Title

Why voters may prefer congested public clubs

Authors

Glazer, Amihai
Niskanen, Esko

Publication Date

1992-07-01

Why Voters May Prefer Congested Public Clubs

Amihai Glazer
Esko Niskanen

Working Paper
UCTC No. 195

The University of California Transportation Center

University of California
Berkeley, CA 94720

The University of California Transportation Center

The University of California Transportation Center (UCTC) is one of ten regional units mandated by Congress and established in Fall 1988 to support research, education, and training in surface transportation. The UC Center serves federal Region IX and is supported by matching grants from the U.S. Department of Transportation, the California Department of Transportation (Caltrans), and the University.

Based on the Berkeley Campus, UCTC draws upon existing capabilities and resources of the Institutes of Transportation Studies at Berkeley, Davis, Irvine, and Los Angeles; the Institute of Urban and Regional Development at Berkeley; and several academic departments at the Berkeley, Davis, Irvine, and Los Angeles campuses. Faculty and students on other University of California campuses may participate in Center activities. Researchers at other universities within the region also have opportunities to collaborate with UC faculty on selected studies.

UCTC's educational and research programs are focused on strategic planning for improving metropolitan accessibility, with emphasis on the special conditions in Region IX. Particular attention is directed to strategies for using transportation as an instrument of economic development, while also accommodating to the region's persistent expansion and while maintaining and enhancing the quality of life there.

The Center distributes reports on its research in working papers, monographs, and in reprints of published articles. It also publishes *Access*, a magazine presenting summaries of selected studies. For a list of publications in print, write to the address below.

University of California Transportation Center

108 Naval Architecture Building
Berkeley, California 94720
Tel: 510/643-7378
FAX: 510/643-5456

Why Voters May Prefer Congested Public Clubs

Amihai Glazer

Department of Economics
University of California at Irvine
Irvine, CA 92717

Esko Niskanen

Government Institute for Economic Research
Helsinki, Finland

Working Paper
July 1992

UCTC No. 195

The University of California Transportation Center
University of California at Berkeley

Why Voters May Prefer Congested Public Clubs*

Amihai Glazer
Department of Economics
University of California, Irvine
Irvine, CA 92717

Esko Niskanen
Government Institute for Economic Research
Helsinki, Finland

July 28, 1992

Abstract

Governmental facilities for such services as education, health, and transportation are often small, of poor quality, and overcrowded, even when the costs are spread among all taxpayers. We also find that governments may subsidize private facilities providing the same services, or may charge admission fees at public facilities. We explain these phenomena with a model which considers two types of people, rich and poor. A majority consisting of poor people may purposely build small and low quality facilities to discourage use by the rich, thereby lowering taxes. For the same reason, the poor may benefit from an admission fee at public clubs, or even from a subsidy to private clubs they do not use.

*Earlier versions of this paper were presented at the 1991 annual meetings of the Public Choice Society, at the 1992 annual meetings of the American Economic Association, at Ohio State University, Carnegie Mellon University, University of Pittsburgh, University of California San Diego, and at the Government Institute for Economic Research in Helsinki, Finland. We are also grateful for comments by Miguel Gouveia, Richard Romano, and Suzanne Scotchmer.

A traditional story of politics has a majority exploit the minority by building local public facilities that mostly benefit the majority. This may particularly apply when the costs of public facilities can be spread among all taxpayers, including those who do not use the public facilities. We observe, however, that governmental facilities are often small, of poor quality, and overcrowded. We also observe that many services provided by such facilities are also provided privately (consider public versus private schools and universities; public versus private medical care; public parks versus private golf courses; public mass transit versus private use of automobiles; and so on).

We examine such phenomena by considering a public facility in a community consisting of two types of people: poor (assumed a majority) and rich. We suppose that a rich person is more averse to poor quality and to congestion than is a poor person. A rich person is therefore more willing to use a private facility. Since an increase in congestion or an increase in admission fees at the public facility will induce rich consumers to avoid the public facility, the majority may benefit from the change. For the same reason, the poor majority may favor a subsidy for private facilities they do not use.

Club theory, used here, provides tools to examine these issues. The spirit of our analysis appears in the literature on public and private provision of education (see Inman 1978, Sonstelie 1982, and Stiglitz 1974). In particular, Stiglitz examines how the quality of public education affects the number of persons who use it. Our analysis also shows how government can redistribute income: provide a public good of lower quality than preferred by the rich. A similar effect appears in Besley and Coate 1991.

1 Assumptions

Consider a public club (facility) of physical size G.[1] The cost of such a club is $c(G)$, with $c' > 0$.[2] These costs are covered by tax revenues, admission fees, or both. Any tax is collected from every person, including persons who do not use the public club. Any person who pays the admission fee has the right to use it. Thus, the majority cannot forbid the minority from using a public club. The public club is built if a majority of the population favors it. The majority also chooses the characteristics of the club to maximize its utility.

