it is possible that a welfare gain can result despite the additional deadweight loss implicit in the queue.

In Figure 5, the private demands of a low wage and a high wage individual are represented by $DD$ and $dd$, respectively, while $D'D'$ and $d'd'$ represent private plus public demands for the same individuals. Note that the appropriate subsidies are $AB$ and zero. If no subsidy is offered, the welfare loss is triangle $AKL$. If both are offered subsidy $AB$, the loss is triangle $XYZ$. Suppose that there is no uniform subsidy, and instead, the product is provided at a zero money price in the public sector and $MC$ in the private sector, and a queue results in the public sector which requires an individual to spend $OT$ man-hours to buy each unit. The individual's perception of the subsidized price will then be the money value of the waiting time. If the wage of the low wage person is $OS/OT$ and that of the high wage person is $OR/OT$, then the money cost of the commodity in the public sector to the low wage person will be $OS$, while it will be $OR$ to the high wage person. The time costs for the high wage person will exceed $MC$, the cost of the commodity in the private sector, so that the low wage person would buy from the public sector, while the high wage person would buy from the private sector. The only welfare loss results from the queue, a loss of $OJBS$, the value paid by consumers in waiting time that might, without additional cost to the buyer, have been used in production.

As drawn, $OJBS$ is very large; an alternative pricing device exists which reduces this loss substantially. If the public sector charges a money price $OF$ and offers a quantity that results in a queue which requires $FM$ man-hours to acquire the commodity, the high wage person will still use the private sector although the price to him of the service in the public sector has fallen substantially, i.e., from $OR$ to $OR'$, as long as the total cost to him, $OR'$, exceeds the marginal cost of the alternative, $OC$. The low wage person now pays $OF'$ in money plus $FM$ in time for each unit and consumes $EH$ units. The total waste is $EFGH$ plus $AK'L'$. A queue that minimizes the sum of this rectangle and triangle would be the most efficient scheme the government could offer when the costs of separating low from high wage people in any other way exceed that minimum sum. When the opportunity costs of individuals lie along a continuum, the government must select quantities of service to offer at various money prices in such a way as to minimize the sum of the rectangles and triangles over all individuals. That is, the sum of the wastes from standing in queues and from having different citizens consume too much or too little of a specific commodity must be minimized. In formal mathematical terms, this is a very messy problem; no significant solutions appear readily at hand.

A solution to a somewhat similar problem has been presented by William Vickrey. He discusses the provision of a nonmerit good (highway services) with time-

cost related to the number of users and shows that if there are constant returns to scale, competition will produce a continuum of money price-time price pairings in which the price that each person pays will cover the congestion costs imposed on others. Our problem is different and more difficult in that congestion serves as a suboptimizing substitute for a means test rather than a way of making services available to more persons.

Differentiation of price may serve not only to vary the time cost to users, but also to vary other qualities of services. An obvious example would be the consumption of space at beaches, pools, and parks. Differentiating by price would leave some facilities less crowded than others, and allow thereby for differences in taste. One consequence might be to simply differentiate consumers by income class, which in at least some instances would be undesirable. Not all forms of product differentiation by money price are desirable, and we turn to a general consideration of their equity consequences in the next section. We conclude here by noting that examples of product differentiation can now be found in the public sector. Burton Weisbrod tells of a first-rate example of what is generally required. In San Juan there are "express" busses which run along the same routes as "local" busses and both are required to stop at the same places if their patrons demand it. Expresses, however, carry a higher price which tolls off customers and makes the express bus the more rapid travel mode. In this example the waiting time does not represent a deadweight loss since it is one of the necessary inputs for transportation, and is an example of Vickrey's model.

### III. Equity and Money Price

The hard equity questions have been side-stepped until now since we have implicitly posited the existence of some social welfare function by specifying the public value attributed to each additional unit of consumption by an individual. Regardless of the form of that welfare function, certain systematic redistributions are implicit in any scheme involving the introduction of money prices into the public sector when they had not existed previously.

There will be a high but not perfect correlation between income and the opportunity costs of time. If we wish to treat those with equal income equally, we will find that the use of queues encourages too much consumption by those with low wages who have sources of non-wage income. And, of course, income may not separate those whom we wish to subsidize from those whom we do not wish to subsidize. Schemes which differentiate beneficiaries according to the opportunity costs of time are inappropriate if the society wishes to differentiate by other standards. The number and age of children, condition of health, or level of education may all affect the degree to which there is a public interest in enhancing the consumption of an individual, either in general or of a specific service. To the extent that these factors are present, queues will be an inefficient device for giving effect to such public interests.

