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FORWARD

Public policies exert critical influences on the structure and composition of economic activity. This paper is the first of a series planned by the author on the general subject of "constitutionalism and incrementalism" in predominantly market economies. Focusing on the progressive displacement of mass transit by the private auto in local transportation and on the concomitant conversion of mass transit to a primarilly public-sector activity, the paper provides a concrete setting for the conceptual and analytical studies which will follow.

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PREFACE

In a "popular" critique of the Reagan Administration's proposed (and now enacted) "transportation infrastructure investment" program ("Save the Infrastructure -- By Auctioning It Off," Opinion and Commentary, *The Christian Science Monitor*, December 9, 1982, reproduced as an attachment to this paper), I suggested the likelihood of *inefficiencies* and *unanticipated consequences* associated with such governmental initiatives in predominantly market or mixed economies, proposing as a example of the latter the apparent consequences of highway expansion for governmental involvement in mass transportation. Subsequently, in thinking about the implications of incrementalist political processes, this case struck me as an excellent example of the invasive aspect of unconstrained incrementalism and as one which was susceptible to concrete empirical analysis. The product is the present paper, which offers empirical support for a principle conjecture of the earlier commentary (cited above) and a specific case study for the more general analysis of "constitutionalism and political incrementalism."

The paper has benefited from discussions with a number of IIASA and nonIIASA colleagues. In particular, Wolfgang Schöpp of IIASA and the Technical University of Vienna collaborated in the statistical analysis and designed the generalized least squares model reported in the Appendix. The author alone, of course, bears ultimate responsibility for the analysis and its interpretation.

Stephen P. Dresch
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URBAN HIGHWAYS AND THE DEMISE OF PRIVATE MASS TRANSIT IN THE UNITED STATES

Stephen P. Dresch

1. Introduction

Virtually any action by any party in any sphere has a large number of consequences, of greater or lesser importance, for other parties. While many of these consequences are consciously intended, many, perhaps most, are unintentional. Whether intentional or unintentional, the efficiency of the *system* within which the consequences of an action are exerted ultimately depends upon the existence of mechansims which insure that parties are encouraged to take actions the net consequences of which are positive and are constrained from taking actions which involve negative net consequences.

Markets constitute an important mechanism employed by one class of societies to attempt to meet this condition in the economic sphere. The principle issue underlying this paper concerns the efficiency impli-

cations of governmental action within one subset of this class of economies, that subset characterized by pluralistic political systems. Thus, the paper is concerned not with the relative efficiencies of *market* versus *planned* economies but rather with the efficiency with which governmental and nongovernmental actions are integrated in the former. The central, if at this stage implicit, elements of the argument can be briefly indicated:

(1) Governmental actions are not subject to the types of market tests to which private actions are subject. Hence an important source of the feedback by which inefficient actions are discouraged or negated (notably bankruptcy) is lost.

(2) In a decentralized, pluralistic political system the adverse consequences of any action, not the underlying, precipitating action itself, provide the focus of governmental response. As a result, actions with adverse consequences (gross or net) almost inevitably lead to further actions in other spheres, rather than to reassessments of the efficiency implications of the precipitating prior actions.

(3) Therefore, politically pluralistic societies with market economies contain an internal bias toward the invasive extension of the governmental sphere of activity.

This paper does not purport to offer proof of these conjectures. Instead, it sets the stage for a more fundamental analysis by examining the consequences of one class of governmental actions for a component of the private sector of the economy and for subsequent governmental

actions.

2. The Postwar Demise of Private Mass Transit

Prior to and in the years immediately following World War II, mass transit in the United States was a primarily private activity. Thus, of the 1,406 operating transit systems in 1950, only 26 systems (1.8 percent of the total) were publically owned. While the public systems were larger than average, they nonetheless accounted for only 28 percent of all transit vehicles. As indicated by Table 1, however, this situation changed dramatically over the following 30 years. By 1980 the number of operating systems had declined by 25 percent (to 1,044), while the number of publically-owned systems increased by 2,216 percent (to 576), comprising in excess of 55 percent of all systems. Concomitantly, the publically-owned proportion of all transit vehicles increased from 28 percent to 90 percent. In short, over a period of 30 years an essentially private mass transit system was effectively absorbed by the public sector. The present paper briefly explores the sources of this rapid demise of private mass transit in the United States.

