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Highway Finance and Economic Development in Korea, West Germany, Japan, and the United States

Robert Cervero

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Contents

Preface

Road improvements are a vital link to economic development in rapidly industrializing countries such as Korea. Sharp increases in motorized traffic over the past two decades have spawned the construction of numerous expressways and major thoroughfares throughout Korea, which have in turn encouraged even greater traffic growth. Over the years, the central and local governments of Korea have passed numerous tax initiatives that collect revenues from road users in the form of vehicle acquisition taxes, vehicle ownership taxes, and fuel consumption surcharges. In this paper, Korea's highway finance program is compared to those of three advanced industrialized nations--West Germany, Japan, and the U.S. Emphasis is placed on defining the relative efficiency and equity of Korea's current highway finance program. The broader policy implications of current funding arrangements, particularly with respect to national economic development, are also addressed.

The materials for this paper were largely gathered ruing August 1989, when I was a visiting scholar at the Korea Research Institute for Human Settlements (KRIHS). A number of KRIHS staff members assisted me during my stay. Dr. Gun Young Lee sponsored my visit. Dr. Lee carefully reviewed my work plan and provided helpful suggestions on the research design. Dr. Dong-Joo Moon was also an invaluable resource throughout my stay, discussing a number of aspects of Korea's approach to highway finance with me and furnishing me with various background papers and reports. Those who assisted me throughout my stay also included Dr. Jai Young Huh, Dr. Jung Jay Joh, Dr. Jin Ho Choi, Dr. Yang Ho Park, and Dr. Jung Cheul Shin. All were very gracious with their time. Last but not least, I thank Mr. Jae Choon Lee, currently a

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Robert Cervero
Berkeley, California

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I. INTRODUCTION

A common problem faced by most industrialized nations of the world is that urbanization pressures are outpacing the ability of governments to provide necessary infrastructure, in particular highway capacity. Traditionally, fuel consumption taxes levied against users have been the primary source of funds for expanding national highways. Funding programs vary markedly among nations, however. Nations rely on fees for registration and vehicle acquisitions as well as excise taxes, user tolls, and private sector contributions to varying degrees. This suggests that the burdens, and thus the levels of "fairness," of different highway financing programs likely vary among nations as well.

The purpose of this study is to investigate how the Republic of Korea's system of financing national highways compares to those of three modern industrialized countries--the Federal Republic of Germany, Japan, and the United States. Comparisons are made with respect to the following factors: (1) funding sources; (2) tax rates; (3) tax expenditures; and (4) tax burden. Emphasis is placed on how efficient and equitable Korea's highway financing approaches appear relative to the "comparison" nations. Equally important, the implications of current funding arrangements on national economic development are probed as well.

This research focuses mainly on the road-financing responsibilities of national governments. Financing by other levels of government are also addressed, albeit only briefly. Only public sector road financing is

considered as well, even though in the U.S. a growing share of new road construction is being financed by private land developers and businesses. The study concludes with a summary and recommendations on the kinds of policy reforms which might make Korea's highway finance programs more economically efficient and equitable.

II. COMPARISON OF COUNTRIES

Korea is one of the most rapidly industrializing nations of the world. Between 1980 and 1987, its gross national product (GNP) per capita increased by 78 percent, from $1,590 to $2,826 (in constant 1980 US dollars). In many ways, Korea is a semi-developed nation. It has accumulated a level of national wealth on a par with other industrializing nations of the world, yet significant shares of its populous maintain the kind of rural, agrarian-based lifestyle found in many third-world countries.

West Germany, Japan, and the U.S. were chosen as comparison countries for the purposes of this study because they very much represent levels of industrialization that Korea appears to be heading toward. All three nations have mature industrial economies centered around manufacturing, construction, services, and exports. While the three account for a sizeable share of the world's gross industrial outputs, their rate of economic growth has slowed in recent years, suggesting they are reaching the "mature stage" of the traditional S-shaped logistics growth curve. In many ways, Korea's economic growth appears to be following in the footsteps of all three countries. Accordingly, it is instructive to compare Korea's highway finance system with those of advanced industrialized nations. To the extent that such nations are shifting their expenditure policies from new construction to maintenance, for

instance, lessons can be learned on possible funding reforms that might be in store for Korea.

Institutionally, the four nations investigated in this study vary by form of governance. Both West Germany and the U.S. have three-tiered federal systems comprised of a central government, sub-national or state governments, and local jurisdictions. Korea and Japan, on the other hand, have only two tiers -- central and local. In the area of highway finance, institutional responsibilities vary as well. In Korea, West Germany, and Japan, central governments bear most of the responsibility for building and maintaining the national system of roads. By contrast, roads are the constitutional responsibility solely of state governments in the U.S.