The population consists of two types of consumers, the rich and the poor. A rich person has higher income, gets higher direct utility from capacity, and suffers more from congestion. All the poor, P in number, are identical; the number of (identical) rich people is R. Each poor person has endowment Y^P; a rich person has endowment Y^R. For the moment suppose each person pays a tax t that covers the *per capita* cost of the public club, so that $t = c(G)/(P+R)$.[3]

Each person consumes a private good. Each poor person also consumes services at a public club. Not all rich people need use the public club. A rich person's choice depends on his utility when not at a public club, $\overline{U}^R(r) - c(G)/(P+R)$, where r is the number of rich people using the public club, and $d\overline{U}^R(r)/dr \geq 0$. We call $\overline{U}^R$ the reservation utility of a rich person.

[1]An analysis with more than one club would merely complicate the analysis without providing additional insights.

[2]Our qualitative conclusions are the same when the cost is also a function of the number of users. We also ignore operating costs and discounting over time by considering a one-period model.

[3]Section 4 considers subsidies and admission fees.

The assumption about the derivative can be interpreted in several ways. For example, a rich person can use a private club, where the size of the club adjusts so that utility there decreases (or does not vary) with an increase in use. Or he may use his time in an alternative activity, which gives him this utility. However, he cannot avoid paying the tax which finances the public club.[4]

Let consumption of the private good by a rich person be x^R; consumption of the private good by a poor person is x^P. The number of users at a public club is n. The utility of a poor person at the public club is

$$U^P(x^P, G, n) = x^P + f(G) - l(n/G), \tag{1}$$

with $f' \geq 0$ and $l' > 0$. The utility of a rich person at the public club is

$$U^R(x^R, G, n) = x^R + h(G) - m(n/G), \tag{2}$$

with $h' \geq 0$ and $m' > 0$. To represent the idea that the rich gain more direct utility from the capacity of a club, we let $h' \geq f'$.[5] The idea that the rich suffer more from congestion is represented by the assumption that $m' \geq l'$. We also suppose that $f(0) = h(0)$ and $m(0) = l(0)$.

2 Equilibrium

Assume that the poor are a majority. They choose the characteristics of the public club to maximize their own utility: the poor are Stackelberg leaders.

[4]Under our strict assumptions, optimality would require separate communities. Other considerations, however, such as peoples' desire to live where they work, lead to heterogeneous communities. See McGuire 1986.

[5]The value of G in the functions f and h is related to the quality of a club. For example, a user may prefer an Olympic-sized pool over a smaller one even if it is more congested. Our qualitative conclusions are similar when a direct measure quality enters the utility function.

We consider the most interesting case where, in equilibrium, the public club yields each poor person a utility higher than his reservation utility. In contrast, we allow the number of rich people who use the public club to depend on the parameters of the model. They may all use it, none may use it, or only some may use it. An equilibrium in which all the poor but only some of the rich use the public facility can arise if higher incomes make alternatives to the public facility more attractive, if higher incomes increase the aversion to congestion, and if the poor use their political power to make the public club unattractive to rich consumers.

Let the number of rich people who use the public club be r, so that the total number of people using the public club is $n \equiv P + r$. Substituting $t = c(G)/(P + R)$ into the budget constraint of a poor person and these constraints into his utility function gives

$$U^P(\cdot) = Y^P - c(G)/(P+R) + f(G) - l\left(\frac{P+r}{G}\right). \tag{3}$$

Similarly, a rich person who uses the public club has utility

$$U^R(\cdot) = Y^R - c(G)/(P+R) + h(G) - m\left(\frac{P+r}{G}\right). \tag{4}$$

At an interior solution (if one exists) a rich person's utility at the public club must equal his reservation utility. The equality implicitly defines r as an increasing function of G: $r = r(G)$ in the interval (G^L, G^H). Furthermore, $r(G) = R$ for $G \geq G^H$, and $r(G) = 0$ for $G \leq G^L$.

To determine the value of dr/dG at an interior solution use the equilibrium condition $U^R = \overline{U}^R(r)$. We find

$$\frac{dr}{dG} = \frac{h'G^2 + m'(P+r)}{m'G + G^2 d\overline{U}^R/dr} > 0. \tag{5}$$

Using this gives the effect of a capacity expansion on congestion:

$$\frac{d(P+r)/G}{dG} = \frac{Gdr/dG - P + R}{G^2} = \frac{h' - (P+r)d\overline{U}^R/dr}{m' + Gd\overline{U}^R/dr}. \tag{6}$$

The sign of this expression is ambiguous in general. If, however, $h' = 0$ (the rich get no direct utility from capacity), then $\frac{d(P+r)/G}{dG} < 0$. An increase in capacity of the public club can reduce congestion there. If, instead, $h' > 0$ (the rich enjoy direct utility from capacity), then increased capacity can increase congestion. For some intuition, suppose that $h' > 0$ and $d\overline{U}^R/dr = 0$. An increase in capacity directly increases the utility of a rich person at the public club. The equilibrium condition that $U^R = \overline{U}^R$ thus requires that more rich people use the public club, leading to increased congestion at the public club.