A perusal of the passenger-load and financial statistics included in Table 1 provides a relatively clear indication of the immediate causes of the demise of the privately-owned component of the mass transit system. Despite rapid increases in population and economic activity, e.g., employment, transit ridership declined by 34 percent between 1950 and 1955, by 18 percent between 1955 and 1960, by 10 percent between 1960 and 1965, by 13 percent between 1965 and 1970 and by five percent between 1970 and 1975, for a cumulative decline of almost 60 percent

over this 25 year period. Financially, in 1950 operating expenditure exclusive of taxes was equal to only 89 percent of operating revenue, a figure which rose to 92 percent in 1960, to 111 percent in 1970 and to 177 percent in 1975. Net operating income (equal to operating revenue less operating expenses inclusive of taxes) declined from $66 million in 1950 to $31 million in 1960, $-11 million in 1965, $-288 million in 1970, $-1,704 million in 1975, and, finally, $-3,818 million in 1980; as a percentage of operating revenue the decline was from 4.5 percent in 1950 to -141.6 percent in 1980. Not suprisingly, public operating assistance by 1980 had reached $3,618 million, equal to 134 percent of operating revenue and to 56 percent of operating expenditure (inclusive of taxes). In short, mass transit (public and private) moved from moderate profitability in 1950 to a breakeven state in the mid 1960s to losses well in excess of operating revenues (passenger fares primarily) in 1980.

At a superficial level, the decline in passenger ridership provides a plausible explanation for the deterioration in the financial status of the mass transit industry, while the financial collapse of the industry provides a similarly plausible explanation for the progressive incorporation of the industry into the public sector. The unanswered question, however, is precisely why transit ridership declined as it did. If this contraction was simply a matter of a shift in consumer preferences away from mass transit or of the effects of rising affluence on the structure of transportation demands, then there would be neither a significant cause for concern nor a legitimate "second-best" justification for the public-sector "rescue" of the mass transit industry. If, however, this veritable collapse of transit demand can be traced not to the independent actions

Table 1
Transit and Highway Statistics, 1950-1980

	1950	1955	1960	1965	1970	1975	1980
TRANSIT							
Rev. pass. (mil.)	13,845	9,189	7,521	6,798	5,932	5,643	6,358(P)
% on pub. systems	NA	NA	NA	NA	77%	90%	94%(P)
Oper. rev. (mil. $)	1,452	1,426	1,407	1,444	1,707	2,002	2,696(P)
Op.exp.-tax(mil. $)	1,297	1,277	1,290	1,374	1,892	3,535	NA
% of op. rev.	89.3%	89.6%	91.7%	95.2%	110.8%	176.6%	NA
Taxes (mil. $)	89	93	87	81	104	171	NA
Op. exp. (mil. $)	1,386	1,370	1,377	1,454	1,996	3,753	6,514(P)
Net op.inc.(mil.$)	66	56	31	-11	-288	-1,704	-3,818(P)
Op. assist.(mil.$)	NA	NA	NA	NA	NA	1,408	3,618(P)
Op. systems (no.)	1,406	1,483	1,251	1,148	1,079	947	1,044
Pub. owned (no.)	26	33	54	78	144	333	576
Pub. % of total	1.8%	2.2%	4.3%	6.8%	13.3%	35.2%	55.2%
Vehicles owned (no.)	24,570	22,011	23,738	29,592	40,778	51,964	64,128
% pub. owned	28%	30%	36%	48%	66%	83%	90%
HIGHWAYS							
Contract awards (m.$)	1,528	2,619	4,039	4,825	6,506	7,187	9,865
Fed. funds (mil. $)	415	667	2,292	3,001	3,657	4,824	6,427
Fed. % of total	27.2%	25.5%	56.7%	62.2%	56.2%	67.1%	65.0%
Fed. aided hiways							
Miles compl. in yr.	20,000	23,000	28,830	18,783	10,935	7,161	NA
Cost (mil. $)	753	1,287	3,652	4,563	4,353	4,218	NA
Fed. fin. (%)	51.8%	51.7%	68.6%	74.3%	75.0%	76.1%	NA
Miles under const.	NA	NA	25,538	25,883	20,831	15,952	NA
Cost (mil. $)	NA	NA	7,080	12,228	14,547	20,104	NA
Fed. fin. (%)	NA	NA	73.2%	78.4%	77.4%	79.3%	80.8%

Sources: *Transit Fact Book (1981).* Washington, D.C.: American Public Transit Association, 1982.
Statistical Abstract of the United States (1969, 1972, 1975, 1980, 1982-83). Washington, D.C.: Government Printing Office (various years).

