Insufficient or uncertain budgetary allocations to road maintenance have resulted in road deterioration that has significantly increased production and transport costs in many countries. To avoid this problem, highway professionals advocate the establishment of dedicated road funds, managed by independent road boards made up of user representatives. The road boards would have the power to determine both the level of charges for road use and the level of expenditure on road maintenance. By contrast, macroeconomists and public finance specialists have tended to resist the establishment of dedicated road funds. They argue that road funds reduce fiscal flexibility, do not adequately address problems associated with the provision of public goods or the internalization of externalities, and often are not well managed.

In general, there are two long-term institutional options for reconciling fiscal prudence with asset maintenance: a road agency that is operated commercially (subject to the normal oversight of behavior accorded to privatized monopolies), or a reformed and well-functioning budget process. This article argues that road funds must be viewed as a provisional, case-specific intermediate step in the direction of one of the long-term solutions. The role and nature of road funds should be assessed not on general principles but on a case-by-case basis through the analysis of likely micro- and macroeconomic effects. The article recommends indicators for use in specific cases to determine whether a road fund should be introduced, continued, or abolished.

Spending on roads accounts for between 0.5 and 10 percent of public expenditure and between 10 and 20 percent of the development budget in many countries. Expenditures on road construction and rehabilitation, which are usually classified as capital expenditures, financed through borrowing and subsequent debt servicing, are not discussed in this paper. This article focuses on expenditures for periodic maintenance, routine maintenance, and operational management of roads. These costs are usually treated as current expenditures financed through annually budgeted allocations from the central treasury.
Road maintenance expenditures account for 30 to 60 percent of total road expenditures and as much as 0.5 percent of gross national product, or GNP (table A-1). Some weak evidence indicates that as road network densities and trade and traffic volumes increase with economic growth, road maintenance expenditures increase with GNP per capita (figure 1). In general, however, road maintenance expenditures depend not just on the size of the network but also on the nature of the terrain (higher costs in mountainous countries such as Bolivia and Nepal), the severity of the weather (higher costs in cold or wet climates such as Norway or Bangladesh), and construction standards. Insufficient or uncertain budgetary allocations undermine orderly planning and execution of road maintenance, resulting in road deterioration, which significantly increases transport costs. This article addresses the fiscal and institutional means for avoiding this outcome.

Deferring road maintenance increases not only total costs but also the present value of the future cost stream at any reasonable rate of discount. If roads deteriorate to the point at which they need reconstruction, restoring them to the original level of service costs three to five times more than timely and effective maintenance (Harral and Faiz 1988). Gyamfi (1992) estimates that the ratio of restoration costs to maintenance costs lies between 1.0 and 2.5 in Chile and Costa Rica. In addition, for every dollar that road agencies withhold by underfunding maintenance, road users must spend about three dollars in additional vehicle operating costs. Therefore, the economy as a whole (although not necessarily the road agency itself) benefits from timely road maintenance at any reasonable discount rate.

Figure 1. Road Maintenance Expenditure Patterns in Selected Countries, Annual Averages for the Period 1988–95

Source: Table A-1.
The World Bank’s Operations Evaluation Department (OED) database supports the assessment that road maintenance is a highly productive expenditure. The OED database covers 341 road projects evaluated between 1961 and 1988. The average estimated economic internal rate of return for this class of projects was 38.6 percent. This rate compares with an average of 26 percent for all transport projects and 21 percent for all World Bank investment projects (Heggie and Vickers 1998).

In the 1960s and 1970s many countries in Africa, Asia, and Latin America established road funds as an extrabudgetary arrangement. Earmarking of a stream of revenues (often from fuel taxes) was introduced for use by the road department or agency, with the intention of insulating maintenance expenditures from erratic and frequently delayed general budget procedures and reviews (Johansen 1989). (For a definition of earmarking and other terms used throughout the text, see the glossary.) Often, the World Bank requested that these funds be set up to protect its investments from economically inefficient asset deterioration. Some recently established road funds in Eastern Europe (in Russia and Georgia) are still based on this model.

From a macroeconomic viewpoint, analysts have criticized earmarking because it infringes on the policymaking powers of state executives and legislatures and reduces the leverage and flexibility of central governments (Deran 1965). Therefore the World Bank and the International Monetary Fund (IMF) have discouraged first-generation road funds in practice on general macroeconomic grounds (World Bank 1986). Even within the transport sector, some analysts have argued that the preferential access of road funds to lucrative revenue sources, such as gasoline taxes, hinders development of a more balanced, multimodal transport system.

The performance of state road agencies continues to be a matter of concern. Therefore a new generation of road funds is being established in the 1990s as part of an agenda to commercialize the road sector. This process runs parallel with (and primarily for the same reasons as) the privatization of state enterprises. Second-generation road funds are funded by levies or surcharges designated as user charges and identified separately from general taxation. Revenues are paid directly into a fund managed by a road board whose membership is chosen to represent users. The road board determines both the level of charges and the allocation of expenditures. Second-generation road funds have been established in several African countries and in countries as diverse as El Salvador, Guatemala, Jordan, Lebanon, and Pakistan (Heggie 1995).

Off-budget financing, or earmarking, is not universally necessary or effective. Many European countries with good governance maintain road systems through traditional public sector budgetary arrangements. Poor governance or governments’ lack of self-discipline may make it impossible to maintain roads even with the existence of a statutory road fund. Governments may not be able to guarantee the security of assigned revenue streams or the designated allocation of expenditures (Potter 1997a). Most countries fall between the extremes of good and bad governance. Assigning
responsibility for tax revenues and expenditures to a representative road board to manage a specific road fund (similar to specialized taxing districts) may make a real difference.

The next section sets out the analytical framework for assessing the desirability of road funds, which has much in common with the framework for fiscal decentralization. An important caveat is in order. Selective establishment of a road fund is justified only where quasi-commercial forms of organization might improve the allocation of resources through the implementation of a system of direct charges for road infrastructure use and a system of fund governance by users. Road maintenance does not inherently have a higher priority than other uses of public resources; thus, even though the discussion focuses on road funds, the general principles developed in the article apply equally to other sectors where quasi user charges and user governance can be implemented.

Analytical Framework for Considering Road Funds

The establishment of a road fund may affect the efficient working of the economy through three main channels. The first channel, fiscal control, influences the efficiency with which resources are collected and allocated among activities to maximize total community welfare. The second channel, management incentives, partly determines the efficiency with which the agents of production use the resources allocated to them. The third channel, rent-seeking behavior, can adversely affect both fiscal control and management incentives. Rent-seeking behavior occurs when individuals or agencies attempt to secure their own specific advantage at society’s expense (Teja 1988). The relative importance of and balance among these channels critically affects the assessment of the efficacy of road funds.