3 The choice of capacity by the majority

Consider a potential solution where some rich consumers (but not all) use the public club. In this solution the poor determine the optimal public club by choosing r and G to solve the problem

$$\max_{r,G} L = U^P(\cdot) - \lambda\left[U^R(\cdot) + c(G)/(P+R) - \overline{U}^R(r)\right]. \tag{7}$$

In this expression λ is the Lagrange multiplier; U^P and U^R are defined in equations (3)-(4). The condition $L_r = 0$ gives $\lambda = l'/(m' + Gd\overline{U}^R/dr)$. Substituting this into the partial derivative with respect to G gives

$$L_G = -\frac{c'}{P+R} + f' - \frac{l'}{G}\frac{h'G - (P+r)d\overline{U}^R/dr}{m' + Gd\overline{U}^R/dr}. \tag{8}$$

Setting this equal to zero and solving for G gives the optimal capacity. The capacity in turn determines, through the function $r(G)$, the number of rich people at the public club. For some parameter values the right hand side of (8) is unambiguously negative: the poor will then choose a capacity for the public club sufficiently small to induce all rich consumers to avoid it. The poor gain more from the reduced taxes than they suffer from the reduced capacity.

In particular, the sign of (8) is negative when $d\overline{U}^R/dr = 0$ and $f' = 0$ (the poor get no direct utility from capacity). The poor can then benefit from increased capacity only if congestion declines. But congestion will not decline, for the reservation utility to the rich is constant.

For other parameter values, an interior solution may hold: some rich people use the public club. We also conclude that small values of $d\overline{U}^R/dr$ and of f' make it more attractive for the poor (the majority) to choose a small capacity of the public club, which induces rich persons to avoid it.

Note also that whether the poor reduce capacity does not depend solely on the relative aversions to congestion. It also depends on the reservation utility of the rich. Thus, we can allow the poor to suffer more from increased congestion than do the rich. But an increase in congestion may induce the rich to move to a private club, thereby benefiting the poor who remain at the public club.

4 Admission fees and subsidies

The poor (the majority) may further increase their welfare by imposing an admission fee at the public club. Alternatively the poor may want subsidies for private clubs. We will show that under reasonable conditions both policies can increase the welfare of the poor.

An admission fee directly increases the cost to a poor person. The fee also discourages use of the public club by the rich, thereby benefiting the poor. Let the fee collected from each user of the public club be τ. Costs not covered by these fees are financed by taxes. The *per capita* tax is then $t = (c(G) - \tau P - \tau r) / (P + R)$. Notice that this formulation allows for a negative user fee, i.e., for a subsidy to users of the public club. Any such subsidy is financed from general tax revenues.

The poor now determine an optimal policy by choosing τ, r and G to solve

$$\begin{aligned} \max_{\tau, r, G} L &= Y^P - \tau - \frac{c(G) - \tau(P + r)}{P + R} \\ &+ f(G) - l\left(\frac{P + r}{G}\right) \\ &- \lambda\left[Y^R - \tau + h(G) - m\left(\frac{P + r}{G}\right) - \overline{U}^R(r)\right]. \end{aligned} \tag{9}$$

The condition $L_\tau =$ gives

$$\lambda = \frac{R - r}{P + R}. \tag{10}$$

Substituting this into $L_r = 0$ and solving for τ gives

$$\tau = \frac{P + R}{G}\left[l' - m'\frac{R - r}{P + R}\right] - (R - r)\frac{d\overline{U}^R}{dr}. \tag{11}$$

The sign of this expression is ambiguous. That is, for some parameter values the poor may want to pay each user of the public club a subsidy; for other parameter values they will prefer an admission fee. In particular, if the reservation utility to the rich is constant ($d\overline{U}^R/dr = 0$), and if the rich and poor suffer equally from congestion ($m' = l'$), then the poor gain from an admission fee ($\tau > 0$). If instead $d\overline{U}^R/dr > 0$ and $m' > l'$, the poor may want a subsidy ($\tau < 0$).

