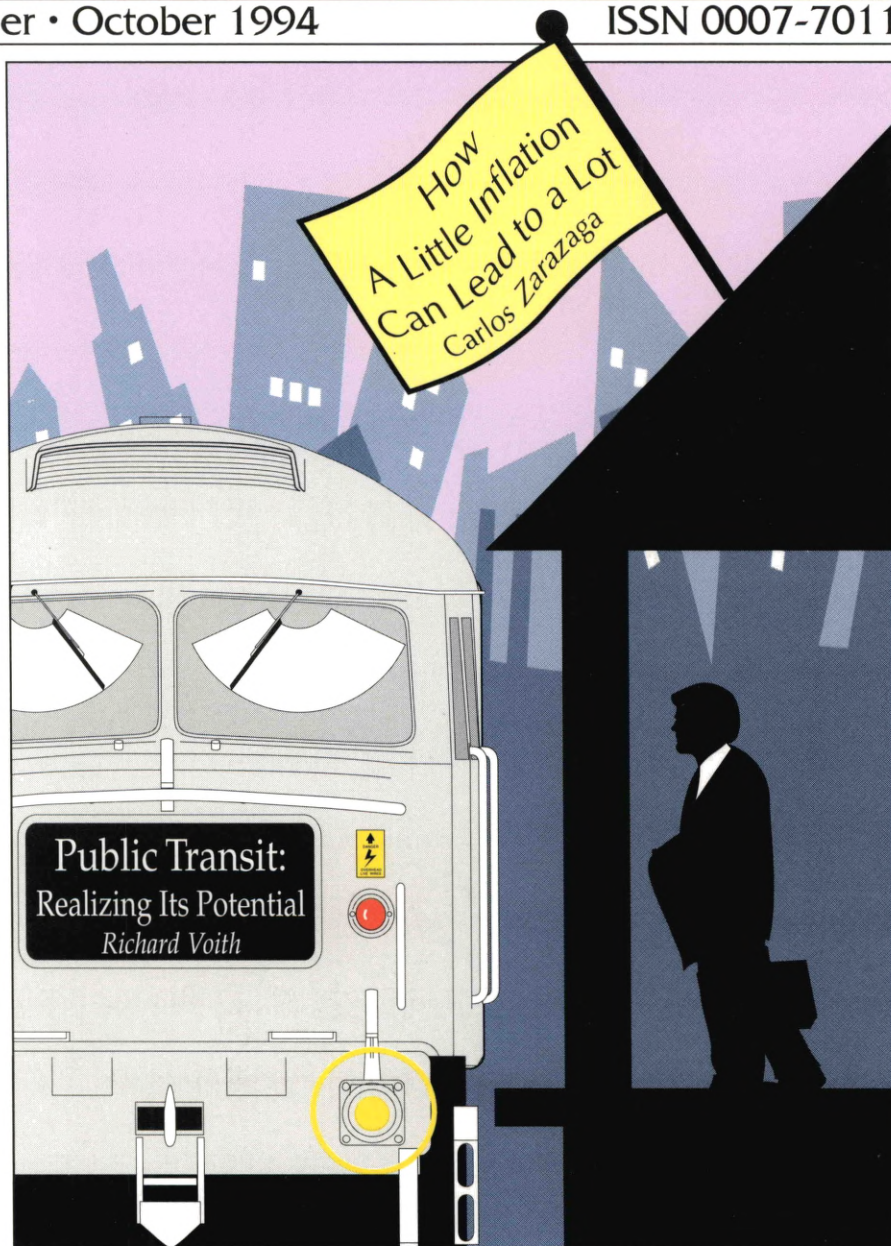


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HOW A LITTLE INFLATION CAN LEAD TO A LOT

Carlos Zarazaga

Why does inflation run out of control in some countries but not in others? What is the relationship between inflation—especially hyperinflation—and central bank independence? As this article suggests, the rate of inflation may depend less on the specific legal independence of the central bank and more on the nature of fiscal and budgetary institutions. Countries that can closely monitor government spending will keep inflation low. But countries in which monitoring is nonexistent or severely limited will almost surely see a little bit of inflation become a lot.

PUBLIC TRANSIT: REALIZING ITS POTENTIAL

Richard Voith

The rationale for subsidizing mass transit is based on the assumption that there are social benefits associated with transit. The social benefits of public transportation, such as reduced congestion and air pollution, will be large only if transit is successful in the marketplace. Dick Voith looks at the issue of subsidies for public transit and concludes that three things are necessary to achieve the greatest benefits from transit: a measurable objective, appropriate incentives, and a long-run strategy.

How a Little Inflation Can Lead to a Lot

*Carlos Zarazaga**

The past 10 years have witnessed one of the most amazing streaks of extreme inflation episodes in economic history. Peru holds the dubious honor of having the record monthly inflation rate for those years: 396 percent in August 1990. Runners-up were Argentina, 197 percent in July 1989; Bolivia, 182 percent in February 1985; and Brazil, 81.3 percent in March 1990.

The intensity of these inflation rates may be shocking, but perhaps as striking is their roller-coaster pattern. For example, in Argentina the inflation rate fell sharply from a peak of 197 percent in July 1989 to a more “normal” 6 percent a month three months later, only to jump again to 96 percent in March 1990. A similar roller-coaster pattern is apparent for Peru.

Why would countries experiencing already uncomfortably high inflation rates of 5 to 30 percent a month push those rates to even more unbearable ones of 100, 200, or 400 percent a month?

A popular explanation of these extreme inflation episodes is that policymakers eager to

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win reelection surrendered to political pressure for subsidies and tax cuts, leaving money creation as the only way to finance a huge budget deficit. Very rapid money growth, in turn, caused the jump in inflation. One problem with that explanation is that inflation rates of 100 percent a month were almost always accompanied by severe social and political unrest and, in some cases, by riots. As a result incumbents met a poor fate: nearly all of them were ousted from office shortly thereafter by popular election or impeachment, or they resigned voluntarily. Surely policymakers seeking another term in office could not have desired such an outcome.

It might be argued that even if policymakers in those countries didn't deliberately seek extreme inflation, they did play with fire: they were tolerating inflation rates of 5 to 30 percent a month, exposing themselves to the risk of runaway inflation. Readers with the view that a little inflation can lead to a lot are in good company. The Chairman of the Federal Reserve System of the United States, Alan Greenspan, recently stated, "I don't think that there is a general agreement that 3 percent is acceptable, because the trouble with modest rates of inflation, and 3 percent is a modest rate of inflation, is that there is a tendency, if it goes on indefinitely, [for it] to accelerate."¹

Appealing as it may be, this argument must confront the challenge of some examples to the contrary. Several countries, such as the United States and Japan, have been running inflation rates of at most 1.4 percent a month since World War II, but these countries never experienced very high inflation.

Why do some countries seem to be capable of keeping a little bit of inflation under control,

while others don't? And why does the roller-coaster pattern of inflation appear in the latter?