Note: NA denotes not available, (P) denotes preliminary.

of "sovereign" consumers but to the inducements of public policy, then the legitimacy of the underlying, causative policy can be questioned, while the justifiability of public sector action in defense of mass transit would be at least partially demonstrated.

3. Urban Highway Expansion and the Decline of Transit Ridership

The thesis developed here is that the primary explanation for the precipitous decline in mass transit demand in the post-war period is the rapid expansion of urban highway systems. While other public policies, notably regulations of the financial system which resulted in artifically low interest rates on home mortgages and provisions of the Federal (and subsequently state) income tax which discriminated in favor of single-family home ownership (especially in socially and economically homogeneous suburban areas), contributed to and reinforced the effects of a rapidly expanding urban highway network, the consequences of expansion of the highway system are most easily and clearly demonstrated.

Between 1963 and 1977 (the only period over which consistent data are available), total U.S. milage of "municipal highways" (highways in urban areas) increased from 475,000 to 687,000, a 45 percent increase of which the mandated local components of the Federal interstate highway system and related roadways constituted a small but not insignificant fraction. Over the first nine years of this period, mass transit ridership declined from 6,915 million to 5,253 million, or by 24 percent, before recovering (marginally) to 5,723 million in 1977. To what extent can the decline in transit ridership be attributed to the expansion of the urban highway system?

To provide at least a tentative (and, in fact, an arguably definitive) answer to this question, a very simple single-equation model of transit demand is proposed, a model which, despite its simplicity, is quite defensible.* Because journeys to work account for a significant fraction of all mass transit trips, the dependent variable in this model is defined as the ratio of total revenue passenger transit trips to total employment (full- and part-time). The explanatory variables are:

(1) milage of municipal highways (thousands);
(2) the implicit price deflator of user-operated (primarily auto) transportation relative to the implicit personal consumption expenditure (PCE) deflator (with 1972 = 1.00 for all variables);
(3) the mean transit fare relative to the implicit PCE deflator (i.e., expressed in constant 1972 dollars); and
(4) the ratio of population to employment.

Estimating this equation in the natureal logarithms of all variables, the coefficients represent elasticities, i.e., percentage changes in the dependent variable implied by one percent changes in the explanatory variables.

This single-equation model was estimated utilizing annual observations for the United States over the period 1963 through 1977, with the following results:

*Because the explanatory variables in this model can be viewed as determined independently of transit ridership (the dependent variable), the estimated coefficients of the model will not suffer from simultaneous-equations bias. The independence of the explanatory variables from the dependent variable is unarguable in the case of the urban-highway-milage, user-operated-transportation-price-relative and population-employment-ratio variables. Moreover, at least over the estimation period, this independence appears to be generally true as well with reference to the relative price of public transit, determined largely by "exogenous" political decisions of the various levels of government subsidizing mass transit.

ln(passengers/employment) =	10.58 (0.57) [18.52]	
	- 1.21 (0.07) [-17.03]	ln(municipal highway milage)
	+ 0.36 (0.10) [3.49]	ln(rel. user-op. trans. deflator)
	- 0.85 (0.07) [-11.50]	ln(relative transit price)
	+ 0.46 (0.16) [2.95]	ln(population/employment)

R^2 =	0.997
Standard error of regression =	0.013
F–statistic (4, 10) =	753.49
Durbin–Watson statistic =	2.72

(...): Std. error of est. coefficient.
[...]: Coefficient t-statistic.