The different results appear because an admission fee has two opposing effects on the poor. One effect of an admission fee is to increase direct costs on the poor, who all use the public club and pay the fee. The fee thus works as a transfer from the poor to the rich. The other effect of a fee is to induce fewer rich persons to use the club, thereby benefiting the poor for any given capacity. This exclusion effect will be stronger if reduced congestion at the public club attracts few rich persons to the public club, that is when m' or $d\overline{U}^R/dr$ are small. Indeed, when m' or $d\overline{U}^R/dr$ are large, there is little need for an admission fee: few rich persons would use the public club anyway.

The results given above apply for any given G. We can also determine the optimal value of τ at the optimal capacity. For simplicity, let $d\overline{U}^R/dr = 0$ and let $f' = 0$. The first-order conditions yield

$$\tau = \frac{G}{P+r}[c' + (R-r)h'G] > 0. \tag{12}$$

At the optimal capacity the poor can benefit from an admission fee to the club they use, for such a fee induces rich consumers to avoid using the public club.

Similar results can appear when government makes a payment to a rich person who uses a private club. One interpretation is that government subsidizes private clubs. Let the subsidy paid to each rich person who chooses not to use the public club be s . The number of such people is $R - r$. Let the subsidies be financed by general taxes, and let admission to the public club be free. Then the total tax paid by each person is $[c(G) + (R-r)s]/(P+R)$.

The poor now determine an optimal public club by choosing s, r, and G to solve

$$\begin{aligned} \max_{s,r,G} L &= Y^P - \frac{c(G) + (R-r)s}{P+R} + f(G) - l\left(\frac{P+r}{G}\right) \\ &\quad -\lambda\left[Y^R + h(G) - m\left(\frac{P+r}{G}\right) - (\overline{U}^R + s)\right]. \end{aligned} \tag{13}$$

Substituting τ for s in this expression shows it to be identical to the objective function with an admission fee. That is, an admission fee at the private club is equivalent to a subsidy at a private club. It follows that for some values of the parameters the poor may want to subsidize private clubs, which are used only by the rich.

We can thus explain a common policy. Government often subsidizes private facilities that provide services similar to public ones; we may think of golf courses, private colleges, and private hospitals. This subsidy can be direct (as with private education), or can be indirect, as with tax benefits. The subsidies appear to benefit only the rich, who use these private facilities. But since such subsidies reduce the demand for public services, users of public facilities may also gain from the subsidy.

Subsidies can also be interpreted as vouchers. Several states propose, for example, to issue school vouchers, thereby subsidizing students at private schools. Our analysis shows that users of public schools may benefit from a subsidy, even if it induces no one to move from a public to a private school. The subsidy makes private schools more attractive. It thus allows the majority (assumed here to use public schools) to reduce congestion at public schools without attracting students from private schools. Thus, vouchers for private schools can increase the quality of public schools.

5 Conclusion

The model we presented shows that a majority (the poor) may choose a small capacity for a public facility, thereby inducing few rich persons to use it. Similar reasoning applies for imposition of an admission fee at a public club, and payment of subsidies for private clubs. Many of these characteristics appear in a comparison of public and private universities, and also appear in proposals for school vouchers.

The analysis also suggests that a community which becomes richer may lower the quality of public services. For example, small communities with large private universities often provide poor police protection, thereby inducing the university to provide its own police force. A city with a large office complex or residential development may build narrow or insufficient roads, thereby encouraging private developers to build internal roads at their own expense. Countries with nationalized health care may purposely have long waits for elective surgery, which encourage the wealthy to use private hospitals.

With more than two types of people, the analysis we gave does not directly apply. The preferences of voters need not be single-peaked, and therefore a median voter need not exist. For example, the very rich and the very poor may form a coalition to build a very congested public club—the poor because they suffer little from congestion, and the very rich because they would not use the public club in any case. This suggests that with multiple types of persons the problems discussed here can be exacerbated.

6 Notation

$c(G)$ Cost of club of size G

G Physical size of club

n Number of users at the public club

P Number of poor persons in population

R Number of rich persons in population

r Number of rich persons who use the public club

s Subsidy to user of private club

t Tax per capita

$\overline{U}^R$ Reservation utility of a rich person when not at the public club

x Consumption of private good

Y^P Endowment of poor person

Y^R Endowment of rich person

τ Admission fee to public club

References

[1] Besley, T. and S. Coate (1991) "Public provision of private goods and the redistribution of income." *American Economic Review*, 81(4): 979-984.

[2] Inman, R.P. (1978) "Optimal fiscal reform of metropolitan schools." *American Economic Review*, 68: 107-122.

[3] McGuire, M. C. (1986) "Private production, collective consumption, and regional population structure." *Journal of Regional Science*, 26(4): 677-706.

[4] Sonstelie, J.C. (1982) "The welfare cost of free public schools." *Journal of Political Economy*, 90: 794-808.

[5] Stiglitz, J.E. (1974) "The demand for education in public and private school systems." *Journal of Public Economics*, 3: 349-385.