Of course, Korea differs from the comparison nations in terms of population, land area, density, and levels of wealth as well. Table 1 compares the nations along these dimensions. From the table, Korea is seen to have the smallest population and land area and the highest population densities among the four nations. Korea compares most closely to Japan in terms of population density; in both nations, around two-thirds of all land is mountainous and generally supports only low levels of habitation. America stands out for its low density, owing largely to the vast amount of wilderness and marginal lands in states like Alaska. Perhaps most relevant to this research is the relative level of wealth in Korea. The table shows that Korea's 1987 GNP per capita was less than one-quarter that of the other nations, a figure that places Korea in the World Bank's "less-developed" category. In many ways, then, this analysis involves the comparison of highway financing between a less-developed, semi-industrialized country, Korea, and three highly industrialized, advanced first-world nations with relatively high income levels. To the extent that Korea continues to experience rapid economic growth, comparisons of highway finance programs

Table 1

1987 National Statistics for Korea and Comparison Nations

	Korea	W. Germany	Japan	U.S.A.
Population (millions)	42.082	61.170	122.264	241.600
Land Area (sq. kms, in 1,000s)	99.221	248.577	377.835	9,363.1
Density (Persons/sq. km)	424	246	324	25.8
GNP (US$ in 1982 prices, millions)	118,924	1,038,739	1,604,814	3,721,937
GNP/Capita (US$ in 1982 prices)	2,826	13,582	13,126	13,202

Sources: United Nations, Economic Commission for Europe, Annual Bulletin of Transport Statistics for Europe; Japanese Statistics Bureau, Japan Statistical Yearbook, 1988; Korean National Bureau of Statistics, Korea Statistical Yearbook, 1988; U.S. Department of Commerce, Statistical Abstract of the United States, 1989.

with these more fully industrialized nations should provide some insight into the kinds of policy directions that might be considered in coming years.

III. HIGHWAY TRAVEL DEMAND

Since many highway funds are collected on the basis of how much roadways are used, it is instructive to compare travel demand levels among the four countries. Table 2 reveals general demand characteristics when expressed on a per-kilometer basis. The first row of the table shows that over 100 times as many kilometers of travel occurred in America as in Korea in 1987. On a per capita basis, moreover, the relatively low levels of road usage in Korea are demonstrated in Figure 1. On an annual growth rate basis, however, Table 2 shows that Korea witnessed the fastest increase in highway traffic--on average, around a 25 percent increase in vehicular volumes per year between 1983 and 1987. While Korea's percentage growth rate is somewhat high owing to its low base of auto ownership, rapid increase in per capita income in recent years no doubt explain much of the traffic growth. Since automobiles are superior goods whose consumption increases with rising disposable income, the meteoric rise in travel during the mid-years of the 1980s could well have been expected. Figure 2 indicates just how much automobile ownership levels increased over the 1983-87 period. Over these four years, the number of automobiles more than doubled in Korea, while in the remaining three countries the vehicle population grew only by 10 to 15 percent.

Table 2 also compares average annual travel distances among modes. In Korea, Japan, and Germany, buses (both urban and inter-city) average the most kilometers of travel, while in America they average the least. Commercial vehicles log the most kilometers annually in the U.S. Last, Table 2 compares the volume of goods movements among three major carriers. In West Germany and

Table 2

Comparison of
General Travel Demand Characteristics
Among Four Nations

	Korea	W. Germany	Japan	U.S.A.
Annual traffic volume (millions of vehicle kilometers):				
Cars	10,537	356,700	300,600	2,097,343
Buses	5,112	3,400	6,455	8,185
Trucks/Goods	9,284	35,800	229,900	837,050
2-Wheeler	248	7,000	12,500[a]	15,150
TOTAL	25,181	402,900	549,455	2,957,728
Total annual % increase in vehicle kilometers, 1983-1987	24.8	5.4	4.4	3.6
Average annual distance traveled in vehicle kilometers by:				
Car	12,479	13,800	10,491	15,486
Bus	25,503	50,900	27,760	13,790
Truck/Goods	16,387	27,600	12,042	20,840
Goods movements in millions of tons per kilometer by:				
Road	8,376	142,500	216,110	1,020,000
Water[b]	13,503	48,000	197,950	632,000
Rail	13,061	59,000	20,620	1,440,000

Notes: a = Estimated.
b = Inland coastal waterways.
Source: International Road Federation, World Road Statistics: 1983-1987, 1988.