Interpretively, a one-percent increase in miles of urban highways implies a 1.2 percent decline in revenue passengers of local transit systems. With reference to prices, a one-percent increase in the relative price of user-operated transportation induces an 0.36 percent increase in transit passengers, while a one-percent increase in relative transit fares results in an 0.85 percent decline in transit ridership. Finally, a one-percent increase in the ratio of population to employment implies an 0.46 percent increase in transit ridership, suggesting that the average nonemployed person uses approximately one-fourth the transit

services of an employed person when the ratio of population to employment is approximately 2.5.*

*A number of reviewers of an earlier version of this paper suggested the possibility that municipal highway milage, which increases monotonically over the period and which, almost definitionally, does not decline, might simply be capturing a downward time trend in transit ridership. To test this possibility, a second version of the basic transit ridership equation was estimated, explicitly including an exponential time trend (1963 = 1), with the following results:

ln(passengers/employment) =	8.74	
	(1.75)	
	[5.01]	
	- 0.009	(*year* − 1962)
	(0.008)	
	[-1.112]	
	- 0.90	ln(municipal highway milage)
	(0.29)	
	[-3.17]	
	+ 0.33	ln(rel. user-op. trans. deflator)
	(0.10)	
	[3.16]	
	- 0.89	ln(relative transit price)
	(0.08)	
	[-11.01]	
	+ 0.36	ln(population/employment)
	(0.18)	
	[2.05]	

R^2 =	0.997
Standard error of regression =	0.013
F−statistic (5, 9) =	617.86
Durbin−Watson statistic =	2.66

As can be observed, inclusion of the time trend does reduce the absolute value of the elasticity of transit ridership with respect to municipal highway milage, but the change is only from -1.2 to -0.9, and elasticities with respect to the relative price of user-operated transportation and the population-employment ratio are also reduced. Perhaps most importantly, the time trend itself is not statistically significant, with a coefficient only marginally greater than its standard error (while a coefficient approximately twice the standard error would be necessary for significance at the five percent level). As the coefficient of determination and the standard error of the regression indicate, the addition of the time trend does not appreciably improve the fit of the equation to the data. In short, there seems to be no reason either to believe that the highway milage variable is simply a proxy for a more general temporal process of modal shift (from mass transit to the private auto) or to substitute the equation including the time trend for the more parsimonious equation presented in the text.

Table 2 indicates quite graphically the degree to which this estimated equation accounts for the reality of the period. The first column presents predicted values of the ratio of transit passengers to employment, the second the actually observed values. Both predicted and observed values decline monotonically from 1963 to 1973, the predicted values from 107 to 63, the observed values from 106 to 63. Predicted and observed values then rise to 65 in 1974 and to 67 in 1975, after which declines are again observed in 1976 and 1977, with predicted values of 66 and 63 versus observed values of 65 and 64.

Table 2
Transit Ridership, Actual and Predicted, and Its Determinants

Year	Predicted RevPass/Emp Ratio	Actual RevPass/Emp Ratio	Municipal Highway Miles	Rel. User-Op. Trans. Deflator	Relative Transit Fare	Population-Employment Ratio
1963	107.41	105.62	475.	.89973	.26873	2.8905
1964	101.36	102.13	491.	.88274	.27066	2.8592
1965	95.81	97.77	507.	.90026	.27515	2.7946
1966	92.40	90.96	510.	.90680	.27923	2.6801
1967	86.65	87.88	521.	.90049	.28893	2.6396
1968	84.34	83.84	532.	.88534	.28463	2.5925
1969	79.07	79.21	548.	.88575	.29150	2.5441
1970	74.56	74.55	561.	.93405	.31109	2.5769
1971	68.73	69.25	593.	1.00000	.32821	2.6160
1972	65.32	64.58	614.	1.00000	.32915	2.5805
1973	62.53	62.52	631.	.95364	.32131	2.5026
1974	64.76	65.18	638.	.91581	.29730	2.4863
1975	67.11	66.85	639.	.87310	.28314	2.5585
1976	66.07	65.45	648.	.94229	.28924	2.5154
1977	63.47	63.85	687.	1.03020	.28600	2.4572

Note: Municipal highway miles are expressed in thousands.