Fiscal Control and Allocational Efficiency

Public finance economists argue against earmarking because the optimal charge on road users would be unlikely to generate the revenue stream required to finance the optimal stream of road maintenance expenditures in terms of scale or timing. In any given time period, any earmarked stream of revenue is likely to generate either insufficient or excessive funding. Too little funding causes the road authority to require continued recourse to the general budget. Too much funding creates the potential for financing lower-priority expenditures. In the former case, ensuring independence from poor budgetary processes and allocations requires rate-setting capabilities; in the latter case, avoidance of wasteful allocations requires public accountability through strict monitoring and auditing mechanisms. Often, the earmarking mechanism lacks these features.
A related argument against earmarking arises from the fact that budgets in developing countries are often very fragmented. The development budget is typically a set of separate budgets, ringfenced by sponsoring donors. The recurrent budget is also fragmented by the prior call of debt servicing and other statutory expenditures and by the large share of wage expenditures that are difficult to cut. The proliferation of earmarked funds by sector or objective would make it difficult to rationalize the allocation of resources as expenditure priorities change. In short, a problem of macroeconomic control arises if extensive earmarking eliminates fiscal flexibility. This situation occurred in Colombia in the 1980s (Premchand 1983) and in Ecuador in the late 1990s.

The fiscal argument against earmarking in general and against road funds in particular is based on the assumption that general-purpose governments are better informed than special-purpose governments about the costs and benefits of alternative expenditure possibilities. The argument also assumes that general-purpose governments are committed to optimizing social welfare; that is, they are informed and benevolent. These assumptions may be true in some cases, where governance is representative and transparent. If the government system lacks these qualities, however, one of the main arguments against earmarking fails.

A related point is that current political pressures or the electoral cycle may result in myopic decisions. Vehicle operating costs, which do not enter into the road agency accounts, make up a high proportion of total transport costs (75–90 percent); these costs increase progressively as road conditions deteriorate (Harral and Faiz 1988). Unfortunately, road deterioration reveals its symptoms late. Expenditures on timely maintenance do not yield such obvious improvements in system performance as do expenditures on new investment. Yet long-term investment funded at the expense of optimum maintenance actually leads to a long-term decline in total available road system quantity and quality. The introduction of explicit road user charges, directed to a road fund in lieu of allocations from the general revenue budget, would contribute to allocative efficiency.

The introduction of explicit road user charges, however, would not automatically eliminate the need to address tradeoffs. In the absence of complete independence between specific road user charges and general taxes, securing funding for roads would entail an opportunity cost in other sectors. For example, in developing countries with low taxable capacity, fuel taxes represent a fairly secure tax source, accounting for 7 to 30 percent of total tax revenues and 1 to 3.5 percent of gross domestic product, or GDP (Gupta and Mahler 1995). The loss of control over this source of revenue may particularly damage the central government’s economic management abilities. Introducing an indirect road user charge, in the form of a surcharge on fuel taxes, would limit the government’s ability to increase taxes on fuel for general tax purposes. This limitation could lead to increased instability in the use of remaining tax revenue for social expenditures, such as health and education.
The independence of general taxing capacity from the level of road user charges is likely to be greatest when a group of beneficiaries is well defined and the payment of user charges is directly linked to the receipt of services. The benefit rationale for earmarking aims to reveal taxpayer preferences for public services and to send a demand signal to the public sector about how much of the public service to supply (Bird 1997). With an efficient and fair charging mechanism, no one receives a service without paying for it or pays without receiving the service. Second-generation road funds attempt to honor this principle by generating the bulk of revenues through vehicle license fees, axle loading or distance fees, and, in a few cases, toll revenues. To a lesser extent, they generate revenue through the separation of the pure tax element from the ex ante explicit user charge element of public revenues collected from fuel taxes.

Management Incentives and Operational Efficiency

The life of a highway investment and the benefits accruing from it depend on the maintenance of the facility. Most appraisals assume optimal maintenance, although they may not explicitly address what this implies. Failure to provide the required maintenance effort means that the return on the initial investment will be lower. If normal budgetary practices do not provide the necessary funding for optimal maintenance, then project designers and evaluators should reduce the likely benefit stream (and therefore the expected rate of return) or introduce complementary institutional mechanisms to ensure appropriate maintenance practices. In the first case, fewer investment projects would meet the criteria for selection. In the second case, establishment of a road fund to ensure funding for road maintenance from road user charges (quasi prices) may be the logical corollary of accepting projects with attractive rates of return, but in contexts where budget practices are poor.

The introduction of road user charges payable directly to a road fund can improve managerial incentives by increasing autonomy from unwarranted political interference. In many countries, wrangling over the budget delays its approval and disbursement. Studies in Latin America show that uncertainty or untimely availability of funding to maintain regular work schedules and to buy fuel and supplies explains in part the low equipment utilization rates and low number of kilometers maintained per employee (Gyamfi 1992). Even if the total level of road funding is open to competition from other demands, a road fund may enable the executing agency to perform more efficiently by guaranteeing the availability of a secure core of funding. In Ghana the establishment of a road fund has substantially reduced the problems of disruption of the planning and execution of maintenance work. These problems are caused by delays in approving the budget or releasing the budget allocations and lack of synchronization between the budget year (the calendar year) and the construction season (September to May). These delays necessitated the awarding of small continuation contracts to contractors who already had commitments with the adminis-
The establishment of road funds has eliminated payment delays, given a significant boost to contractor cash flow, and reduced unit costs by 15 to 20 percent (Pankaj 1989).

The guarantee of a core of finance may also allow road agencies to extend and improve contracting arrangements with the private sector. The same studies for countries in Latin America and the Caribbean suggest that maintenance by force account (that is, staff on government payrolls) is little more than half as efficient as maintenance that is contracted out to the private sector. In Ghana the greater certainty of funding associated with earmarking allowed the introduction of effective competitive bidding. In general, more reliable financial arrangements lead to better use of resources.

Operational efficiency may also increase if users willingly pay for maintenance because the road authority channels payments more directly to the provision of a service of value to the users. (The availability of these additional resources, which might not be forthcoming otherwise, can also improve the government’s ability to manage macroeconomic imbalances.) Some countries, including many in Sub-Saharan Africa, have experienced a severe crisis in the maintenance of their main road networks. Heavy users, such as truckers and other operators of commercial vehicles, have demonstrated a willingness to levy an additional charge on their “own” use of fuel to finance a road fund with responsibility for maintaining a core network. There is no mystery to this behavior. Users more than recoup the surcharge if it is dedicated to fund better road maintenance, which in turn reduces vehicle operating costs. For example, Heggie (1995) estimates that vehicle operating costs decrease by two to four dollars for every additional dollar spent on road maintenance.

Rent-Seeking Behavior and the Distribution of Welfare

At the heart of the problem of traditional road funds was the failure of the associated earmarking arrangements to address incentive and governance issues. Unlike marketable commodities, including deregulated rail and airline services, the typical traditional road fund had no link between the tax rate (or the amount of taxes earmarked) and spending priorities (in light of the level of road use). Road fund managers had incentives to maximize their discretionary expenditures (including investment in low-priority roads or ancillary activities) rather than to optimize the level of road maintenance. The combination of public scrutiny and periodic monitoring by a competent central bureaucracy may provide some defense against this problem in industrial countries, but that combination is less likely in developing countries with less developed institutional capabilities.