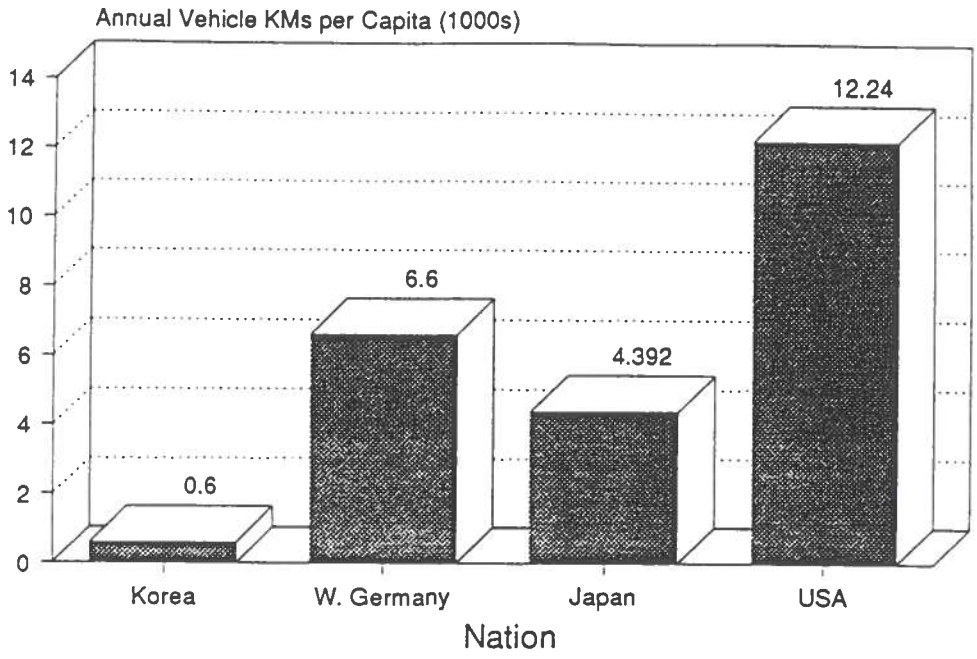


Figure 1. Comparison of Annual Vehicle Kilometers of Travel per Capita, 1987.

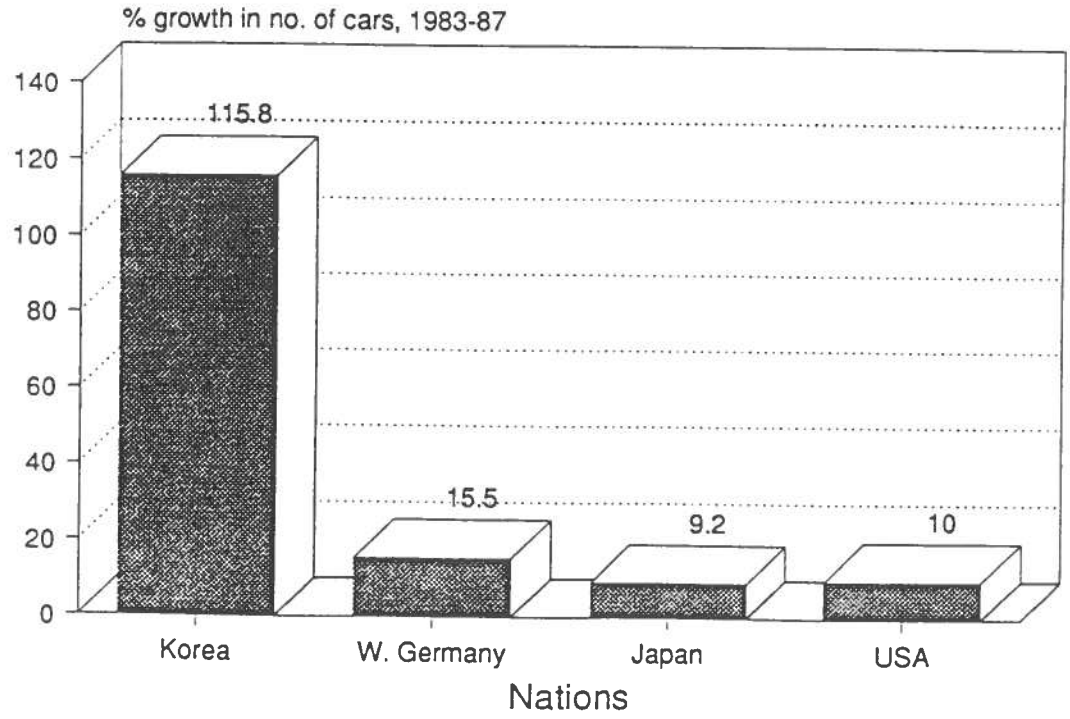


Figure 2. Percent Growth in Number of Four-Wheel Vehicles, 1983-1987.

Japan, trucks hauling cargo on roads are the predominant form of goods movement. In the U.S., rail transport accounted for the largest share of goods traffic in 1987, while in Korea, both inland and coastal water vessels hauled the most goods and cargo.

Comparisons of four-wheel vehicle populations are shown in Table 3. In 1987, there were over 110 times as many vehicles in America and over 30 times as many vehicles in Japan as in Korea. Figures 3 and 4 show the modal breakdowns in percentage terms for each country. Among four-wheel vehicles, private automobiles predominate in each country, although buses and trucks constitute a relatively large share of the vehicle population in Korea (Figure 3). Commercial vehicles also make up a substantial share of four-wheel vehicles in Japan. When expressed on a vehicle-kilometer basis, Figure 4 shows that private automobiles again are predominant among modes in the U.S. and Germany. In both Korea and Japan, however, trucks log a comparable number of kilometers per year as do cars.

Lastly, the bottom portion of Table 3 expresses the per capita levels of ownership of the three classes of vehicles. In 1987, only one out of 25 Koreans owned a car compared to one out of every 1.34 Americans. In spite of its high national wealth, Japan also has a relatively low count of vehicles per capita. In the case of Japan, such low per capita ownership levels stem, in part, from high tax rates which make owning a private automobile prohibitively expensive for many (McShane, Koshi, and Lundin, 1984).