Thus, notwithstanding its simplicity the model correctly predicts the 1973-74 and 1975-76 turning points. Interestingly, however, the reasons for the turning points are not quite what one might expect, as indicated by the values of the explanatory variables as presented in the third

through sixth columns of Table 2. Clearly, the rise from 1973 to 1974 was due primarily to the seven percent decline in the relative transit fare, reinforced by the comparatively slight 7,000 mile increase in urban highways. Contrary to popular perceptions (and despite an increase in gasoline prices), the relative price of user-operated transportation actually declined by four percent between 1973 and 1974, while the ratio of population to employment was virtually unchanged.

Equally clearly, the resumption of declining transit ridership after 1975 was due to the resurgence of growth in urban highway milage, with 9,000 miles added in 1976 and 39,000 miles added in 1977, the effects of which were only partially offset by the rising relative price of user-operated transportation. Transit fares remained relatively constant after 1975, while the population-employment ratio declined modestly, reinforcing the depressive effects of highway expansion.

To place in bold relief the impact of post-1963 highway construction, *if* urban highway milage had remained constant while all other explanatory variables took actually observed values, the estimated equation predicts that there would have been 99 transit rides per employed person in 1977, only six percent fewer than in 1963. In reality, transit ridership relative to employment declined to 64, or by 40 percent from its 1963 level of 106. Thus, of the observed decline, 85 percent can be attributed to expansion of the urban highway system, only 15 percent to increased transit fares and other factors.

4. Conclusion

In summary, the expansion of the urban highway system (largely at Federal expense, as will be indicated) induced a serious erosion in transit ridership, the consequence of which was the financial demise of the private mass-transportation sector in the United States. As a result, mass transit has been effectively absorbed by the public sector, requiring large and growing operating subsidies (not to mention subsidies for capital investment, with direct Federal capital subsidies alone increasing from $51 million in 1965 to $2.8 billion in 1980).

If the underlying expansion of the urban highway system and decline in transit ridership simply reflected the free play of market forces, then the foregoing would constitute little more than an exercise (hopefully interesting) in economic analysis. Its only practical import would be to call into question the justification for the growing relative subsidization of mass transit. However, the modal shift from mass transit to the automobile can hardly be viewed as the result of free choices of sovereign consumers in reponse to unbiased opportunities provided by a free market. With the passing of the private turnpikes of the 18th and 19th centuries, highway-system development became an entirely public activity, and, as Table 1 indicates, this is an activity expenditure on which has increased dramatically in the postwar period. Thus, the value of construction contracts (in nominal dollars) increased from $1.5 billion in 1950 to $9.9 billion in 1980, with the Federally-financed share rising from 27 percent to 65 percent.

In this regard, it is frequently argued by the "highway lobby" that highway "users' fees" more than cover the costs of the highway system, and hence that highway users collectively are paying at least the "market" price of highway services. While it is beyond the scope of this paper to definitively refute this claim, a number of flaws in the argument are apparent. First, even if true in the aggregate, it would not be true of individual components of the highway system. Thus, relative to the costs of highway rights-of-way, construction and maintenance, certain highway users (urban and rural) pay substantially less than others and also substantially less than the true economic costs of providing highway services. Second, the nominal costs of highway rights-of-way, construction and maintenance generally significantly understate the true economic costs: The power of eminent domain reduces initial property-acquisition costs, governmental authorities are exempt from property and income taxes, highways are financed in many cases using tax-exempt borrowing, the expenses of repair and replacement to be incurred in the future are rarely recognized as a cost of current highway use, *ad nauseum*. Finally, third, much of the revenue collected as ostensible highway users' fees is indistinguishable in economic terms from the revenues of taxes levied on other activities, e.g., retail sales taxes; only to the degree to which tax rates on highway-related activities exceed those on other comparable activities can these taxes be viewed as even roughly comparable to a service price, in this case a price charged for highway services. In short, in general and especially with reference to *urban* highways, substantial subsidies are involved.

At this point Federal highway funds (including those appropriated as part of the Reagan Administration's putative program of bridge and highway "repair") are targeted primarily on completion of the still incomplete components of the interstate system, and these are primarily in urban regions where the adverse impact of highway construction on the demand for mass transit is greatest. Thus, we confront the anomolous prospect of incurring extremely high costs for continuing highway building in urban areas and as a result also incurring exponentially increasing costs of mass transit subsidies as new highways further erode transit demand.