Public choice theorists express skepticism even about institutional capabilities in industrial countries, including the political process that translates citizens’ preferences into public action. Essentially they believe that diverse citizens’ preferences do not permit aggregation into a well-defined community preference function. They
also believe that monitoring costs and informational asymmetries may enable public officials (regardless of whether they respond to organized pressure groups) to project their personal interests onto their function of allocating resources. And they believe that budget choices do not depend solely on the inherent costs and benefits of services but also on the ability of one set of taxpayers to transfer the costs of programs that benefit them to others.

Where individual preferences for public goods differ, separate earmarked funds could potentially increase general welfare if the payments to those funds reflect individuals’ relative marginal utilities for different public goods (Johansen 1963). Despite the ingenuity devoted to designing ways of getting consumers of public goods to reveal their marginal utilities truthfully, this analysis remains difficult to apply practically. Quasi prices, or user charges, may have welfare advantages because they can be levied approximately in proportion to the demonstrated benefit of consumption.

Public choice theorists have pointed out a fundamental flaw in general fund budgeting. That is, heavy consumers of a service that is financed through general taxes would benefit from lobbying for larger expenditures on that service (thereby transferring welfare to themselves). At the same time, nonconsumers would argue for lower expenditures. The outcome depends on the respective political power of the parties, rather than the aggregate value attached to each individual service. The road authority can eliminate this bias by setting prices, such as tolls and vehicle duties, for the beneficiaries of a specific service. Using a fuel surcharge as a quasi price for road use (with appropriate corrections for agricultural vehicles and for fuel not used for road vehicles) is analogous to establishing a special taxing district. These districts are common in the provision of some facilities, such as water, and could be consistent with the government’s pursuit of redistribution objectives through its policies on general taxation and the allocation of merit goods.

The argument for earmarking as a way of separating allocation and distribution issues may also be applied spatially. The government could implement a program of regional financing for services consumed regionally. This program would avoid overprovision in some regions at the expense of others as the regions compete to maximize their share of the national budget. Of course, the road authority may justify some regional disparities in provision, particularly of road investment, on both efficiency and equity grounds. The government would require operational criteria for the spatial allocation of resources, as have recently been developed for second-generation road funds, regardless of whether the funds are earmarked.

Empirical Evidence

The influences discussed above do not militate in the same direction and may demonstrate variable quantitative significance in different circumstances. Therefore, the
evaluation of second-generation road funds cannot be resolved solely by reference to a priori theorizing but instead must be approached on a case-by-case basis in light of national circumstances. Several issues affect the balance between the micro- and macroeconomic considerations, including the demonstrated effectiveness of road funds in meeting their public service objectives, the magnitude of the economic cost of undermaintenance, the extent of the backlog of road maintenance work, the demonstrated capability of existing fiscal arrangements to finance efficient maintenance, and the degree of current fiscal dependence on taxation of road users.

**Experience with the Operation of Road Funds**

The empirical evidence suggests a positive but statistically weak ability of traditional forms of earmarking to alter resource allocation significantly (Eklund 1967). Wherever the government retains control over the level of the user charges or over the allocation of complementary funds, the total level of funding may be just as vulnerable with a road fund as without one. For example, the earmarked funds for the Colombian National Road Fund grew at the same rate as GDP in 1979–87, but road expenditures per kilometer fell by 25 percent (Dick 1989). The fall in expenditures occurred in part because funds were preempted to cover increased debt service payments.

McCleary (1991) reviews the experience in the Central African Republic, Colombia, Ghana, Mali, and Zaire (now the Democratic Republic of Congo) in the late 1980s. He concludes that the road fund was successful only in Ghana, where the government was strongly committed to increased expenditure on roads in any case. In general, the governments found it difficult to set appropriate levels for earmarked taxes. Allocations tended to continue to depend on the general budget situation, and the adequacy of overall road fund resources provided no assurance of an appropriate balance among maintenance, rehabilitation, and new investment. A more recent review of 10 African road funds confirms many of these failings (box 1). It also emphasizes the need to examine more closely why the funds failed. In contrast, second-generation road funds overcame many traditional defects when they had clear objectives, an independent revenue source, and efficient management and accounting arrangements (Balcerac de Richecour and Heggie 1995). Some newer funds (for example, in Ghana and Zambia) ensured the automaticity of payment by separating the fuel levy from general taxes.

**Experience with Existing Fiscal Arrangements**

A survey of the views of country road agencies and task managers in nine countries shows the ratio of actual maintenance expenditures to those considered necessary to maintain constant road conditions. The ratio varies between 29 percent for Jordan and 89 percent for Argentina, with most countries falling in the 50–70 percent range.
Continued inadequate maintenance of the road network

Insufficient revenue base. The revenue base of the road fund is large enough to finance only part of the qualifying expenditures, with the balance financed through the government's general budget. Once road agencies obtain some money from the road fund, they may find it even more difficult to get funds through the normal budgetary process.

- **Ghana.** The road fund's original revenue base could finance only 60 percent of periodic maintenance.
- **Zaire.** In 1985 a higher fuel tax increased the revenue base of the existing road fund, but it was insufficient to cover all of the qualifying expenditures. In 1986 the new budget contribution dropped to zero, resulting in a drop in total road funding. The situation was repeated in 1987.

Funds raided by the general budget. The revenues are collected by the customs and excise department and channeled through the ministry of finance, which almost invariably withholds some of these revenues.

- **Sierra Leone.** In February 1990 the central customs authority reduced the amount paid into the road fund and in June 1991 suspended payments altogether, even though the road users continued to pay the same fuel levy.
- **Similar situations occurred in Ghana, Mozambique, and Tanzania.**

Poor governance, limited operational efficiency, and misappropriation of funds. Without satisfactory audit procedures, the government cannot track how monies paid into the road fund are spent. Nor can the government ensure that only approved expenditures are covered and that these expenditures meet required specifications.

- **Mozambique.** Audit reports for 1993 and 1994 could not verify the flow of money between Petromac (the oil company that imports fuel), the Ministry of Finance, and the road fund. Nor could the audit determine whether the road fund had received all the revenue due it from the levies on gasoline and diesel fuel.
- **Rwanda.** The 1991 audit report was unable to certify accounts because of a general lack of financial information and a lack of specific information on the revenue side.
- **Sierra Leone.** The audit for September 1989 to December 1991 showed that about $200,000 was used to purchase vehicles that were never delivered.
- **Tanzania.** The audit report for fiscal year 1992/93 showed that about $1.5 million in payments was made without any supporting vouchers or other documents.
- **Zambia.** $760,000 of the revenue collected for roads between May 1993 and November 1994 never reached the road fund. The audit also showed that about $500,000 was paid for materials that were never supplied, about $6 million was paid to contractors without any reliable records to show that work had been done, and about $70,000 was paid for the purchase of vehicles that were never delivered.

Misallocation of resources

Diverting funds to low-priority and nonrelated activities to avoid showing a surplus. When the road fund finances roads managed by different agencies without any transparent and equitable mechanism for allocating revenues among them, allocations are often subject to political whim rather than economic criteria. A weak or nonexistent road fund board and ambiguous legislation add to the problem.