IV. ROAD FACILITIES

Table 4 indicates how underdeveloped Korea's national system of roadways was, compared to the other three nations in 1987. While nearly four times the size of Korea, Japan had over twenty times as many kilometers of roads in 1987.

Table 3

Four-Wheel Vehicle Populations Among Four Nations, 1987

	Korea	W. Germany	Japan	U.S.A.
Vehicles in Use (in 1000s):				
Cars	844.3	28,304.0	29,478.4	138,431.1
Buses	200.5	70.0	234.2	593.7
Trucks/Vans	566.6	1,309.2	20,194.3	40,956.5
TOTAL	1,611.4	29,683.2	40,907.1	179,981.3
Vehicles in Use per capita:				
Cars	.021	.463	.241	.573
Buses	.005	.001	.002	.003
Trucks/Vans	.014	.021	.165	.170
TOTAL	.040	.485	.408	.746

Source: International Road Federation, World Road Statistics: 1983-1987, 1988.

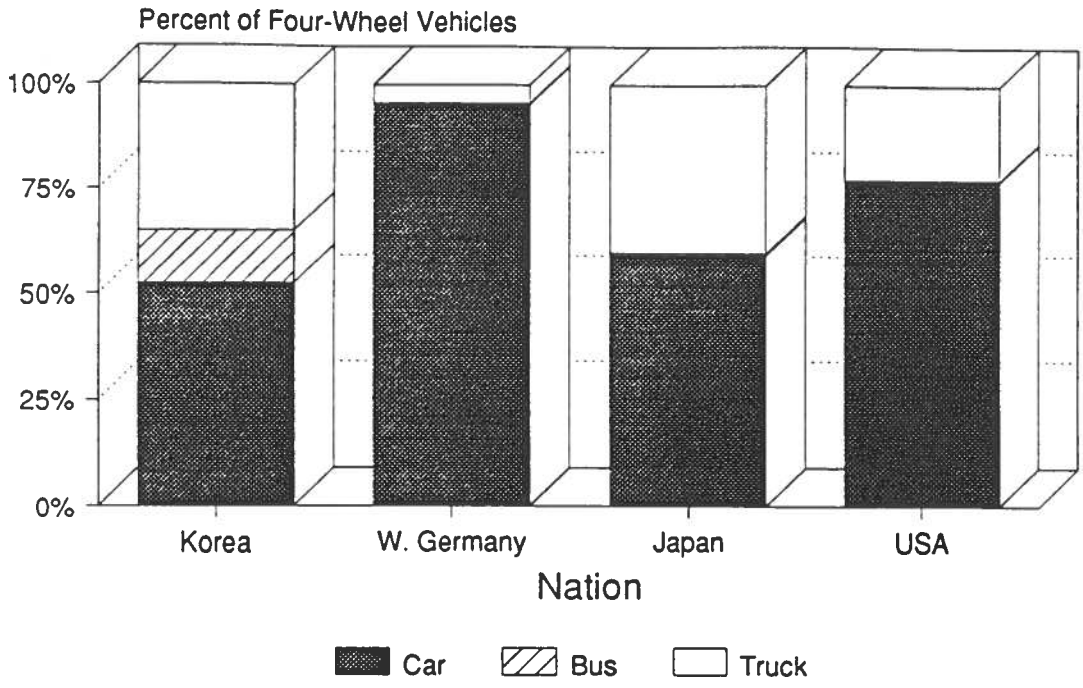


Figure 3. Percent of Vehicles in Each Modal Category, 1987

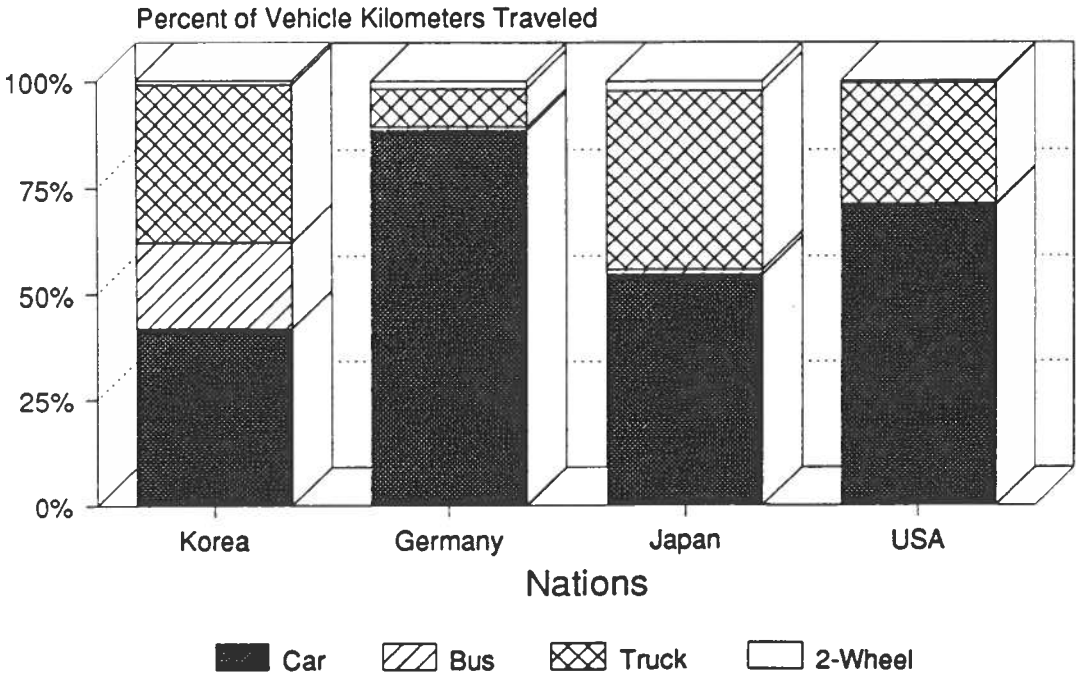


Figure 4. Percent of Vehicle Kilometers Traveled by Modal Groups, 1987.

Table 4

Comparison of Supply of Road Facilities Among Four Nations, 1987[a]

	Korea	W. Germany	Japan	U.S.A.
Kilometers of:				
Motorways/Expressways	1,539	8,597	3,910	82,279
Highways/National Roads	12,253	31,368	46,523	651,454
Secondary Roads	10,328	63,382	127,682	695,288
Local/Other Roads	30,569	389,291	920,817	4,895,436
TOTAL	54,689	492,637	1,098,931	6,242,177
Population per Kilometer of:				
Motorways/Expressways	27,344	2,161	31,269	2,936
Highways/National Roads	3,434	1,950	2,628	371
Secondary Roads	4,075	965	958	348
Local/Other Roads	30,569	157	133	49
TOTAL	768	124	111	38
Number of Four-Wheel Vehicles per Kilometer of:				
Motorways/Expressways	1,047	3,452	12,764	2,187
Highways/National Roads	131	946	1,072	276
Secondary Roads	156	468	390	259
Local/Other Roads	53	76	54	37
TOTAL	29	60	45	29
Kilometers of Total Roadways per Square Kilometer of Land Area:	0.55	1.98	2.91	0.61
Percent of Total Roads Paved:	57.2	99.0	65.4	56.1

Note: Kilometers expressed as lineal kilometers for one direction of travel only.