Equity among income classes is also affected by the range of available prices. Suppose that a visit to a doctor is available at \$0 plus 2-1/2 hours at the public clinic or \$5 plus 1/2 hour in a doctor's office. The effective prices in money (the sum of money prices and time prices converted to money) for persons with different opportunity costs of time are shown by the solid line in Figure 6. Persons with time worth less than \$2.50/hour use the public sector and pay 2-1/2 hours, while those with time worth more than \$2.50/hour use the private sector and pay \$5.00 plus 1/2 hour. Now suppose that an additional price is

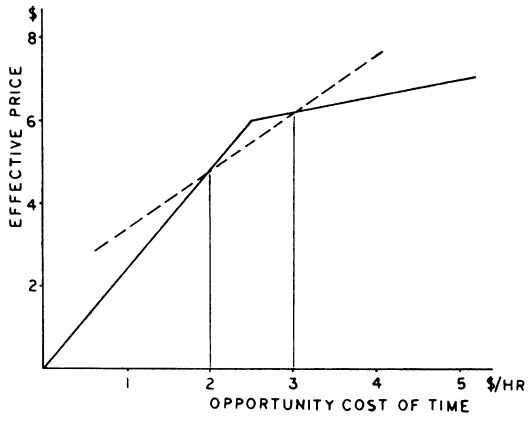


FIGURE 6

offered at the public clinic: $2.00 plus 1-1/2 hours. (This could be accomplished at a single facility by allowing each patient to specify the line he wished to join, and then calling patients in such an order as to preserve the relative lengths of the lines. The doctors would not need to know which line a patient came from.) The new effective prices, expressed in money, are shown by the dashed line in Figure 6. The beneficiaries are persons with opportunity costs of time in the range of $2/hour to $3/hour. The greatest benefits accrue to persons with time worth $2.50/hour.

The preceding discussion requires that the zero-priced facility continue to have the same time price. This is accomplished by adding an appropriate amount of capacity. If we were to merely institute money charges at some facilities where none existed previously, the queue lengths at the zero-priced facilities, serving the very poorest people, will increase. By varying capacity, any desired time price can be achieved.

It is difficult to set constraints on what constitutes equity. Nevertheless, it would be surprising if the corners of Figure 6 were consistent with maximization of any social criterion. Equity would seem to require a continuous variation in the nearly equal treatment of near equals, but a smooth schedule in Figure 6 would require a continuum of money-time price pairs, which might be prohibitively expensive. The practical optimum almost certainly involves undertaking some expense for the sake of greater continuity.

If we relax the assumption that the opportunity cost of time is measured by the marginal product of labor in the market, we can say little about equity. Relaxing the assumption does raise a pertinent question about equity, however, when the chosen policy is to expand the set of money price-waiting time pairings. Suppose, for example, that two individuals have the same opportunity cost of time in the labor market. For one of these individuals, the opportunity cost of time is indeed his marginal product of labor as valued in the market place. For the other, the opportunity cost of time is in performing motherly duties which she values at more than the market value of her time, so that she earns no wages. Introducing the set of money price-waiting time pairings benefits the worker but not the mother, who values her time so highly that she continues to pay the high money price.

Current practice which, by and large, offers public services on a first come, first served basis at a single money price (usually zero) poses its own problem in equity. As an appropriate test of an equitable rule we offer the following: *ex post* is the distribution of recipients of a service a random draw from the client population along each relevant dimension. That is, are there any systematic variations in characteristics between recipients and non-recipients which are arbitrary with respect to the purposes of the program? (See Morris Ginsberg, ch. 2.) Our expectation, which must still be empirically verified, is that current practice would not pass this test. Current practice imposes an arbitrary dis-

tinction: consumers will be differentiated from non-consumers by the opportunity costs of their time. The missing money price-waiting time pairings may even serve to discourage work effort from those at the margin between unemployment and employment at low wages. The value of waiting time may exceed the marginal product of labor at a full-time job. Casual employment may yield a higher total utility than the somewhat higher money income from full time employment for the poor hypochondriac—and hypochondria is a poverty-linked characteristic.

In summary, our policy proposal is to increase choice in the public sector through variation in money prices, which may be considered a form of third-degree price discrimination.[8] This proposal is not without equity problems. But without an explicit social welfare function on the one hand and a precise congestion function and production function for the service on the other, these conflicts are not resolvable.