- **Central African Republic.** The 1993–94 audit report showed that the central government took an irregular loan of $340 million from the road fund to pay civil service salaries.
Sierra Leone. From September 1989 to December 1991, there were no guidelines regarding use of funds. The presumption was that the funds were intended for road maintenance. Substantial sums were spent on refurbishing offices, purchasing 1,800 yards of carpet, and carrying out repairs at the State House and the Parliament building.

Tanzania. The audit report for fiscal year 1992/93 found that the road fund was used to finance recurrent expense items not covered by the directives issued by the Ministry of Finance, including leave payments, ferry operators, electric bills, and gratuities. Of the funds allocated for urban and rural roads, 75 percent went only to urban areas because they were better able to prepare plans—not because their needs were inherently greater.

Zambia. Between May 1973 and November 1994, $4.7 million was released through provincial accounting control units for road rehabilitation. No guidelines for disbursing funds were provided, no expenditure returns were submitted, and no expenditure returns were requested before further funds were released. About $600,000 was paid for items that should have been covered through normal budgetary provisions.

High revenue flow into the road fund. A persistent buildup of a surplus that is not accessible by the general budget can severely limit the financial resources of the central government in a fiscal crisis.

Colombia. In 1986 more than 35 percent of central government tax revenue was earmarked, with the road fund alone accounting for nearly 7 percent.

Poor governance because the governing agency is captured by those who shift allocative priorities.

South Africa. Its initial road fund board, which primarily consisted of provincial representatives, found it difficult to get the members to act in the national interest.


(1998). Table 1 shows even more pessimistic conclusions from assessments of maintenance provisions based on the World Bank's Highway Design and Maintenance Standards model for World Bank projects.

Backlog of Road Maintenance Work

In a study of road deterioration in developing countries, Harral and Faiz (1988) estimate the annual maintenance expenditures required to prevent deterioration. For 1986–90, expenditures varied from 0.2 percent of GDP, on average, for countries in East Asia and the Pacific to 1.0 percent for countries in West Africa. Harral and Faiz estimate that the backlog of maintenance work varied from 1.6 percent of GDP in East Asia and the Pacific to 3.5 percent in South Asia. Although these calculations have not been updated recently, anecdotal evidence suggests that the pattern persists. These estimates in table 1 do not suggest that lack of maintenance in the road sector was worse than the underfunding of maintenance expenditures in the provision of other public goods and services. And they do not suggest that the recommended levels of expenditure were socially optimal in economic terms. The estimates in table 1 show only the extent to which funding was insufficient to maintain constant service levels for an economically critical asset.
Table 1. Inadequacy of Annual Road Maintenance Expenditures, Selected Countries, 1980s–1990s
(millions of current U.S. dollars)

<table>
<thead>
<tr>
<th>Time period</th>
<th>Country</th>
<th>Network</th>
<th>Amount spent</th>
<th>Amount recommended</th>
<th>Ratio of amount spent to amount recommended (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>Bangladesh</td>
<td>Roads and Highways Department</td>
<td>24.6</td>
<td>42.4</td>
<td>58</td>
</tr>
<tr>
<td>1991-92</td>
<td>Cameroon</td>
<td>All</td>
<td>28.1</td>
<td>44.9</td>
<td>63</td>
</tr>
<tr>
<td>1988-91</td>
<td>Honduras</td>
<td>All</td>
<td>11</td>
<td>45</td>
<td>24</td>
</tr>
<tr>
<td>1991-92</td>
<td>Madagascar</td>
<td>All</td>
<td>8</td>
<td>27.9</td>
<td>29</td>
</tr>
<tr>
<td>1992</td>
<td>Nepal</td>
<td>All</td>
<td>2.6</td>
<td>18.1</td>
<td>15</td>
</tr>
<tr>
<td>1988</td>
<td>Nigeria</td>
<td>Federal highways</td>
<td>112.3</td>
<td>248.5</td>
<td>45</td>
</tr>
<tr>
<td>1991-92</td>
<td>Rwanda</td>
<td>All</td>
<td>4.1</td>
<td>8.6</td>
<td>48</td>
</tr>
<tr>
<td>1991-92</td>
<td>Uganda</td>
<td>All</td>
<td>4.1</td>
<td>12.7</td>
<td>32</td>
</tr>
<tr>
<td>1992</td>
<td>Zambia</td>
<td>All</td>
<td>6.1</td>
<td>32.7</td>
<td>19</td>
</tr>
<tr>
<td>1990-91</td>
<td>Zimbabwe</td>
<td>All</td>
<td>25.9</td>
<td>35.7</td>
<td>73</td>
</tr>
</tbody>
</table>

*a.* The recommendation was based on maintaining at least the existing network at a level that would generate a constant flow of services (except for Nigeria, where the recommendation was intended to eliminate a five-year backlog).


Strategic Options and Interim Arrangements

The previous sections show that there is some evidence of a backlog in road maintenance work and that savings in operating costs could fund increased payments for road use without reducing general taxable capacity. The critical question is whether road funds constitute the most effective way of achieving an efficient allocation of resources for implementation of road maintenance expenditures. The decision to introduce or eliminate road funds must be based on a practical and systematic assessment of the context and of the available options for reconciling the micro- and macroeconomic objectives. Two broad options are available.

**Option 1: A Commercial Road Agency**

In the first main option, the government would move toward commercialization of the road sector. This would involve creating an independent, regulated road authority (similar to a monopolistic public utility). The road authority would have responsibility for the entire road network and for revenues derived from direct user charges (quasi prices) rather than from taxation. A first step in this direction might involve creating an independent road board to manage a road fund financed through various
instruments, including a surcharge on fuel taxes. In the longer term, a commercial road agency would replace the road fund. Tolls charged on a fee-for-service basis or charges more directly related to the costs imposed by road use (for example, charges for trucks based on axle weight and distance traveled) would replace the fuel surcharge. New Zealand is already moving in this direction.

Option 2: A Reformed Budget Process

In the second main option, the government would rebuild the capability of, and confidence in, its budgetary processes. In some cases, commercialization is not politically or practically feasible, and the public is unwilling to pay additional general taxes. Earmarking some special-purpose taxes and creating a road board—cum—road fund may provide the most practical interim means for generating additional funds for a priority economic activity and rebuilding public confidence in government. Even weak governments may accept some transient impediments to raiding activities with high benefits but low profiles, thereby changing the balance of expediency. In the longer term, the government would phase out the road fund and return all revenue and expenditure responsibilities to the budget. Countries in the European Union commonly rely on the budget rather than on road funds.

Interim Arrangements

The decision whether to establish a road fund as an interim step in option 1 or option 2 is a complex issue and requires case-by-case analysis (box 2). Three principles guide the decisionmaker about whether to introduce (or retain) a road fund:

- Will it improve resource allocation—for example, by ensuring better funding of activities with economically high returns but politically low profiles (bearing in mind that other services such as primary schooling and basic health clinics may also fall in the same category)?
- Will it improve operational efficiency—for example, through the introduction of better incentives for managing resources?
- Will it reduce rent-seeking—for example, by strengthening the link between benefits and payments?