Source: International Road Federation, World Road Statistics: 1983-1987, 1988.

When indexed to population, Table 4 further reveals the relative scarcity of roads in Korea.

Figure 5 expresses the kilometers of roads for four types of facilities in each country, in percentage terms. Definitions of road classes often vary. In general, expressways are high-speed, limited-access facilities that are grade-separated. Like expressways, national roads typically link major centers of population and industry, but usually are at-grade facilities. Secondary roads generally serve as the feeders into national highways and small communities. Last, the function of local roads is mainly to connect higher-level facilities with individual land parcels. From Figure 5, it is evident that a comparable share of road types exists among the three developed countries. Japan has a larger share of local roads and a smaller share of expressways than Germany or the U.S. Among all four nations, Korea has the largest share of roads devoted to expressways, national highways, and secondary facilities, albeit the least developed local network.

Of course, the performance characteristics of road supplies can best be gauged in terms of usage levels per kilometer of road. This is shown in the third subcategory of Table 4, expressed as the number of four-wheel vehicles per road kilometer. In 1987, the average density of traffic appeared to be roughly comparable in Korea and the U.S. The largest number of vehicles per kilometer of road was registered in West Germany. Another expression of road density is the number of road kilometers per square kilometer of land area. Table 4 reveals that a larger share of land was covered by roadways in Japan than any other nation, while the smallest road density existed in Korea. Finally, the table shows the share of total road facilities that were paved in 1987. West Germany had, by far, the largest percentage of paved roads, followed by Japan. In both Korea and the U.S., fewer than 60 percent of all road