### *Introducing Money Prices into the Public Sector: Some More General Issues*

Failure to provide many alternative price-time pairings is not a widespread problem. Not only does it arise on a quite limited number of publicly provided goods, but it also probably affects the welfare of only a small portion of the income distribution. Many public facilities carry only one money price, usually zero, but the private sector supplies closely substitutable services at alternative price-time pairings. The two extremes of the income distribution are, therefore, probably getting the appropriate choices. The pairings offered, however, have a sharp discontinuity between the zero money price at which the good is fully subsidized by general taxes, and the minimum feasible money-time price pairing which just yields normal profits. Partial subsidies, with some money user charges, are lacking.

Partial subsidies have applications beyond those instances in which congestion is manifested by queues. Choice seems to be unduly restricted over the whole range of public service. One can go to the health clinic at zero money prices or the private doctor, the municipal golf course at zero money prices or the country club, the library at zero money prices or the second-hand book seller, the purely public or the purely private elementary school. The larger the public subsidy to any congested public service, the sharper will be the discontinuity in the price pairings offered. The general effect is to serve poorly those with a low but positive marginal product of labor.

Alternative price pairings for the same basic goods do exist throughout each metropolitan area. One source of these variations is residential segregation by income class. The charity health clinic that caters to the needs of domestics in high income areas is not likely to be congested. For other reasons, the public schools in the high income areas are not likely to be congested either. Political boundaries within the metropolitan area serve to permit individuals to collect according to income and their taste for public services, thereby producing a mix of money and time prices, but the commodity also varies.[9]

[8] Strictly speaking, third-degree price discrimination is an attribute of monopoly and an exercise of monopoly power. "A third degree would obtain if the monopolist were able to distinguish among his customers $n$ different groups, separated from one another more or less by some practicable mark, and could charge a separate monopoly price to the members of each group" (A. C. Pigou, p. 279). We do not expect the government to exercise any monopoly power it may have simply to increase money receipts for its own sake.

[9] Charles Tiebout and Margolis (1957). However, as Paul Samuelson has pointed out, variance in income within neighborhoods reduces the effectiveness of product differentiation among municipalities in a metropolitan area (p. 377).

## IV. Conclusions

The issues posed by this paper have not been completely resolved. We have done no more than highlight some relatively neglected facets of the problem of congestion at public facilities.

Because of the peak load problem, it is often efficient to have queues at both private and public facilities if the cost of varying prices exceeds the dead-weight loss of the queue. In addition, public services that are provided below cost often appear to be rationed through the use of queues. Such a rationing device is efficient only if the alternative forms of rationing are more costly than the dead-weight loss implicit in the existence of the queue. Queues are effective rationing devices because they impose a charge on the users in waiting time. Since the opportunity costs of time vary across people, the money cost of the queue will vary as well and for many people the costs of waiting will exceed the price at which the service can be bought in the private sector. Those with a high opportunity cost of time will find the money price in the private sector to be lower than the time price charged in the public sector. Thus the use of a queue rations a service exactly as if a money price were charged that varied directly with one's wage rate. Since the public sector often wishes to subsidize commodities in a manner that varies negatively with wage rates, queues can be an efficient device for singling out those it is desired to assist. This is true when alternative costs of discriminating exceed the dead-weight loss implicit in the queue.

In some cases, it may be desirable to charge many different money prices for the identical publicly subsidized commodity. Queues of different lengths will form with the shortest queues occurring at the facilities with the highest money prices. Individuals will then have a choice of paying for a commodity with various combinations of money and time, each choosing that combination which is cheapest for him. There may be substantial efficiency gains to be had from such differentiation.

Our proposal may produce serious equity problems that cannot be overcome.[10] Even if only the poor benefit, those with higher money income may benefit relatively more than those with lower incomes. If equity means the same treatment for all persons, it may not be possible to improve social welfare by increasing the number of money-time pairings. If, however, unequal treatment of unequals is equitable, which seems much more reasonable, then there are unexploited possibilities for improving social welfare. If offering the relatively better off among the poor services at both a smaller subsidy per capita than other poor and a smaller congestion cost is equitable, for example, then there should be a substantial increase in the set of the money-time price pairings offered the poor.

Taken together, the public and private sectors provide substitutable commodities at many alternative money-time price pairings. Those with a high opportunity cost of time will choose from the private sector, and the poor will choose from the public sector. Segmentation of the market will not extend to its technically feasible limits, however, unless governments offer income-in-kind at varying money prices. We think we have shown that there may be a high payoff in increased social welfare to ingeniously conceived expansions in the number of waiting time-money price pairings in the public sector. By extension, the payoff to increased welfare may also be extended by differentiating product along dimensions other than the money and time.

[10] The problems of extending choices on the supply side, thereby foregoing economies of scale, have not been discussed here.

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