Expenditure and Revenue Assignments and Governance

Assuming that conditions justify the creation or continuation of a road fund, its charter should explicitly address three broad issues. First, what road expenditure line items should the road fund protect, and what is the primary purpose of the fund? Second, what revenue streams or revenue authority should finance the chosen expenditure items
Box 2. Conditions for Introducing a Road Fund

Introduction of road funds may be justified if all the following conditions apply.

Maintenance is poor because of:

- **Insufficient funds.** Poor setting of budget priorities with bias in favor of new investments, often donor driven.
- **Unreliable timing of funds.** Poor budgetary processes that cannot ensure credible commitments, disbursements, or both.
- **Inefficient implementation of works.** Absence of incentives to use resources efficiently in the agency.

**Potential indicators**

- Asset condition of core network predicted to decline over the next 10-year period (increasing percentage in poor condition by road class).
- User costs predicted to increase over 10 years (increasing ratio of vehicle operating costs/vehicle/year by vehicle class).
- Substantial maintenance forgone (with economic rate of return greater than 20 percent).
- Net present value of near-optimal program more than 1.5 times higher than that of current program.
- Total costs per mile of road maintained in the core expected to drop by 25 percent throughout the life of the fund (relative to current expenditures or future benchmarks).
- Cabinet-level commitment (acts, regulations, gazetting) to increase road maintenance expenditures.
- Cabinet-level commitment to permit direct user charges (or surcharges on fuel taxation) to generate funds.
- Cabinet-level commitment not to reduce parallel funding.
- Principles accepted for major allocation decisions.
- Representatives of key user groups included on the road board.
- Economic criteria accepted as key to setting priorities.

There is political commitment to increase maintenance expenditures on roads.

There is a political commitment to establish long-term reliable mechanisms for improved allocation and accountability for the core network.

*Note:* The size of the core network will vary over time as unused and lightly used routes are dropped and emerging heavily used routes are included.

in the road fund? And third, how will the proposed institutional structure ensure responsible governance and appropriate incentives to reconcile the conflicting micro- and macroeconomic management objectives? In particular, what features will ensure that unrepresentative or unaccountable interests will not capture the funds?

**Expenditure Assignments**

Should the government or the road authority decide about the allocation of resources between investment and maintenance, among regions or road types, and between administration and implementation activities?
ALLOCATION OF RESOURCES BETWEEN INVESTMENT AND MAINTENANCE. The most commonly identified problem, systematic bias against maintenance, occurs in fiscal regimes that fund both investment and maintenance through the same channels (with or without road funds). The regime tends to favor investment because large schemes are politically attractive and have easier access to external financing. In addition, the benefits of investment are more apparent ex ante than the benefits of maintenance. As a result, decisionmakers behave as if their discount rate were greater than the technical rate. This problem commonly occurs in developing countries as well as in transition economies, such as in Eastern Europe.

The creation of a road fund with both investment and maintenance responsibilities does not automatically ensure against such a systematic bias. In Mali the road fund provided the national counterpart funding for foreign lending for road construction and financed the servicing of debt on earlier investments. These became the first calls on the road fund, and maintenance suffered accordingly. This suggests that road funds be dedicated to maintenance, thereby providing a needed counterbalance to a systematic bias.

Experience provides less clear guidance on the treatment of investment. Several countries (including Japan, the Republic of Korea, South Africa, and the United States) introduced road funds to facilitate crash investment programs. The governments considered the investment programs too large for the general budget, thus justifying special treatment, including extra special-purpose taxation. But such arrangements can create a temptation to misallocate funds to lower-priority investments if they continue to generate large amounts of revenue after the real need that stimulated their creation has been satisfied. This problem, combined with the systematic bias in favor of investment, would appear to provide sufficient reason to exclude investment from any ringfenced allocation in an interim arrangement.

Unlinking closely related investment and maintenance requirements, however, is not appropriate over the long run. Freed from the responsibility of funding the operating and maintenance consequences of their investment decisions, governments and donors could continue to indulge in excessive road investments, leading to debt-servicing and maintenance-funding burdens that, combined, are unsupportable. This concern would argue in favor of a commercialized road agency or road fund, recouping from users the costs of investment and maintenance. For the road agency or road fund to influence investment expenditures, however, it would need a broad membership that extended beyond direct road users (for example, to groups displaced or inconvenienced by new road construction). It would be politically difficult to delegate such right-of-way and eminent domain functions to an entity such as a road fund.

ALLOCATION OF RESOURCES AMONG REGIONS OR ROAD TYPES. Another reason for excluding investment is that road boards dominated by user representatives may not
allocate investment resources optimally beyond the narrow confines of road maintenance. Roads perform social and strategic, as well as economic functions, which may justify cross-subsidies. For example, governments keep some rural roads in existence and repair even though their users cannot pay sufficient sums to maintain them. Ecological or aesthetic reasons in environmentally sensitive areas could require additional expenditures on roads beyond the amounts users would willingly pay. The same is true for strategic functions. There are several ways to approach this issue, but all of them introduce complications in the governance of road funds.

First, the road authority could introduce a system equivalent to the public service obligations of transit operators. Such a system would use a contracted payment from the state to compensate the commercial road fund for meeting an explicit public obligation. This arrangement reduces the neatness of the separation between the road fund administration and the political process and reintroduces substantial scope for negotiations about financial responsibility.

Second, the government could expand the road board to include representatives of noncommercial, environmental, and local interests in the management of the road fund. The expanded road board would address issues of acquisition of rights of way, resettlement, and other problems associated with the expansion of the road network. This solution, too, would reintroduce an element of politicization.

Third, the government could create multiple agencies, each concentrating on a more restricted set of roads with representative management. This arrangement, however, could restrict legitimate transfers across regions or types of roads. Box 3 summarizes the issues created by multiple road funds.

---

**Box 3. Single or Multiple Road Funds**

<table>
<thead>
<tr>
<th>Single road fund</th>
<th>Multiple road funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>By type of road (rural, interurban, urban)</td>
<td>By administrative unit (district, province, city)</td>
</tr>
</tbody>
</table>

**Benefits**

- Potential to cross-subsidize between high-use and low-use links, particularly if the fuel surcharge applies to all road users irrespective of the specific links they use.

**Issues**

- How to design a transparent spatial or functional allocative formula, for example, by population, length of road network, type of network, priority.
- How to ensure the representativeness of the board, especially for the purpose of setting priorities and allocating resources.
- Whether each fund should have its own revenue base, allocative criteria, and governance structure.
- How to deal with components of subnational roads that are part of the national network.
Allocation of resources between administration and implementation. Staff complements for road agencies are often adequate and well protected. But salaries for road agency staff are usually well below the market rate, with the result that the agency tends to be weak and dysfunctional. A commercialized road agency (as well as a reformed civil service—cum—budgetary arrangement) is more likely to do a better job of determining the quantity, level, and remuneration of staff, thereby leading to a more efficient allocation of resources between administration and implementation. The interim road fund arrangement might still have a strong inducement for management efficiency if user charges (or earmarked taxes) finance operational expenditures. Core management staffing would remain funded through the central budget, provided that the availability of this core budget is linked to some indicators of performance that are public and transparent.