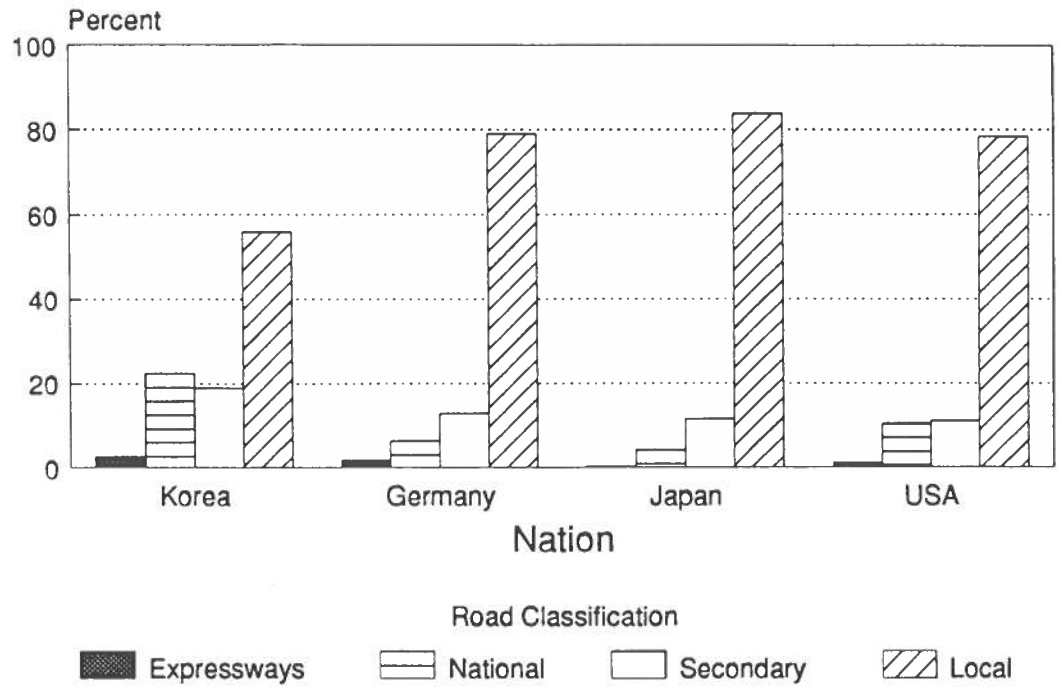


Figure 5. Percent of Total Road Kilometers in Each Road Classification Group, 1987.

facilities were paved in 1987. Korea's length of paved roads has increased dramatically over the past several decades, from only 1,120 kms in 1961 to 31,280 kms in 1987.

V. HIGHWAY REVENUE SOURCES AND ROAD-USER CHARGES

V.1. Taxation Principles

The construction, operation, and upkeep of highways is normally financed through charges levied against beneficiaries--that is, road users. While some fees are direct charges collected from those using a facility at a certain place and at a particular time (i.e., tolls), most funds consist of indirect charges levied upon potential consumers of road investments, such as vehicle owners or fuel purchasers. Thus, indirect charges such as fuel taxes and vehicle acquisition taxes are exactions on complementary products. That is, they are in lieu of charges.

The reliance on indirect charges compels one to ask, "how equitable are such funding programs?" While it may be true that indirect charges pass the total cost of highways on to all drivers as a group, considerable horizontal inequities may nonetheless exist. While gasoline use depends on distance driven, each mile driven does not impose the same extra cost. Driver A using road Z may end up supporting road X used by driver B. Equally important is the concern over vertical equity--collecting different rates of revenues from different classes of road users based on the social costs they impose on the road system. Because heavier vehicles are known to cause higher costs to be occasioned in building a road (e.g., higher overpass clearances, thicker pavement, sturdier bridge columns), differential tax rates which reflect such cost differences should exist if principles of efficiency and vertical equity are to be enforced.

At this point, it is important to distinguish between what is a "tax" versus a "user's charge." The two are fundamentally different; however, they are often used interchangeably. The efficient way to finance any resource is to charge consumers a price that reflects the scarcity value of the resource to the economy. In virtually all countries, there is a substantial difference between the resource price of fuel and the pump price. Many refer to this difference as a tax. In actuality, the greater part of the difference is a user's charge--an add-on to the resource cost designed to raise revenues to cover the cost of building and maintaining roads and bridges. The user's charge is in fact a "resource fee" to cover the cost of infrastructure resources that are nearly impossible to collect through direct payments. Again, occasionally highway costs are recovered through tolls; however, in most cases they are recovered indirectly through an add on or from various licensing fees. Low fuel prices that do not recover full highway fixed and variable costs are likely to result in inefficient resource allocation--i.e., artificially cheap road transport that penalizes competitors (e.g., trains and air transport).

The pump price of fuel often includes a third element--a pure tax that is levied on road users. A tax is a charge not related to the opportunity cost of resources used by the person who pays the tax. A tax element in any consumer price may, of course, be levied to influence consumer demand, to redistribute income, or simply to raise money. A congestion toll that attempts to lure motorists into buses and trains, for example, is more of a tax than a user's charge--i.e., it is used principally to reduce automotive demand rather than to generate funds to pay for highways.

In general, the distinction between user charges and taxes is often not recognized, and many user chargers are misleadingly referred to as taxes. In the discussions which follow, revenues which aim to recoup the cost of building

and maintaining roads will generally be referred to as road-user charges. Commonly, however, add-on charges to such items as motor fuel are defined as taxes in legislation. Even where a monetary receipt is referred to as a tax, it should be interpreted as a supplemental fee to the cost of owning or using a motor vehicle that in actuality is a road-user charge.

V.2 Revenue Sources for Road Financing

A variety of revenue sources are used among the four countries for financing highways. Table 5 lists the various revenue sources that existed in 1987. While in some cases revenues are earmarked specifically for constructing and maintaining roads (e.g., U.S. motor fuel taxes), in most instances receipts are channeled to the general fund of central and state governments from which allocations are made to the highway sector.