This article will offer possible answers to these questions. We will show that the idea that a little inflation can lead to a lot contains a germ of truth, but the outcome depends crucially on the nature of the fiscal and budgetary institutions. Countries in which those institutions make it possible to establish how government spending is allocated among different uses will be able to keep inflation low. But a little inflation will almost surely become a lot in countries in which such monitoring is nonexistent or severely limited.

Our interpretation of why a little inflation may lead to a lot will shed some light on another important economic policy issue as well: the relationship between central bank independence and inflation.² While ironclad independence of a country's central bank may guarantee low inflation, we will argue that in most countries low inflation depends more on the nature of fiscal and budgetary institutions than on the formal legislation governing the central bank.

Because economists and other social scientists have only now started to understand some of the issues raised above, parts of the following discussion will be unavoidably tentative in nature. Trying to uncover the role that the interplay of monetary, fiscal, and budgetary institutions has in generating low, high, or variable inflation seems worth the effort, however; countries in Eastern Europe and in what used to be the Soviet Union, as well as countries in Latin America, are changing their fiscal and monetary institutions. So are the European countries that signed the Maastricht Treaty, which includes provisions for a European Monetary Union. Undoubtedly, these countries would like to avoid adopting the faulty

¹Answer to a question during testimony before the Subcommittee on Economic Growth and Credit Formation of the Committee on Banking, Finance and Urban Affairs of the U.S. House of Representatives, February 22, 1994.

²For a more thorough review of the literature on this relationship, see Pollard (1993).

institutions that may have been responsible for the roller-coaster inflation experiences of the last 10 years.

WHAT DO EXTREME INFLATION COUNTRIES HAVE IN COMMON?

A look at the inflation experiences of several Latin American countries over the last 10 years shows striking similarities (see Figure). Argentina, Peru, and Brazil all experienced times when inflation was high—between 3 and 30 percent a month—but fairly stable, and other times when inflation rose dramatically for short periods.

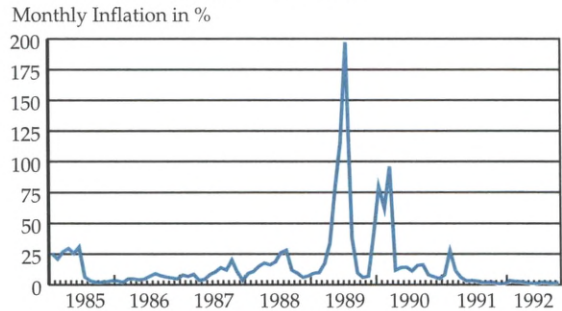
Extreme inflation experiences are not limited to Latin America. Take, for example, the case of Ukraine. The inflation rate in this independent republic of the Commonwealth of Independent States had been around 30 percent a month since shortly after the dissolution of the Soviet Union until it jumped to 70 percent a month in February 1994. The similarity of these inflation rates to those of a country as geographically distant and culturally different as Brazil is striking. Russia has also been experiencing high inflation rates (10 to 30 percent a month) since the dissolution of the Soviet Union, as have several Eastern European countries. Turkey would also qualify as a member of this club: it experienced inflation rates between 2 and 4 percent a month during most of the 1970s and 1980s, with a spike of 21 percent in February 1980. Intense inflationary pressures have reappeared in that country lately.

What do all these economies have in common? Our main hypothesis is that the common feature ultimately responsible for their extreme inflation is budgetary and fiscal institutions that make it difficult, if not impossible, for

FIGURE

Inflation Rate for Argentina

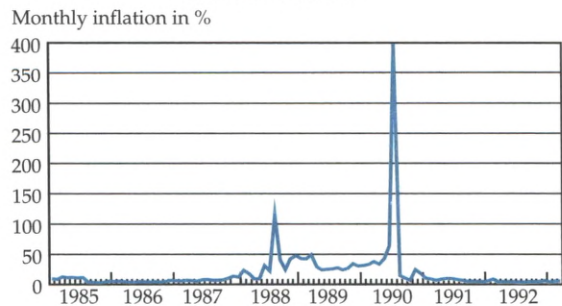
1985:1 - 1992:10*



*as measured by the Consumer Price Index for Buenos Aires
Source: National Institute of Statistics and Census

Inflation Rate for Peru

1985:2 - 1993:3*



*as measured by the Consumer Price Index
Source: Central Bank of Peru

Inflation Rate for Brazil

1987:1 - 1992:12*



*as measured by the Índice Geral. do Precos - disp. Interna
Source: Current Economic Conditions, Getulio Vargas Foundation
Rio de Janeiro

policymakers to monitor the allocation of government spending among different uses.

Before describing these institutions in more detail, it will be enlightening to present a brief overview of the features and characteristics of high inflation economies that will be important for our explanation of how a little inflation can lead to a lot.

THE ROLE OF A LARGE PUBLIC SECTOR AND ITS DEFICIT

As in any nation, part of government spending in the high inflation countries mentioned above results from the need to provide public services. These countries need to build and maintain public buildings, schools, and infrastructure, and to pay public employees. In this respect, high inflation economies do not seem different from low inflation ones.

What makes them different, at least during the time in which they experienced high inflation, is that their governments (either at the federal or local level) directly controlled important sectors of the economy that in other countries are in the hands of the private sector. The governments of these countries owned, sometimes in limited partnership with the private sector, an impressive array of physical and financial assets: mining (oil, copper); industrial conglomerates (distilleries, petrochemicals, steel, aluminum, shipyards, defense-related industries); utilities (electricity, gas, water, telephone, TV, radio); transportation (railroads, airlines, ports and airports); financial services (banks).

As President Eisenhower warned in his famous speech about the military-industrial complex in the United States, public-sector industrial complexes came to amass independent power. In some high inflation countries they went as far as refusing to pay taxes for which they were legally liable or refusing to prepare financial statements and balance sheets not only for the public but also for officials in charge of the government budget.³

Through a variety of means, such as special tax treatment, subsidized interest rates, exchange rates and tariffs, or artificially inflated wages, these public-sector industrial complexes strained government budgets. It's tempting to buy the conventional explanation that the fiscal authorities decided to finance the resulting huge fiscal deficit with money creation and that this fast expansion of the money supply was ultimately responsible for the extreme inflation described above. But this conventional view presents some problems.

First, when inflation rises, people hold a smaller fraction of their wealth in money. As a result, very rapid money creation doesn't really help much in financing higher government spending in real terms.⁴ Second, the conventional view does not explain the inflation spikes we observed. Third, as mentioned in the introduction, inflation rates of 100 percent were not conducive to the political survival of incumbents and policymakers.

So, why did policymakers allow inflation to reach extreme levels? Unless we assume they were plainly irrational or perverse, their intent must have been to finance the fiscal deficit with much lower rates of money creation (and inflation). This may have appeared a sensible decision at the time, given that economic research has argued that financing a fiscal deficit with moderate amounts of money creation is the right thing to do in many circumstances.⁵

³Thus, we find that in a high inflation country such as Turkey "the ordinary budget statistics conceal how much of the taxpayers' money goes into the three dozen main state economic enterprises and the 100 or so they wholly or mainly own." (From "A Survey on Turkey," *The Economist*, December 14, 1991)

⁴Research shows that there's an inflation rate that gives the government the most revenue possible. Higher inflation rates generate less revenue; see Sargent and Wallace (1987) and Zarazaga (1994).