Revenue Assignments

Determining the level and sources of funding is not straightforward. Defining the level in terms of expenditure categories (for example, rehabilitation and periodic and routine maintenance) invites the padding of these expenditures and the substitution of these items for other categories of expenditure. Defining the level in terms of the whole, or a predetermined proportion, of a particular tax could be inappropriate because tax yields and expenditure requirements change relative to each other over time. Making the level of funding subject to regular review returns the whole issue to the political arena. One advantage of a road board representing user interests is that it would most likely exert a strong downward pressure on spending.

Defining the sources of funding is somewhat easier. Where direct charges, such as tolls or weight—distance charges, are feasible, there is little conflict with fiscal objectives. The road authority could collect a weight—distance charge from truckers and channel the revenue to a road fund. Iceland, New Zealand, Norway, and Sweden charge weight—distance fees to diesel vehicles according to axle configuration and gross vehicle weight. In practice, the system of fees is difficult to administer and vulnerable to evasion. In New Zealand administrative work such as collection and enforcement absorbs 5 percent of gross revenues; evasion is estimated to be between 10 and 20 percent (Heggie 1995). Annual vehicle taxes, even if weight related, are weaker proxies because they do not reflect distance traveled and hence embody perverse incentives to intensify vehicle use.

Similar problems arise with the use of a fuel tax surcharge as a proxy user charge (figure 2). Road use generates several externalities, of which road damage—requiring maintenance—is only one. A surcharge on fuel use provides a reasonable proxy for the road damage externality caused by automobiles and implies a modest tax on gasoline.
Fuel use, however, is not as good a proxy for road damage by trucks, which account for the bulk of road damage. The impact of a heavy truck is 10,000 times as great as that of a medium auto (Newbery 1987). It also varies nonlinearly with axle weight. Truck use would require a very high surcharge on diesel fuel, thereby creating problems for the use of diesel outside the transport sector (as in power generation or agriculture). Otherwise, the charge is too low to collect the necessary revenue or to affect truck use.

A surcharge on fuel may be appropriate for other externalities, such as air pollution, but not for other externalities such as congestion (which varies by time and location) or safety. Given the multiple claims on the surcharge, the road authority need not direct all the revenue generated by the surcharge to a road administration,
a road fund, or a commercialized road agency. Some of the road user charges will have to be transferred to other budgets (see figure 2).

If a fuel charge is used, the road authority should base the design on a transparent and supportable predetermined formula that is directly linked to the externalities or services consumed. The introduction of a fuel tax surcharge as a quasi price for road use should be approached particularly cautiously if the following circumstances apply:

- Taxation on fuel is a high proportion of total tax revenue (say, more than 10 percent), and any surcharge is likely to detract from general taxing capability. This situation occurs in many small developing countries. For example, the proportion is 19 percent in Costa Rica, 16 percent in Guatemala, and 13 percent in Nepal.
- The general fiscal situation is weak and many sectors are making similar claims for special fiscal treatment (as in many countries with internal deficits in excess of 5 percent of GDP or tax-to-GDP ratios of less than 15 percent).
- Diesel fuel is used extensively in power generation and in agriculture (as in many countries in South and East Asia).

The road authority should anticipate and avoid the danger of resistance to supplementary funding from the general budget, once the road fund has been set up. Road maintenance may still require funding from the general budget. Insofar as the efficiency arguments in favor of a partially protected budget relate to the ability to plan and phase a core maintenance work program, the benefits of a road fund do not depend on complete separation of the road budget from the rest of the budgetary process. Funding for links outside the core network or to cope with unforeseen circumstances (for example, natural disasters) would still require appropriations from the general budget.

**Governance**

The crux of the argument in favor of second-generation road funds is the separation of road user charges from general taxes and improved arrangements for governance of these funds. Many traditional road funds failed because funds accumulated or were misallocated. Better governance is essential to ensure that budget constraints are hard and that expenditure decisions are responsive to users. The following four institutional components should therefore be included in the package.

1. The package should have a strong legal basis. Road funds should be established by law to ensure clear terms of reference and some minimum protection from arbitrary political interference. The legal instrument not only needs to guarantee the source of funds but also must ensure that the funds are automatically channeled to
the executing agency. Where the setting of user charges and taxes overlaps between
the road board and the government, the instrument should establish clear proce-
dures enabling the executing agency to have the greatest possible security of a base
level of funding and the greatest possible notice of changes in that base. It is unrea-
sonable, however, to expect legal commitment to any particular level of tax or tax
yield.

2. The package should have an independent executive authority. The need for
efficient maintenance suggests that the executing agency should be accountable in a
clear and transparent framework. It should have the primary role of formulating
maintenance policy, marshaling and allocating funds, and securing effective imple-
mentation. Where these functions are clearly stated and well publicized as the re-
sponsibilities of a quasi-independent executive, as in Brazil and Chile, they establish
proper management incentives and facilitate effective performance.

3. The package should have a third-party monitoring system. Given the problems
of securing representative governance, a monopoly supplier of road services (the op-
erator of the road fund or commercialized road authority) should be subject to regu-
latory supervision. The fund or authority should be required to inform the public
and supervisory authorities of its activities; its accounts should be externally audited
and periodically reviewed by an independent review body; and, if corporatized, its
net income should be subject to corporate income tax.

4. The package should delineate administrative competence and proper criteria
for expenditure. Assigning expenditure responsibilities to the road fund does not per
se ensure efficient allocation within the ringfenced area. As necessary conditions for
assigning revenues, the executing agency should have well-established procedures for
allocating funds efficiently and the necessary administrative competence to adminis-
ter the allocation and to monitor and report on performance. Mozambique and New
Zealand have developed effective procedures for allocation of funds (Heggie and

Where the road fund is established as a temporary arrangement until general bud-
getary procedures are improved, termination criteria and a sunset clause must be in
place to determine what should occur when effective budgetary procedures are judged
to have been reestablished. Box 4 summarizes suggested criteria for the termination
of earmarking taxes to a road fund based on an independent review.

Where the road fund is established as a stepping-stone to a commercial entity
because the government wants to disengage from the direct production of goods
and services, a review should be commissioned. If the review determines that the
performance criteria set out in box 2 have been satisfied, it should then formalize
the road authority as a commercialized public utility with user charges accruing
directly to it rather than passing through the government treasury. Subsequently,
the road authority should be subject to the same general form of public scrutiny as
other privatized monopolies. The response to an unfavorable review should be, as

**Box 4. Sunset Provisions for Road Funds**

Closure of road funds may be justified if the following apply.

Continued inadequate maintenance of the road network because of:

- Insufficient revenue base that is not topped up as needed by the general budget.
- Raiding of funds by the general budget.
- Poor governance due to incentives that limit the operational efficiency of the fund.

Potential indicators

- Ratio of revenue flow to the fund to the required (nearly optimal) maintenance expenditure flow less than 0.7.
- Ratio of actual expenditures to required maintenance expenditures less than that of the revenue flow to required expenditure, and the actual expenditure flow also less than that before institution of the fund.
- Increase over time of predicted real vehicle operating costs for the roads maintained.
- Actual maintenance cost per kilometer of road greater than comparable benchmark.
- Percentages of roads in fair and poor condition increasing.