In a recent column critically reviewing the now-enacted Federal gasoline tax increase and transportation "infrastructure investment program" ("Save the Infrastructure -- By Auctioning It Off," Opinion and Commentary, *The Christian Science Monitor*, December 9, 1982), the present author briefly summarized the consequences of highway development discussed in this paper:

> In major metropolitan areas the economically inefficient local components of the interstate system induced an acceleration in the shift from mass transit (public and private) to the private automobile, creating the difficulties of the transit systems (now largely public) which are to be the "beneficiaries" of one-fifth of the proposed gasoline-tax-cum-user's fee (while they are likely to be further victimized by the four-fifths to be allocated to highways).

The serious (and, for private companies, fatal) blow to mass transit in the 1950s and 1960s was not the failure of the Federal government to subsidize transit but rather its insistence on subsidizing highways and use of the private automobile. And just as in 1950, transit systems today would benefit more from four dollars *not devoted* to urban highway subsidies than from one dollar allocated to transit subsidies.

THE CHRISTIAN SCIENCE MONITOR Thursday, December 9, 1982

OPINION AND COMMENTARY

Save the infrastructure — by auctioning it off

By Stephen P. Dresch

"Infrastructure" has become the vogue word of late 1982. As popularized by Pat Choate, former director of economic research in the Economic Development Administration, the concept of a decaying infrastructure calls forth dire images of collapsing bridges, crumbling roads, overflowing sewers, defiled water; in short, the general deterioration of those capital facilities the services of which are shared in the course of virtually all other activities, "productive" and "unproductive" alike. Congress and the Reagan administration are considering a substantial increase in highway "user fees," i.e., gasoline taxes, the proceeds of which are to be channeled into a massive program of "investment" in transportation infrastructure — an undertaking which can be more accurately portrayed as old-fashioned public works and employment.

But the fact that the services of a particular capital facility are used in the course of a great many other activities (which, ultimately, is all that is meant by the term infrastructure) does not logically imply that the facility must be *publicly* owned, operated, and maintained.

Thus, for example, telephone systems would certainly be classified as part of the infrastructure, but the United States has survived quite well with privately owned telephone companies and will probably continue to do so with the advance of deregulation and the weakening of public control.

If efficiency in infrastructure investment is to be improved, decisions concerning the level and allocation of that investment must be subjected to market tests, and this can be accomplished only by private ownership. Prices determined in free (almost by definition, private) markets represent the best user fees yet devised.

Hence, a modest proposal: Auction off the publicly owned infrastructure to private investors.

Those facilities for which there is a substantial economic justification will command relatively high prices, will be continued in their current uses and will be maintained. Those which are not economically justified will command prices equal to their value in their economically most efficient use and will, sooner or later, be converted.

For example, an economically unjustified segment of urban freeway might, after it reached a particular degree of decay, be converted to housing, factories, or a rail spur.

The end result can only be beneficial.

Thus, a failure to maintain every bridge on every interstate highway in the country will not mean that those bridges which have a justification will be permitted to collapse. Rather, those facilities which are justified will probably be better maintained and operated than they now are. Especially in light of the greater legal liability of private (compared to public) owners for the safety of their facilities, the overall quality of publicly used facilities would almost undoubtedly increase.

For example, one can well imagine that the courts might find a private toll-road operator legally liable for the injuries and deaths caused by a drunken user, encouraging a diligence at the entry gate which would be impossible if the gate weren't there and which might well be considered constitutionally intrusive were it imposed by a public authority. A governmental authority cannot legally require that a citizen take a breathalyzer test as a condition for entering a highway, while a private company can require this as a condition for access to its facilities.

Federal interstate highways in the more densely populated and congested regions may have made substantial economic sense. However, to induce the political support of senators and congressmen from less-congested rural regions, it was necessary to provide for many miles of highway which were not economically justified. In short, the allocation of public resources to highway investment was undoubtedly inefficient and, in the aggregate, probably excessive.