⁵Phelps (1973) was the first to discuss this possibility.

But the road to hell is paved with good intentions, and this was no exception. In deciding to finance the fiscal deficit with a little bit of money creation, policymakers in extreme inflation countries may have acted a little bit like the Sorcerer's Apprentice. In the version of the story presented in the classic movie "Fantasia," the Sorcerer orders his Apprentice to take some buckets of water to fill the big fountain in the lower level of the castle. After a while, tired of this taxing chore, the Apprentice decides to put to use the magic formulas he is just learning to master. At the sound of his magic words, two brooms start carrying buckets full of water from the spring to the fountain. Proud of his skills as a sorcerer and feeling relieved from the arduous task, the Apprentice falls asleep. Unfortunately, he has forgotten a little detail: each broom replicates itself after each trip. The Apprentice suddenly wakes up in the middle of a flood caused by an ever-growing army of brooms. Only the intervention of the angry Sorcerer stops the process and saves the castle from total collapse.

What the policymakers of these high inflation countries may have forgotten is that financing the fiscal deficit with a little bit of money creation may be the right thing to do only when there is perfect knowledge of the exact amount of government spending apportioned among different uses. Unfortunately, this condition was violated in the economies that suffered the high inflations described above, and sadly, these policymakers woke up to the reality of inflation rates several times higher than they had intended.

WHERE DID ALL THAT MONEY GO?

A common problem of high-inflation economies was that the nature of their institutional arrangements, budgetary processes, and public-sector statistics was such that no one could answer a very simple, but important question: exactly how much government spending was for genuine public goods and services (for

example, financing public education, police, courts, and infrastructure) and how much was used to funnel funds, mainly through public-sector industrial complexes, to vested interests?⁶

An indication of those institutional ailments is that in many of these countries the fiscal authorities operated without a lawfully approved government budget for long periods of time. In Argentina, for example, in several years over the past couple of decades the government budget has been approved when the year for which it was effective had almost expired. Another case in point is Ukraine, whose budgetary institutions are virtually nonexistent—not surprising given that this republic became independent as Soviet economic and political institutions were collapsing.

The practice of planning government budgets several years ahead, typically observed in all low inflation industrialized countries, is almost invariably absent in extreme inflation countries. Even worse, these countries typically lack the necessary information to monitor the execution of previous years' budgets. Even gross government budget statistics have not been available except with several years' lag.

Of course, the problem isn't just one of a lack of statistics about the economic activities of the public sector; it's actually one of monitoring, auditing, and management control: missing or faulty statistics can hide the true state of affairs. Studies by David Robinson and Peter Stella (1992) and Mario Blejer and Adrienne Cheasty (1992) illustrate how misleading government budget statistics can be because of the manipulation of the valuation of government assets or the presence of substantial quasi-fiscal deficits in the transactions between the central bank and the financial system. For example, public enterprises can reduce losses by taking depre-

⁶The contents of this section are more fully documented in Zarazaga (1992).

ciation allowances for a lower amount than would be required by the economic depreciation of their capital. Likewise, the central bank can overvalue the assets offered as collateral by financial institutions borrowing from it.

Put simply, in the past 20 years the highest inflation rates have been observed in economies in which it was difficult to determine where the public monies went. In contrast, countries with the lowest inflation rates have had more transparent and accountable budgetary institutions. Thus, the evidence suggests that the nature and quality of the fiscal institutions involved in the preparation, adoption, and execution of the government budget may be an important determinant of a country's ability to keep inflation under control.

NOT KNOWING WHERE THE MONEY WENT AND HIGH INFLATION

Let's consider a simplified example that offers some insight into the importance of fiscal institutions. This example is meant to illustrate some common features of high inflation countries, rather than the details of any one country.⁷

All governments need to provide public goods and services, such as maintenance of essential infrastructure (for example, roads and highways). Typically, the amount of spending required to provide those goods and services varies unpredictably, for reasons such as technological changes, changes in the price of materials needed to repair and maintain the infrastructure, or even bad weather. Imagine a situation in which those expenditures are "normal" 90 percent of the time and abnormally high 10 percent of the time.

Suppose the benevolent policymaker in charge of providing public goods and services is convinced, perhaps because of the economic

research mentioned earlier, that it's a good idea to finance those expenditures not only through the usual means (collecting taxes and issuing debt) but also with a little bit of money creation (and thus a little inflation). In normal periods, a low rate of expansion of the money supply—say, 3 percent growth—will be enough to pay for those expenditures. But in abnormal periods those expenditures rise, so a faster expansion of the money supply—say, 6 percent growth—is needed.

In other words, the intention of the benevolent policymaker in charge of providing public goods and services is to finance them with a moderate amount of money creation: the money supply will grow at a rate of, at most, 6 percent. But this intention can be thwarted by the presence of other, less altruistic policymakers, who funnel funds to their constituencies mainly through the public-sector industrial complexes.

Imagine, for example, the situation at the Ministry of Public Works and Transportation. The request for funds from that Ministry may reflect such legitimate expenses as the cost of replacing several hundred miles of obsolete railways. But it may also include special benefits—a generous retirement plan for railroad workers or subsidized shipping rates for farmers—for powerful constituencies with vested interests in the railroad system.

Likewise, imagine the situation at the Ministry of Industry and Public Utilities. Its legitimate expenditures include maintaining the equipment required for the production and transmission of electricity. But its budget may also contain implicit subsidies, such as reduced electric rates for certain industries or artificially inflated fees paid to contractors.

What's important for our explanation is that certain constituencies with substantial economic, financial, and political ties to different government agencies can manipulate the budgets of those agencies. Subsidies favoring these constituencies can be disguised as expenditures for public goods and services; therefore,

⁷The theory behind the analysis in this section is formally developed in Zarazaga (1993).

the benevolent policymaker will authorize such expenditures (financed with money creation), even if in reality at least part of that money creation finances hidden subsidies. So on top of the money created to finance essential public goods and services, there is the money created to funnel subsidies to particular constituencies.

Because policymakers can't determine exactly which part of government spending went to finance public goods and services and which part went to subsidies, we say that the economy suffers from imperfect monitoring. By contrast, if a policymaker could say exactly how much money was apportioned to each of those two possible uses, the economy would be characterized by perfect monitoring.

Why is information about the use of the public monies so important? Because the availability (and quality) of that information will have dramatic consequences for inflation. Under perfect monitoring, it will be possible to keep inflation low. By contrast, under imperfect monitoring, the attempt to finance public goods and services with a little inflation will lead to political pressures for higher subsidies. As a consequence, a little inflation will end up leading to a lot, sometimes even to hyperinflation.

Inflation Bias. Economies such as the one described above have a high inflation bias. This bias arises when each policymaker cares only about his own constituents and not about the harm that inflation causes to other constituencies. Under these circumstances, each policymaker representing a constituency will try to put in place fiscal programs that benefit his constituency—even if financing such programs with money creation produces inflation that hurts other constituencies. The money creation induced by the actions of each individual policymaker adds up to rapid overall expansion of the money supply. As a result, money creation—and, therefore, inflation—ends up being much higher than each policymaker had individually intended. The costs of higher in-

flation more than offset any benefits a constituency may have gained from the subsidies it gets and makes all constituencies worse off.