Misallocation of resources:

- Wasteful spending to avoid showing a surplus.
- As a result of high revenue flow into the fund, a persistent buildup of a surplus that is not accessible by the general budget.

- Ratio of administrative expenditure to total expenditure greater than 20 percent.
- Actual expenditures greater than the estimated required maintenance expenditures.

Poor governance due to capture that shifts allocative priorities.

- Inadequate representation of stakeholder groups in board management structure.
- Inadequate public reporting of plans, expenditures, and road conditions.
- Maintenance expenditures on links not in proportion to the corresponding economic rates of return from maintaining the links.

in most countries, a matter for political and legislative rather than simple administrative action.

**Conclusions and Recommendations**

Road funds are a continuing subject of controversy. Highway specialists regard them as a boon to facilitating the provision and maintenance of a highly productive asset by means entirely consistent with the general shift away from direct government production of goods and services. Macroeconomists and public finance specialists have tended to regard them as a bane because they reduce fiscal flexibility, do not
adequately address problems associated with the provision of public goods or the internalization of externalities, and are often not well managed.

This article has argued that the issue is not one to be resolved on general principles but on a case-by-case basis through the analysis of likely micro- and macroeconomic effects. In general, two radically different long-term options reconcile fiscal prudence with asset maintenance. The first is a fully commercially operated road agency, subject to the normal oversight of behavior accorded to privatized monopolies. The second is a reformed and well-functioning budget process. Neither option exists at present in most developing and transition economies. Thus, any recommendations on the role and nature of road funds must be viewed as a provisional, case-specific intermediate step in the direction of one of the long-term solutions (Potter 1997b).

This article lists a few indicators that can be used. In addition, the article argues that the interim arrangement requires four conditions. First, the road fund’s expenditure responsibilities should be limited to maintenance in order to correct a systematic bias against maintenance despite the link between investment and maintenance. Second, the road fund’s revenues should come only from direct charges on road users, except in the case of fuel surcharges (which need to be separated from general taxes in agreement with the treasury). Where feasible, weight-distance charges should be introduced for trucks. Third, the road fund should have professional management, under the direction of a user representative board and subject to strict oversight and auditing arrangements by third parties. Fourth, the road fund requires explicit transition arrangements as it moves toward a long-term solution.

As recent experience in Africa shows, when there is a crisis and main road systems fail, commercial interests can be mobilized to pay a surcharge on the existing fuel tax, so long as the user charge is devoted to improving the quality of the road infrastructure. Experience with second-generation road funds is very limited, however. It remains to be seen whether road fund management will be sufficiently immune to the kind of political interference that currently disturbs the flow of funds into road maintenance. And road authorities need to overcome the immediate, most extreme problems of deficient maintenance.

Therefore, analysts and policymakers should monitor carefully the recently introduced road funds in Sub-Saharan Africa and elsewhere. Sector programs and investment projects establishing these funds should include appropriate and comparable monitoring and evaluation components. Monitoring and evaluation of second-generation road funds well help to determine the utility and applicability of such interim arrangements and facilitate the amendment of initial designs on the basis of experience.

Notes

Ken Gwilliam is a transport economist with the World Bank’s Transport, Water, and Urban Development Department, and Zmarak Shalizi is a research manager with the Development Economics Department.

1. For this result, a heavy truck is defined as a load of about 10 tons (21,000 pounds) per axle and a medium car as a load of about 1 ton (2,000 pounds) per axle. The road damage of a vehicle axle load, $L$, (in tons) is calculated using the fourth-power formula: $[L/8.2]^4$. It is measured in equivalent standard axle loads, or ESALS; one ESALs is defined as 18,000 pounds (Hau 1992). For a more technical analysis, see Paterson (1988).

2. The World Bank policy review paper Sustainable Transport: Priorities for Policy Reform (1996) argues that fuel taxation may be an appropriate mechanism for covering many of the environmental impact costs, as well as the infrastructure use costs associated with road traffic, but only if there is no better, more direct charge available for each of the different externalities.

3. The difficulties of ensuring efficient channeling of revenues were exemplified in Mali in the late 1970s and early 1980s. Almost all of the revenue of the road fund was received through a postal checking service, the illiquidity of which prevented effective and timely finance of the routine road maintenance program. Most second-generation road funds are set up as a special account under an existing finance act. Money collected under the general taxing powers of the government is first paid into a consolidated fund and then transferred to the road fund. This arrangement works as long as it has the continuing support of the ministry of finance. Legislation under preparation in Ghana, Malawi, and Zambia and the arrangement already in operation in Yemen enable charges collected from users to be paid directly into the road fund.

4. To evaluate effectiveness, a case-specific set of indicators needs to be created to track changes for at least five years before and after the introduction of road funds. To facilitate comparison between countries, there should be a subset of indicators that are tracked for all road funds. The indicators should include the impact of road funds on general fiscal management (overall balances as well as allocations to other sectors) compared with their impact on revenues generated and spent on road maintenance. Some of the indicators should highlight the positive or negative impacts on incentives and accountability created by the governance structure (including the ability to resolve conflicts and withstand political pressures).

Table A-1. Road Expenditure Patterns in Selected Countries, 1988–95
(average annual values)

<table>
<thead>
<tr>
<th>Country</th>
<th>GNP per capita (1995 U.S. dollars)</th>
<th>Total government expenditure (% of GNP)$^a$</th>
<th>Total road expenditure (% of total government expenditures)$^b$</th>
<th>Road maintenance expenditure$^c$ % of total</th>
<th>% of GNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanzania</td>
<td>174</td>
<td>–</td>
<td>–</td>
<td>24.62</td>
<td>–</td>
</tr>
<tr>
<td>Yemen, Rep.</td>
<td>292</td>
<td>43.24</td>
<td>8.67</td>
<td>13.73</td>
<td>0.51</td>
</tr>
<tr>
<td>Kenya</td>
<td>392</td>
<td>27.16</td>
<td>16.36</td>
<td>4.54</td>
<td>0.20</td>
</tr>
<tr>
<td>Pakistan</td>
<td>481</td>
<td>23.32</td>
<td>3.43</td>
<td>29.21</td>
<td>0.23</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>615</td>
<td>29.11</td>
<td>3.45</td>
<td>6.54</td>
<td>0.07</td>
</tr>
<tr>
<td>Bolivia</td>
<td>853</td>
<td>26.15</td>
<td>19.95</td>
<td>11.83</td>
<td>0.62</td>
</tr>
<tr>
<td>Ecuador</td>
<td>1,315</td>
<td>15.80</td>
<td>14.71</td>
<td>14.09</td>
<td>0.33</td>
</tr>
<tr>
<td>Thailand</td>
<td>2,084</td>
<td>16.72</td>
<td>6.30</td>
<td>18.12</td>
<td>0.19</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>2,326</td>
<td>27.08</td>
<td>2.77</td>
<td>28.73</td>
<td>0.22</td>
</tr>
</tbody>
</table>