Three classes of tax sources are shown in Table 5: acquisition taxes, ownership taxes, and use taxes. While referred to as taxes in the legislation of each country, as discussed above most are actually road-user charges. Acquisition taxes, such as title taxes and sales taxes, are one-time add-ons that are exacted when a vehicle is purchased. They more or less reflect the fixed costs associated with providing infrastructure to accommodate a certain population of vehicles within a country. Ownership taxes are normally collected annually from vehicle owners, often based on the value, weight, or size of vehicles. In some sense, they reinforce both the beneficiary and ability-to-pay principles of tax equity. Like acquisition taxes, their purpose is mainly to pass on the fixed costs of providing road facilities for vehicle owners. In contrast, the aim of use taxes is mainly to capture the variable costs (e.g., maintenance, operations, extra pavement width) of providing roads. With the exception of tolls, all are indirect forms of user charges. Comparisons of

Table 5

Tax and Revenue Sources Used
for Road Financing
in Four Comparison Countries

	Korea	W. Germany	Japan	USA
Acquisition Tax				
Value-Added Tax	XX	XX	XX	
Commodity Tax			XX	
Sales Tax				XX
Title Tax				XX
Excise Tax				XX
Fuel Conservation Tax				XX
Ownership Tax				
Vehicle Tax	XX	XX	XX	
Registration Tax				XX
Special Consumption Tax	XX			
Property Tax				XX
Use Tax				
Motor Fuel Tax	XX	XX	XX	XX
Tolls	XX		XX	XX
Tire Tax				XX
Operator's License				XX
Sales Tax				XX
Inspection Fees				XX
Transport Tax				XX

XX = Tax exists for financing roadways

Source: International Road Federation, World Road Statistics: 1983-1987, 1988.

road-user taxation among countries are complicated by the different forms of taxes imposed, different definitions of vehicle classes, and the different distribution of taxing powers between various levels of government. Notwithstanding, Table 5 suggests considerable variation can be found among the four countries in how they finance their roads. While each nation has some form of acquisition, ownership, and use tax, specific tax sources vary from only three in West Germany to thirteen in the U.S. Revenue sources collected in Korea and Japan appear quite similar. West Germany has a relatively streamlined tax structure, collecting funds only in the form of a value-added acquisition tax, an annual vehicle ownership tax, and a motor fuel tax. The U.S. clearly has the most complex structure, featuring an array of special-purpose revenue sources. In part, America's multi-faceted tax structure reflects the active role of autonomous state governments in the highway finance area, each of which tends to collect a unique set of road-user charges.

V.3 Highway Tax Structures and Rates

For each of the tax sources listed in Table 5, the specific rate and assessment basis is shown in Table 6, by country. Among the acquisition taxes, Japan has the steepest rates in general, while in the U.S., higher tax payments are exacted for the purchase of heavy commercial vehicles. The U.S. also has a fuel conservation tax that penalizes "gas guzzlers." Germany collects a moderate-level acquisition tax that is uniform across vehicle classes. Korea, by contrast, imposes a relatively low acquisition tax that is collected at the local level for local roads.

Japan, Korea, and the U.S. all have a fairly complex system of ownership taxes. Owners of large and heavy vehicles generally pay the highest ownership taxes in both Korea and Japan. This is the case, however, only for private

Table 6

Sources, Rates, and Basis of Assessment
for Road User Taxes as of 1988 for Comparison Countries

Country	Type of Tax	Rates and Assessment Base
KOREA	Acquisition	2% of auto price (local)
	Ownership	
	Auto tax (annual)	Varies by type of auto, engine size, wheelbase, and degree of business use -- 4,400 to 486,700 Won (local)
	Registration tax (annual)	5% of auto price (local)
	Authorization tax (annual)	Varies by type of auto and engine size -- 16,200 to 27,000 Won (local)
	Special consumption tax (annual)	15% to 40% of auto price, depending on engine size (national)
	Use	
	Motor fuel tax	75% of unleaded petrol; 100% of leaded petrol; 10% of LPG; 10% of Diesel (national)
	Tolls	16 to 46 Won/km (national)
WEST GERMANY	Acquisition	14% VAT
	Ownership	
	Vehicle tax (annual)	DM 14.4/100 cc for private cars and up to DM 11,000 for trucks
	Use	
	Motor fuel tax	DM 0.49/litre, unleaded petrol; DM 0.53/litre, leaded petrol; DM 0.45/litre, diesel
JAPAN	Acquisition	
	Commodity tax	Varies from 5% to 23% of vehicle price, depending on size
	Purchase tax	5% of retail price of cars; 3% of retail price of trucks
	Ownership	
	Vehicle tax (annual)	4,000 Yen for motorcycles; ranges from 4,000 to 148,500 Yen for cars; 17,500 to 49,000 Yen for buses; 3,000 to 25,500 Yen for trucks
	Tonnage tax (annual)	2,500 Yen for motorcycles; 6,300 yen for cars and trucks
	Use	
	Motor fuel tax	53,800 Yen/kg-litre, gasoline; 24,300 Yen/kilo-litre, diesel; 17,500 Yen/kg, LPG
	Tolls	Most urban expressways have tolls of 800 Yen/km