Is there any way of deterring each policymaker from requesting subsidies that just end up causing high inflation? The answer is a resounding yes under perfect monitoring, but not under imperfect monitoring.

Inflation When Policymakers Know Where the Money Went. The perfect monitoring scenario is ideal for understanding why having fiscal and budgetary institutions that make it possible to monitor government expenditures can help to avoid undesirably high inflations.

If the different constituencies of the economy expect to interact indefinitely with each other, policymakers representing them could promise not to grant any subsidies in excess of a certain amount. However, both parties would understand that if any one party breaks the agreement, the others will retaliate by giving to his own constituents the same amount of excess subsidies given by the policymaker who cheated.

Because under perfect monitoring cheating can always be detected, the only thing that cheating will accomplish will be retaliation by the other policymakers. The result of this "retaliation" or "punishment phase" will be the outcome described in the previous section: higher inflation without any net gains to any constituency. Thus, the temptation to grab the short-run gains from cheating just once (that is, from giving excess subsidies) will be offset by the long-run costs of the punishment that will follow.

With perfect monitoring, then, the different constituencies have the ability to keep each other from demanding more than their fair share of subsidies. This prevents the rapid money growth that the financing of higher subsidies would require and, therefore, prevents undesirably high inflations. For example, France, which publishes detailed government budget figures and thus allows policymakers

to closely monitor the government budget, has low inflation despite the presence of a large public sector.

The situation changes dramatically, however, when faulty fiscal and budgetary institutions make it impossible to perfectly detect cheating (i.e., giving excess subsidies) by policymakers trying to favor a particular constituency.

Inflation When Policymakers Don't Know Where the Money Went. Under imperfect monitoring no policymaker will be able to establish with certainty whether others have cheated each time the money supply grows at an abnormally high rate.⁸ This poses a quandary. If a policymaker observes unusually rapid money growth but does not retaliate—on the assumption that this is merely an abnormal period in which the provision of necessary public goods and services requires unusually high spending—he creates the potential for other policymakers to increase the money supply every period by giving subsidies to their constituents. On the other hand, if a policymaker retaliates on the suspicion that it's a normal period but other policymakers are cheating, he may be retaliating for something that never happened, since legitimate spending will be abnormally high some of the time. Is it possible to sustain the low subsidy, low inflation outcome of the perfect monitoring case? The answer is no when there is imperfect monitoring.

Each policymaker will provide extra subsidies to his constituents every time he sees unusually high money growth, regardless of whether the cause of that unusual growth was

cheating by some other policymaker or the spending required for the provision of public goods and services in abnormal times. The reason is that, unlike in the perfect monitoring case, the subsidy war must be actually carried out if it is to deter cheating. This is analogous to the rule in baseball that specifies that a batter is always awarded first base when hit by a pitch. If pitchers weren't effectively punished for hitting batters, pitchers would have an incentive to hit batters more often and plead accident.⁹ To be effective, the subsidy war must be carried out in economies with imperfect monitoring. This is the crucial fact in explaining why inflation remains low in economies with perfect monitoring but stays high—and occasionally shoots up in the form of hyperinflationary spikes—in economies with imperfect monitoring.

Inflation Under Perfect and Imperfect Monitoring. As explained above, subsidy wars never occur under perfect monitoring. The threat of retaliation deters deviations from a low subsidy policy because such deviations would always be detected without ambiguity; subsidies remain at low levels because each policymaker knows that the benefits of extra subsidies to his constituents would be more than offset by the harm from extra inflation. The growth of the money supply financing subsidies, and therefore the associated inflation, remains low as well. In the case of imperfect monitoring, however, the low subsidy policy will be abandoned during abnormal periods when financing public goods and services requires unusually high growth of the money supply. Since the higher subsidies of

⁸The uncertainty about the use of the public monies in a high inflation country such as Bolivia is apparent in Jeffrey Sachs's account of that country's experience with extreme inflation during 1982-85: "Surprisingly, it is difficult, even four years in retrospect, to uncover precisely the causes for this jump in money creation...The problem with nailing down a culprit lies with the disarray of Bolivian fiscal data during this period." (Sachs, 1986).

⁹Porter (1983) and Green and Porter (1984) were the first to examine what happens when there is imperfect monitoring of the actions of participants in strategic games or situations (such as baseball) and to formally analyze the clever mechanisms and rules participants might use in those circumstances.

this retaliation stage are paid for by printing money, the result is even higher growth of the money supply in abnormal times and a considerable acceleration of inflation, perhaps to the levels of 100, 200, or 400 percent observed in the countries discussed earlier.¹⁰

The argument we've been making also explains why inflation in economies with imperfect monitoring is higher than in their perfect monitoring counterparts even in normal times. That is, the low inflation of normal times under imperfect monitoring is higher than the permanently low inflation that would prevail in that same economy under perfect monitoring. Essentially, the problem is that under imperfect monitoring the threat of a subsidy war means the various policymakers won't cooperate as they would under perfect monitoring. As a consequence, subsidies in normal times (and therefore money growth and inflation) are not as low as in the perfect monitoring case.¹¹ To illustrate the point, compare the normal inflation rate of an economy with poor monitoring of the government budget, such as Argentina, with the normal inflation rate of a country with adequate fiscal and budgetary institutions, such as the United States. The normal inflation rate for Argentina has been about 10 percent a month in the last 20 years, while for the United States it has been about 0.3 percent a month during that same period.

CENTRAL BANK INDEPENDENCE AND FISCAL INSTITUTIONS

A possible objection to the analysis above is that high inflation comes about only because the central bank prints money at the command

of the different policymakers who directly or indirectly control monetary policy.

Had the central bank been completely independent and charged solely with avoiding inflation, policymakers would have found it impossible to finance the provision of public goods and services, or subsidies, with money creation. This by itself would have eliminated the imperfect monitoring problems and the associated high inflation.

But as noted earlier, many economists argue that it may be best to use money creation to finance part of the fiscal deficit. In this case, it's not clear that complete independence of the central bank is always desirable. Judging by the fact that inflation is a worldwide phenomenon, every country is directly or indirectly financing part of its deficit with money creation. None appears to have a perfectly independent central bank focused solely on preventing inflation. Perhaps more important, there's no such thing as ironclad legal protection of central bank independence. The evidence suggests that written laws cannot preserve the effective independence of the central bank any more than a wedding ring can preserve fidelity.¹² As Otmar Issing, chief economist of the Bundesbank, aptly said in a recent speech, "Central banks alone cannot ensure, or guarantee, monetary stability and are dependent on other sectors of the economy for maintaining stability...In the long term, central banks are powerless in the face of differing social demands."¹³

¹⁰We discuss elsewhere (Zarazaga, 1993) that these inflationary outbursts are not a figment of the data, somewhat artificially induced by factors other than those discussed in this article, such as the lifting of price controls or wars.

¹¹The reasons for this outcome are rather technical and are discussed in detail in Zarazaga (1993).