The interstate highway system also provides examples of unanticipated and undesirable consequences. At least in part because the system was excessively large, it served to induce a radical shift of freight transport from railroads to trucks, thus contributing significantly to the economic decline of the railroad industry (and hence to the need for such additional public infrastructure investments as those undertaken by Conrail). In major metropolitan areas the economically inefficient local components of the interstate system induced an acceleration in the shift from mass transit (public and private) to the private automobile, creating the economic difficulties of the transit systems (now largely public) which are to be the "beneficiaries" of one-fifth of the proposed gasoline-tax-cum-user's fee (while they are likely simultaneously to be further victimized by the four-fifths to be allocated to highways).

A decision to remove government from the ownership and operation of infrastructure facilities would be opposed from a number of quarters. Many private interests (road construction companies, automobile manufacturers; certain labor unions, etc.) benefit from the inefficiencies of the current system. Many more private parties have rationally adapted their behavior to the irrationalities of the existing system of infrastructure resource allocation (by buying suburban homes, automobiles, etc.). Thus, there would be inevitable transitional costs.

But, whatever the transitional costs, the long-run benefits would be substantially greater. Thus, it would be socially preferable to compensate those whose interests, in the short run, are damaged (using a fraction of the proceeds of the infrastructure auction to finance the compensatory payments) and then to reap the long-term gains.

With reference to the employment-generating effect of infrastructure investment (read: public works) programs, whatever increase in employment such programs may generate can be obtained by other means. Investment and investment-related employment *should* be increased, in infrastructure and in other productive capital. But other appropriate changes in fiscal and monetary policies can induce as large an increase in this employment as a public works program, and that increase will be more efficiently allocated to alternative investment activities by private parties subject to market discipline.

To reiterate, in the interests of efficiency in the rate and composition of capital formation (infrastructure and other), replace public infrastructure monopoly and inefficiency with a rational system of private responsibility accountable to the market.

Stephen P. Dresch is chairman of the Institute for Demographic and Economic Studies Inc.

APPENDIX

An examination of the residuals (actual minus predicted values) of the estimated transit ridership equation presented in the text (excluding the exponential time trend) revealed one striking peculiarity: The variance of the residuals was markedly higher over the ten years prior to 1973 than in the last five years of the estimation period.* Thus, while the *mean* residual was very low in both periods (0.0001 for 1963 to 1972, -0.0002 for 1973 to 1977), the mean *absolute* residual (0.0101 for 1963 to 1972, 0.0052 for 1973 to 1977) was one-half as great in the second period. While a systematic change in the variance of the error term of the equation would not result in biased ordinary-least-squares (OLS) estimates of the coefficients, these estimates would be inefficient.

*While this analysis is restricted to the equation excluding the time trend, the markedly lower variance of the residuals in the 1973-77 period was also exhibited by the equation including the exponential time trend.

To obtain efficient coefficient estimates, maximum likelihood estimates were obtained using interative generalized-least-squares, constraining all coefficients to equality in both periods but permitting the variance of the error to differ between the two periods, with the following results:

ln(passengers/employment) =	11.08 (0.38) [29.1]	
	- 1.27 (0.05) [-27.7]	ln(municipal highway milage)
	+ 0.39 (0.03) [12.2]	ln(rel. user-op. trans. deflator)
	- 0.87 (0.03) [-25.1]	ln(relative transit price)
	+ 0.30 (0.12) [2.4]	ln(population/employment)

Although only the coefficient of the population-employment ratio is affected significantly [declining from 0.46 (OLS) to 0.3 (GLS)], the overall improvement in the equation is indicated by the increase in the log of the likelihood function [from 47.3 (OLS) to 113.7 (GLS)] and by the increased levels of significance of the individual coefficients.

It is notable that the breaking point appears to occur between 1972 and 1973, with the first oil shock occuring in late 1973. However, why the ***variance*** of the equation should be affected, by the oil embargo or by any other specific development, leaving all coefficients "unchanged," is unclear. Also, in the absence of additional data, permitting a longer esti-

mation period, we cannot be confident that other characteristics of the equation did not change after 1972. Nonetheless, the finding of this substantial reduction in the purely stochastic component of transit ridership is interestingly puzzeling.