(Table continues on the following page.)
Table A-1 (continued)

<table>
<thead>
<tr>
<th>Country</th>
<th>GNP per capita (1995 U.S. dollars)</th>
<th>Total government expenditure (% of GNP)*</th>
<th>Total road expenditure (% of total government expenditures)</th>
<th>Road maintenance expenditure</th>
<th>% of total</th>
<th>% of GNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey</td>
<td>2,832</td>
<td>20.28</td>
<td>3.26</td>
<td>34.63</td>
<td>0.23</td>
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<tr>
<td>Brazil</td>
<td>3,152</td>
<td>51.70</td>
<td>0.38</td>
<td>30.05</td>
<td>0.06</td>
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<td>South Africa</td>
<td>3,195</td>
<td>45.24</td>
<td>1.73</td>
<td>32.37</td>
<td>0.25</td>
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<tr>
<td>Hungary</td>
<td>3,686</td>
<td>70.93</td>
<td>0.89</td>
<td>29.07</td>
<td>0.18</td>
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<tr>
<td>Korea, Rep.</td>
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<td>16.68</td>
<td>12.00</td>
<td>9.70</td>
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</tr>
<tr>
<td>Average</td>
<td>2,160</td>
<td>31.80</td>
<td>7.22</td>
<td>21.03</td>
<td>0.25</td>
<td></td>
</tr>
</tbody>
</table>

Countries with per capita income $8,000 or greater

<table>
<thead>
<tr>
<th>Country</th>
<th>GNP per capita (1995 U.S. dollars)</th>
<th>Total government expenditure (% of GNP)*</th>
<th>Total road expenditure (% of total government expenditures)</th>
<th>Road maintenance expenditure</th>
<th>% of total</th>
<th>% of GNP</th>
</tr>
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<tbody>
<tr>
<td>Portugal</td>
<td>8,386</td>
<td>44.07</td>
<td>2.40</td>
<td>6.09</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>13,429</td>
<td>61.98</td>
<td>2.10</td>
<td>34.60</td>
<td>0.45</td>
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<tr>
<td>Spain</td>
<td>13,771</td>
<td>50.61</td>
<td>2.17</td>
<td>19.81</td>
<td>0.22</td>
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</tr>
<tr>
<td>United Kingdom</td>
<td>19,205</td>
<td>52.26</td>
<td>1.56</td>
<td>40.82</td>
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<tr>
<td>Australia</td>
<td>19,484</td>
<td>46.47</td>
<td>2.85</td>
<td>29.68</td>
<td>0.39</td>
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<tr>
<td>Italy</td>
<td>20,853</td>
<td>54.93</td>
<td>2.60</td>
<td>33.66</td>
<td>0.48</td>
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<tr>
<td>Netherlands</td>
<td>22,479</td>
<td>69.45</td>
<td>0.70</td>
<td>57.20</td>
<td>0.28</td>
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<td>France</td>
<td>24,209</td>
<td>54.41</td>
<td>1.04</td>
<td>11.11</td>
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<tr>
<td>Austria</td>
<td>24,427</td>
<td>57.77</td>
<td>2.96</td>
<td>32.06</td>
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<tr>
<td>Finland</td>
<td>24,858</td>
<td>62.69</td>
<td>3.06</td>
<td>52.53</td>
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<td>Germany</td>
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<td>55.80</td>
<td>1.79</td>
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<tr>
<td>United States</td>
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<td>42.94</td>
<td>2.89</td>
<td>32.25</td>
<td>0.40</td>
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<tr>
<td>Sweden</td>
<td>27,659</td>
<td>72.00</td>
<td>1.31</td>
<td>66.28</td>
<td>0.63</td>
<td></td>
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<tr>
<td>Denmark</td>
<td>28,236</td>
<td>77.90</td>
<td>1.16</td>
<td>52.59</td>
<td>0.47</td>
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<td>Norway</td>
<td>31,067</td>
<td>62.37</td>
<td>2.05</td>
<td>32.69</td>
<td>0.42</td>
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<tr>
<td>Japan</td>
<td>33,761</td>
<td>19.01</td>
<td>10.54</td>
<td>14.14</td>
<td>0.28</td>
<td></td>
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<tr>
<td>Switzerland</td>
<td>39,760</td>
<td>44.45</td>
<td>1.82</td>
<td>18.45</td>
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</tr>
<tr>
<td>Average</td>
<td>23,833</td>
<td>54.65</td>
<td>2.53</td>
<td>32.09</td>
<td>0.37</td>
<td></td>
</tr>
</tbody>
</table>

—Not available.

Note: Gross national product (GNP) per capita is based on the market exchange rate. Calculation of GNP per capita in terms of purchasing power parity shows that while values change for all the countries selected, resulting in a change in internal rankings, there is no shift in countries between the two groups.

a. Total government expenditure includes all expenditures at the central, state, and local government levels. Original data in local currencies are converted to dollars using the exchange rate data from the World Development Indicators database of the World Bank.

b. Total road expenditure includes all capital and maintenance expenditures on roads at the central, state, and local government levels. Original data in SDR (Special Drawing Rights) are converted to dollars using the exchange rate data from IMF, International Financial Statistics Yearbook 1997.

c. Road maintenance expenditure includes all maintenance expenditures on roads at the central, state, and local government levels converted to dollars using the exchange rate data from IMF, International Financial Statistics Yearbook 1997.

d. The average for each variable is computed as the sample mean for the group of selected countries.

Glossary

Earmarking refers to the precommitment of taxes to support or fully fund prespecified expenditure items. These revenues may be channeled through the general treasury or may be paid directly to a dedicated fund.

First-generation road funds were established in the 1960s and 1970s as extrabudgetary arrangements through which an earmarked stream of tax revenues was put at the disposal of a road department or agency.

Ringfences are theoretical enclosures established by tax legislation around certain transactions in order to isolate them. This mechanism is used to separate the income or loss from one project from the income or loss from other projects. For example, the United Kingdom uses such a provision to prevent oil companies from using tax losses and relief from activities on the mainland to reduce their taxable profits from North Sea oilfields.

Second-generation road funds moved away from using earmarked tax revenues in the 1990s. Instead, they are funded by levies or surcharges designated as "user charges" and identified separately from general taxation.

Special taxing district refers to limited special-purpose forms of government to which taxing powers are devolved. In contrast to earmarking a part of tax revenues, the allocation of taxing powers includes the ability to set tax rates in a regulated framework.

Taxes are public charges that are generally unrelated to the costs of production of a particular transaction. These charges generate revenue that is collected by one set of government departments (treasury, internal affairs, customs and excise, or energy) and distributed through the budgetary process to another set of government departments (transport, public works, local government) for spending purposes.

Tolls are direct charges for public services that function like prices (analogous to public utility tariffs) and that are retained by the collecting entity.

User charges (or quasi prices) are indirect charges for infrastructure services that are often levied as fees on proxy transactions. The choice of proxy varies with the type of infrastructure. The more indirect the relationship between the transaction subject to charges and the behavior to be influenced, whether of suppliers or consumers, the more the user charge functions as a tax rather than a price.

References

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