¹²For example, the German Reichsbank was formally declared independent on May 26, 1922. In Cagan's chronology (Cagan, 1956) this was just three months before the 1922-23 German hyperinflation started! For more detail on how the formal legal independence of the central bank can and has been circumvented, see Cottarelli (1993).

¹³Extracted from Mr. Issing's speech at the University of Freiburg, as reported by the Knight-Ridder wire service, March 3, 1994.

Our analysis suggests that one of the “other sectors of the economy” needed to maintain monetary stability is transparent fiscal and budgetary institutions. This may explain why countries such as Belgium, Japan, and Norway, whose central banks rank almost at the bottom in terms of legal independence, have a much better inflation record than countries such as Argentina, Peru, or Turkey, whose central banks rank much higher in that regard.¹⁴ The fiscal and budgetary institutions of Belgium, Japan, and Norway allow much better monitoring of public-sector spending than their counterparts in Argentina, Peru, and Turkey.

CONCLUSION

This article has shown that there is more rigorous economic theory than generally believed behind the argument that a little infla-

tion can lead to a lot. The theory is still developing, and it does not attempt to explain all facets of high inflation, but it does indicate that the nature of fiscal and budgetary institutions is central to this issue. The fears that a little inflation can lead to a lot do not seem justified in economies where it's possible to monitor the allocation of government spending among different uses. But when that monitoring is absent or seriously flawed, the attempt to finance the fiscal deficit with just a little money creation (and inflation) may turn out to be a “sorcerer's apprentice” experiment with unpleasant inflationary consequences. The roller-coaster high inflation experiences of the last 10 years, with inflation spikes of 100, 200, and even 400 percent a month, testify that the possibility is far from a theoretical curiosity. These experiences also suggest, as the theory argues, that the transparency of fiscal and budgetary institutions may be more important than formal legislation in making the central bank largely independent from the fiscal authorities and, therefore, in maintaining low inflation.

¹⁴See Cukierman, Webb, and Neyapti (1992), especially their Table 2.

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Public Transit: Realizing Its Potential

*Richard Voith**

Most major metropolitan areas provide subsidized mass transit. The primary rationale for government support is that public transportation has benefits that extend beyond those enjoyed by the riders. Because of these added benefits, the value of public transportation to society exceeds the amount that riders alone are willing to pay for the service.

Proponents of subsidies for public transportation cite several potential benefits to society at large. Increased transit use reduces the number of people using highways, thereby

alleviating congestion and the need for additional, expensive highway construction. Diverting commuters from autos to transit also reduces auto emissions and thus improves air quality. Transit service also allows dense concentrations of economic activity, which many economists believe increases overall productivity. Proponents also note that public transit can benefit specific groups; for example, it may provide access to employment for low income people.

Subsidized public transportation is not without its critics, however. Opponents of government transit subsidies suggest that the benefits to society at large are too small to justify a subsidy. After all, according to the 1990 cen-

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sus, only 5.3 percent of all workers commute by public transit, down from 6.4 percent in 1980. Continued decentralization of population and employment may further erode transit's market share in the future. Opponents argue that low ridership precludes transit from having large social benefits. They also claim that transit agencies use their subsidies inefficiently, resulting in high costs relative to the public benefits.¹ Finally, opponents note that transit services targeted to disadvantaged groups constitute "in kind" transfer payments and suggest that cash or voucher programs are more efficient means of improving the welfare of the targeted group.

While there may be disagreement about the value of transit subsidies to help specific groups, transit proponents and opponents alike would agree that public transit's benefits to society at large are directly related to the number of people choosing to ride. For example, transit's contribution to reducing congestion and pollution depends on how many people prefer to ride transit instead of driving.² Similarly, public transit's contribution to productivity growth will be small unless the service is sufficiently

attractive to encourage private investment in dense economic developments.

Since transit's benefits to society at large are linked to use, the social value of a given level of subsidy depends on how well transit can compete in the transportation marketplace. This issue of transit's market potential is more complicated than it might appear for two reasons. First, public transit's ability to compete varies from one market to another.³ Second, current ridership may not be a good indicator of potential because transit providers may be pursuing objectives other than attracting the largest number of riders. Despite these complications, policymakers need to evaluate transit's market potential to determine the proper level of subsidy and to monitor the efficiency of transit providers. Transit providers need to understand the dynamics of the market to attract as many riders as possible with the level of subsidies granted.

WHAT DETERMINES TRANSIT'S MARKET SHARE

The potential of public transit depends on the underlying demand in each market and the cost of supplying transit to that market. In markets where the demand for transit is very low or the cost of supplying it is very high, transit's potential is low.

The underlying supply and demand for transit can be difficult to observe for a couple of reasons. First, for any mass transit system, whether buses, trains, or airlines, the cost of carrying each person depends on the number of other people making the same trip. Thus, supply and demand are not independent of one

¹For example, Jose Gomez-Ibanez argues that transit operators invest in excessively expensive rail transit systems whose benefits do not justify their costs. See "The Federal Role in Urban Transportation" in John Quigley and Daniel Rubinfeld, eds., *American Domestic Priorities*, University of California Press (1985). In the popular press Frederic Rose (*Wall Street Journal*, June 29, 1993) has argued that increasing transit subsidies has had little success in increasing transit's national market share.

²All public transportation trips may not be of equal social value. For example, a transit trip during rush hour may reduce congestion more than a trip at midday. Still, the assumption that the social benefits are linked to overall transit use is a good one because the patterns of transit use are not easily categorized. A person choosing to use transit during rush hour might have driven instead if he had not had the opportunity to make a return transit trip midday. Thus, the social value of the midday trip may be greater than first appears.

³Despite transit's small national market share, transit plays a very important role in the central cities of many large U.S. metropolitan areas. New York, Washington, D.C., San Francisco, Boston, Chicago, and Philadelphia all have transit market shares above 25 percent. Although transit's market share is large in many central cities, it is small in the suburbs.

another. Second, as with any subsidized service, the price the rider pays and the quality of a particular transit route depend on how much subsidy it receives. The differences in ridership observed across routes may reflect different subsidy levels as well as different underlying supply and demand conditions. To evaluate the competitiveness of public transit, it is crucial to have a precise understanding of transit supply and demand and how they interact with public subsidies to determine ridership.

Demand for Transit Services. Individuals choose how to get from one place to another based on the relative price, quality, and convenience of the alternatives such as the automobile or the bus. To understand transit demand, we need to know how changes in these factors affect people's choices between riding transit or driving cars. Of course, demand for public transit may differ across individuals because they have different preferences and incomes.⁴

Travel, whether for work or leisure, involves more than simply moving from point to point, and people may have strong preferences for how they do so. For example, some people may like the perception of control associated with car travel; others may prefer to be able to read on the train. These idiosyncratic differences explain why two people facing the decision of taking a car or a train may not make the same choice.

More systematic differences in individuals' transit demands arise from income differences. People with higher incomes tend to value their time more highly and therefore are more likely to choose a faster mode of travel.⁵ In addition,

⁴Because people have diverse tastes, economists describe transit demand in terms of the probability that an individual will choose public transit rather than a car. Formally, the theory of transportation mode choice is based on the random utility model pioneered by Daniel McFadden, "Conditional Logit Analysis of Qualitative Choice Behavior," in Paul Zarembka, ed., *Frontiers in Econometrics* (Academic Press, 1973), pp. 105-42.

higher income people can afford to choose more comfortable and convenient transportation. Luxury cars with many amenities are often the chosen means of travel for people with higher incomes. On the other hand, bus transportation is frequently characterized as an "inferior good," that is, people choose to ride the bus less as their income increases.⁶

Regardless of preference or income, the relative price of transportation is always an important factor in an individual's demand for public transportation. As with most other products or services, a consumer's demand for transit falls as the price increases. Similarly, as the price of automobile travel rises, transit demand increases.

For any particular trip, the additional or marginal cost of that trip is the relevant consideration. Even though the total private costs of automobile travel tend to be higher than those of transit, the marginal cost of a trip by car is very low. The greatest private costs of auto travel are the fixed costs associated with purchasing, maintaining, and insuring an automobile.⁷ Thus, once a person has made the decision to own a car, the out-of-pocket financial

⁵See Kenneth Small, *Urban Transportation Economics* (Harwood Academic Publishers, 1992), pp. 43-44, for a review of the literature examining the link between income and the value of time in transportation mode choice.

⁶Curiously, in Paris the bus is not considered an inferior good, at least when compared with the famous Paris Metro. According to officials of the RAPT, the agency that operates the transit system in Paris, wealthier people choose to ride the bus system rather than the Metro. The Paris bus system, which provides services that are largely duplicated by the Metro in central Paris, is also higher priced than the Metro.

⁷For 1991, the total private cost of auto travel is estimated to be 43.6 cents per mile, of which 9.8 cents are for the out-of-pocket variable costs. Source: American Automobile Manufacturers Association of the U.S., *Motor Vehicle Facts and Figures*. The average fare per mile of transit is 15.3 cents. Source: Computed from Tables 20 and 38, 1993 *Transit Fact Book*, American Public Transit Association.

expense of a trip includes only the relatively small cost of gas and perhaps tolls and parking. On the other hand, a consumer's out-of-pocket expense for transit is usually relatively high and frequently higher than the marginal costs of car travel.⁸

The relative quality of transit and travel by car is, in some ways, even more important than the relative price. Because the scope of transit service is not universal, transit is simply not available for some trips, while for others the need to transfer several times may make the journey by transit absurdly time-consuming. The automobile, on the other hand, has the advantage of being available at any time for any destination. On the basis of availability alone, the car is the mode of choice for many trips. For those trips with a transit alternative, the quality of the transit service—the speed, frequency, and comfort—will surely affect a person's choice. (See *Demand Comparison: SEPTA vs. PATCO*.) If transit is too slow, resulting in high travel-time costs; too infrequent, resulting in limited choices of travel time; or too crowded, resulting in an unpleasant trip, there is little likelihood that people will choose transit. On the other hand, if congestion erodes the quality of car travel, travelers will choose transit more frequently.⁹

Taken together, individual choices determine a community's travel demand in general and its demand for public transit services in particular. A community's demand for transit depends on the number of people in the community and the fraction of those people choos-

ing transit. However, even within a relatively small neighborhood, the attractiveness of transit service will vary. The convenience and even the cost of a transit trip will depend, for example, on the amount of time a person has to spend walking or driving to use the service. Communities that are densely populated are likely to have more commuters living close to transit services and, therefore, have higher transit use. Similarly, communities whose residents tend to have destinations served by the transit route will have high demand. The layout of a community and the destinations of its residents are crucial for the transit provider because they have implications for the cost of supplying competitive transit service.

Supply of Transit Services. There are two ways to think about the supply of transit services. Public transportation providers can be thought of as simply providing a number of vehicle-miles of bus or train operation or, more generally, a number of passenger-trips on buses or trains. Whether we focus on vehicle-miles or on passenger-trips depends on the question to be addressed.

Vehicle-miles of bus operation are "intermediate products" because they have no direct value in themselves; rather they become valuable only when people choose to ride the bus. Focusing on intermediate products is most useful when we are examining the purely technical efficiency of operating and maintaining buses and trains, since the costs of producing intermediate products are completely independent of people's choices about riding public

⁸Transit agencies sometimes offer monthly, weekly, or daily passes, so that the consumer's marginal costs of each trip are zero, at least in the very short run.

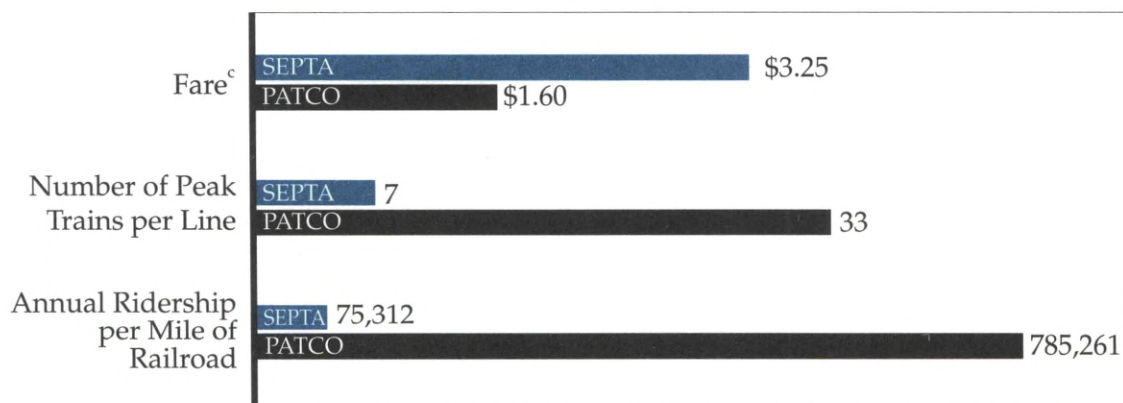
⁹The high fixed cost and low marginal cost of auto travel have implications for the quality of highway travel. Since the marginal cost of car travel is very low, the use of cars (among car owners) is limited primarily by highway capacity. As the capacity of the highway system is reached, the

travel time increases rapidly, eroding the time advantage of auto travel. See William S. Vickrey, "Congestion Theory and Transport Investment," *American Economic Review: Papers and Proceedings*, 1969, pp. 251-60, for an early discussion of highway pricing and congestion. The total costs of highway congestion for 50 large metropolitan areas were estimated to be about \$39.2 billion in 1989. (James W. Hanks and Timothy J. Lomax, *1989 Roadway Congestion Estimates and Trends*. Texas Transportation Institute, 1991.)

Demand Comparison: SEPTA vs. PATCO

The effects of price and service on ridership can be seen in a comparison of two separate, very unequal rail systems providing commuter service to the central business district of Philadelphia. SEPTA (Southeastern Pennsylvania Transportation Authority) and PATCO (Port Authority Transit Corporation) provide service to demographically similar suburban neighborhoods, but there the similarity ends.^a

As shown in the figure, PATCO's fare is less than half of SEPTA's. PATCO runs almost five times as many rush-hour trains on its single 14-mile line as SEPTA runs on its average commuter line. PATCO also runs much more frequent off-peak service. The net effect of the lower-price, higher-quality service is that PATCO carries over 10 times more people per mile of railroad than SEPTA does.^b Thus, for very similar suburban markets and the same destination, ridership levels are dramatically different. The level of current SEPTA ridership doesn't necessarily reflect transit's potential.



^aCommunities served by SEPTA tend to have somewhat higher incomes than communities served by PATCO.

^bPATCO ridership is higher, in part, because motorists in New Jersey must cross a toll bridge to enter Philadelphia.

^cThe PATCO fare is for a trip from Philadelphia to the end of the line. The SEPTA fare is a peak fare for zone two.

transportation. The cost of running a bus for 10 miles, which includes fuel and maintenance costs plus wages for the operator, is roughly the same whether four or 40 passengers are on board. Statistical studies of the transit industry also suggest that the cost per mile of running a bus or train is independent of the scale of operation.¹⁰ In other words a transit authority could provide 10 or 100 bus vehicle-miles for roughly the same cost per mile.

Passenger-trips, on the other hand, are the "final products" of public transportation. Un-

like the cost of an intermediate product, the cost of the final product depends, in part, on the number of people choosing to ride. The cost of a passenger-trip would vary tremendously depending on whether the cost of operating a bus were spread over four or 40 people. Moreover, statistical studies suggest that, unlike with intermediate products, producing the final product entails economies of scale. More frequent service enhances the competitiveness of public transportation, and economies of scale arise when increased service expands ridership faster than costs. That is, the cost per person riding transit falls as service levels increase. (See *Supply Comparison: SEPTA vs. PATCO.*)

The cost to supply identical quality service

¹⁰See Small (1992) for a review of the literature on the cost structure of public transit providers.

may differ widely from one community to another. At one extreme, consider a very low density suburban community whose residents work at dispersed employment locations throughout the region. This pattern of land use reduces the number of potential transit customers because of the great distance between residents and because of the low probability that residents along any route will have the same destination. Simply to cover the destinations of a high proportion of the community, the transit authority would have to operate many routes, each serving only a small number of people. To have frequent service would require running small buses at substantially less than capacity most of the time. The costs per person of supplying service to this community would be extremely high.

Next, consider a low density suburban community that has a relatively high proportion of people who work in one area, say, the central business district. In this second community, the cost of supplying high quality transit service will be lower than that in the first community. Concentration of destinations means that many people can be served by a single transit route, allowing transit vehicles to operate near full capacity with frequent service. Frequent service, in turn, attracts a larger share of the market. If the market is large enough, and if transit captures a large enough market share, higher capacity vehicles, such as larger buses or trains, can lower per-trip costs even further.

Transit is most competitive in communities that have high residential densities, common destinations, and high costs of auto travel. This type of market is most commonly found in older cities in which employment is concentrated in a central business district. In such markets, passenger volumes are large enough to justify high capacity, high efficiency technologies operating at high frequencies over a wide network of routes.

Like all markets, the market for public transportation is not static. The cost of supplying

transit services changes over time as communities change. Incentives in the transportation system affect the way communities evolve. These incentives guide long-term choices such as residential and business location and private investment in automobiles. For example, if public transportation is attractive, people and firms will locate in areas where they can take advantage of transit services. Households will make less of an investment in private transportation by not purchasing a second or third car. In the long run, high quality transit service attracts people who have destinations served by transit and who own fewer cars.¹¹ On the other hand, public transit that is priced too high or is of poor quality will play little or no role in long-term decision-making. Little sorting by destination and car ownership will occur, which increases the cost of providing transit service in the long run.

Subsidies and Transit Ridership. In addition to the underlying supply and demand conditions, transit ridership depends on the level of public subsidies. On a per-rider basis, transit subsidies can be viewed as the price society is willing to pay to induce a person to ride public transit. For example, if transit authorities are willing to provide a high enough subsidy, they can increase ridership in low demand, high cost markets. Similarly, very low per-passenger subsidies may depress ridership well below potential in high demand, low cost markets. Since per-passenger subsidies are seldom equal across markets served by a transit authority, actual ridership may not

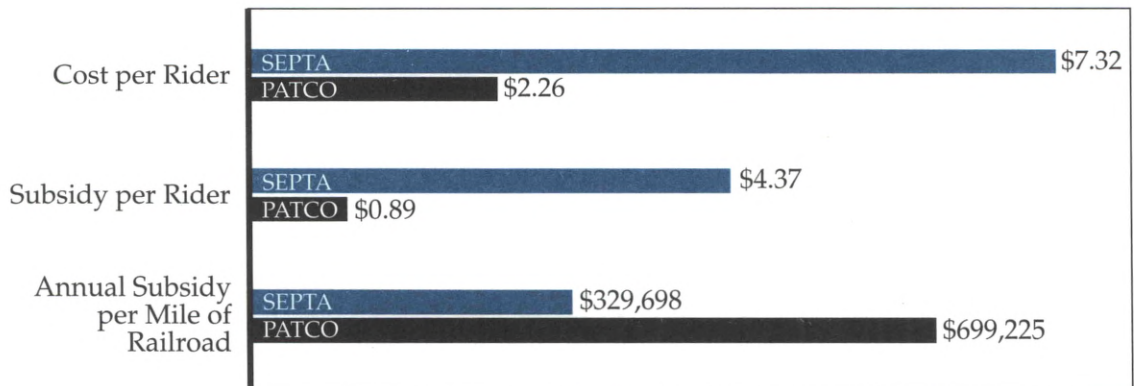
¹¹In "Transportation, Sorting and House Values," Richard Voith examines the effects of transportation on residential location and finds that high quality public transportation induces people with similar destinations to live in the same neighborhoods. In addition, households living in areas with good transit service tend to own fewer cars than households of similar income living in other areas. (*AREUEA*, 1991, Vol. 19, pp. 117-37)

Supply Comparison: SEPTA vs. PATCO

PATCO succeeds in carrying many more passengers per mile of railroad than does SEPTA's Regional Rail system, but at what cost? As shown in the figure, PATCO's costs, on a per-passenger-trip basis, are one-third of SEPTA's costs. Part of the difference is simply that PATCO's cost of running trains is lower than that of SEPTA, but by far the major reason for the low costs per passenger is the extremely high ridership. Because PATCO's costs per rider are low, subsidies per-passenger-trip are only \$0.89 on PATCO, much lower than the per-rider subsidy of \$4.37 on SEPTA.

Why would SEPTA management opt for low quality service if it requires higher per passenger subsidies? The answer is that total subsidies per mile of railroad available to SEPTA are less than those for PATCO. Communities along the SEPTA lines receive less than half as much in total transit subsidies as communities along the PATCO line. PATCO's higher subsidies, which allow for higher quality service, have extremely high returns; they generate ridership that is higher by a factor of 10. PATCO's infrastructure is used much more intensively than is SEPTA's.

This does not necessarily imply that policymakers have chosen an unreasonably low level of subsidy for SEPTA. In theory, policymakers should choose a level of subsidy such that the social benefits of attracting an additional rider are just equal to the marginal subsidy costs. If the marginal benefit of an additional transit trip declines rapidly as the number of trips increases, then SEPTA's high subsidy per trip, low ridership regime is appropriate from a social perspective. However, some of the largest social benefits of a transit trip, such as reduction of congestion and pollution, are unlikely to fall rapidly as transit use increases. SEPTA's subsidy level may also be appropriate if the cost of attracting additional riders is very high. However, economies of scale would suggest that the marginal cost of attracting riders is not increasing, and thus the costs per additional rider are probably lower than the current average subsidy per rider.^a



^aSEPTA's marginal subsidy cost of attracting an additional rider might be somewhat higher than PATCO's because New Jersey motorists must cross a toll bridge to enter Philadelphia and because communities served by SEPTA have higher incomes. In addition, there may be substantial infrastructure costs in converting the SEPTA commuter rail system to make it capable of operating at significantly higher frequencies.

accurately reflect the fundamental supply and demand conditions.¹²

Diverting scarce resources from markets where the price of gaining an additional rider is low to markets where a high subsidy is required to attract riders necessarily lowers the overall ridership on a transit system. Given a fixed subsidy, maximizing ridership requires that the change in ridership resulting from an increase in subsidy must be equal across markets. In other words, the price that the transit authority pays to attract an additional rider must be the same on all its routes. Otherwise ridership could be increased by shifting subsidies from a market with high costs for an additional rider to a market with low costs for an additional rider. (See *Intrasuburban and Reverse Commuting*.)

REALIZING TRANSIT'S POTENTIAL

An array of national, state, and local policies—including investment in infrastructure, user fees and subsidies, and regulation of land use—shapes the environment in which consumers choose between cars and transit. Changes in these policies could affect transit's future potential. But given the current policy environment, there are three keys to achieving the greatest benefits from transit: a measurable objective, appropriate incentives, and a long-run strategy.

A Measurable Objective. Although publicly subsidized transit authorities face a daunting array of competing demands, not all of them can or should be met. A measurable objective is needed to help transit providers focus resources in areas of high potential and to help policymakers evaluate the performance of transit management. Because most of public

transportation's social benefits are linked to high use, management's overriding objective should be to attract the greatest number of riders.

Appropriate Incentives. Another key to realizing transit's potential is providing incentives to management to attract the greatest number of riders. These incentives are a better tool than the common practice of budgetary restraint for ensuring the efficient use of public funds. Because costs per rider tend to fall as transit service increases, excessively tight budgets may result in higher, not lower, costs per rider. If, for example, insufficient subsidies limit transit frequencies to uncompetitive levels, ridership will fall, increasing subsidy per passenger even though total subsidies are lower. On the other hand, if management fails to use its public subsidies to attract the most riders, the full social benefits of transit subsidies will not be achieved. With management incentives tied to ridership objectives, policymakers could more confidently choose the level of public subsidies justified by transit's potential social benefits without being concerned that transit providers are using public funds inefficiently.

Long-Run Strategy. Because markets evolve over time, transit authorities need a long-run strategy to attract riders. Good transit policies can support development that favors public transit; however, poor policies can undermine the very markets for which public transit is most cost effective. A successful strategy will support markets in which transit has a potential competitive advantage and avoid subsidizing locations in which providing transit services is inherently expensive.

The objective of attracting the greatest number of riders using incentives and a long-run strategy may appear simple, but it involves choices that favor some markets over others. Generating consensus about where public transit authorities should focus resources tests the ability of regional leaders to make hard choices for the common good of the region.

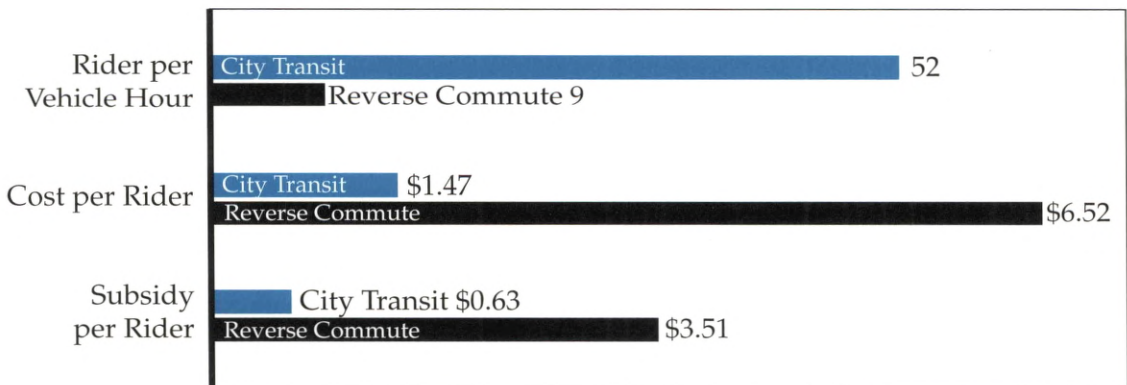
¹²On the SEPTA city transit system in 1992, the subsidy per rider varied dramatically from route to route. SEPTA's best route was profitable, with the Authority earning \$.08 for each rider carried, while trips on the worst route received a subsidy of \$15.88.

Intrasuburban and Reverse Commuting

The rapid increase in suburban employment and intrasuburban commuting has prompted new requests for public transit service in suburban areas. Public transit is often suggested as a means of linking lower income city residents with suburban jobs or as a means of reducing suburban congestion. While these are laudable objectives, public transit is frequently not the answer to the problem. In many suburban markets, the costs to supply transit services are high because destinations are widely dispersed and demand is low, in large part because there is extensive free parking.

A comparison of SEPTA city service with special “reverse commute” services provides a good illustration of the difficulty that transit faces when competing in suburban markets. The figure compares the performance measures for a “typical” SEPTA transit route in the city of Philadelphia with special “reverse commute” routes designed to deliver city people to suburban work sites. Ridership per vehicle hour—the number of people who board a bus or train in an hour—is about 52 on a city route versus only nine on the reverse commute routes. The low ridership on the reverse commute routes results in an extremely high cost per rider of \$6.52, compared with a figure of \$1.47 on a city transit route. Finally, the subsidy per rider is \$3.51 on the reverse commute routes versus \$0.63 on the city transit routes. In other words nearly six people could be carried on the city transit routes for the subsidy provided for a single person on the reverse commute route. The subsidies for SEPTA’s reverse commute routes are generally borne by companies whose employees use the services, but the numbers illustrate the amount of public subsidies that would be necessary if the costs were not paid by private employers.

While there are almost certainly some large and growing suburban markets where public transit can be competitive, that is not the case in many other markets. Attempts to serve these markets will likely fail. Furthermore, diverting resources to these markets may undermine those in which transit is a viable alternative. For example, companies that expect the public transit agency to subsidize their employees’ commutes, regardless of where the companies locate, will have one less incentive to locate near a transit hub. Ultimately, there will be more congestion and less accessibility to employment for residents in older, densely populated areas because transit will become less and less viable over time.





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