Table 6 (continued)

Country	Type of Tax	Rates and Assessment Base
USA	Acquisition	
	Excise tax	12% of retail price of new trucks over 16.5 tons and trailers over 13 tons Gross Vehicle Weight (national)
	Fuel conservation tax	Graduated tax on new cars with under 27.5 mpg fuel consumption (national)
	Sales tax	Most states and some local govt's: various rates up to 7.5% of sale price of vehicle.
	Title tax	Most states: varies from $1 to $18.50
	Ownership	
	Registration fees (annual)	All states: varies from $3 to $2,160, $3 to $2,160, depending on vehicle size/weight, private/contract carrier, farm/non-farm use, etc.
	Property tax (usually annual)	Most state and local govt's; varies up to $5,051
	Use	
	Motor fuel tax	Federal: $0.09/gallon gasoline; $0.15/gallon diesel; all but $0.01 dedicated to highways.
		All states: ranges from $0.07 to $0.19/gallon for gasoline; $0.07 to $0.205/gal. for diesel; 12 states all collect sales tax on fuel consumption
	Tire tax	Federal: varies up to $10.50 + $0.50/lb/tire
	Sales tax	Most states and a few local govt's: vehicle parts, tires, lubricants, accessories, etc.
	Operator's licence	All states: varies
	Vehicle safety and emission inspection fees	All states: varies
	Tolls	Some local and state toll authorities: varies
	Transport tax	Most states: carrier gross receipt tax, mileage/ton-mile and passenger-mile tax, weight or capacity tax, flat rate tax, permit fees, etc.

Source: International Road Federation, World Road Statistics: 1983-1987, 1988

automobiles; relatively low rates are collected from owners of trucks and commercial vehicles. In contrast, heavier and larger vehicles pay higher ownership taxes in the U.S. regardless of vehicle class. Thus, trucks generate substantially larger revenue sums than private automobiles in the U.S.

Motor fuel taxes constitute an important user tax source in all four countries. Table 7 highlights the fuel tax structure of each nation. Germany has the highest fuel tax rate for both petrol and diesel fuels--with fully three-quarters of the pump price for petrol consisting of a surcharge. The U.S. exacts the lowest tax for petrol consumption, whereas Korea collects the smallest surcharge from diesel fuel users.

From Table 6, it is seen that the U.S. has the most complex use-related tax structure. In particular, a progressive series of excise taxes (e.g., tire, parts, sales) are collected to capture the higher marginal cost of building and maintaining roads to serve heavier vehicles. Tolls, the most direct and accurate gauge of road-use benefits, are collected in Korea, Japan, and Germany. In both Korea and Japan, tolls constitute an important source of local revenues; in the U.S., tolls are collected mainly by state authorities.

V.4 Road-User Receipts

The total amount of revenues received from the various tax sources described in the previous section in 1987 are shown in Table 8. In both Japan and the U.S., acquisition taxes are fairly significant sources of revenue. Korea collects the largest share of its road-user fees from ownership fees. The other three countries, on the other hand, are most reliant on user fees for its revenues. In the case of West Germany, around three-quarters of all receipts are from motor fuel taxes. Korea relies most heavily upon tolls among comparison countries. Finally, the U.S. generates a significant share of its

Table 7

Comparison of
Fuel Taxation and Consumption Rates
Among Four Nations

	Korea	W. Germany	Japan	U.S.A.
Petrol:				
% taxation content of minimum price per liter of fuel	50.1	75.0	43.9	22.4
Total consumption (metric tons in 1,000s)	1,222	25,053	28,888	351,700
Diesel:				
% taxation content of minimum price per liter of fuel	14.6	67.2	33.2	27.7
Total consumption (metric tons in 1,000s)	8,450	15,871	25,460	48,802

Source: International Road Federation, World Road Statistics: 1983-1987, 1988.

Table 8

Comparison of Road User Receipts Among Four Nations

	Korea	W. Germany	Japan	U.S.A.
Total Road User Receipts (in US$ 1987 prices, in millions)	1,424	17,659	36,188	55,829
Percent of Road User Receipts from:				
Taxes on:				
Acquisition	5.9	0.0	19.6	13.3
Ownership	43.0	24.9	32.6	5.4
Use	35.4	75.1	45.8	42.6
Driver License Fee	0.0	0.0	0.0	1.0
Tolls	15.7	0.0	2.0	4.2
Other Special Taxes	0.0	0.0	0.0	33.5
TOTAL	100.0	100.0	100.0	100.0
Road User Receipts as % of GNP	1.1	1.7	1.6	1.5
Road User Receipts as % of Total Government Revenue	3.9	3.7	3.7	4.7

Sources: International Road Federation, World Road Statistics: 1983-1987, 1988; Korea Research Institute for Human Settlements.

road-user income from various special taxes, such as fuel conservation taxes, tire taxes, and inspection fees--around one-third of all receipts.

The bottom portion of Table 8 shows road-user receipts as a percentage of the total GNP of each nation. Percentages fall between 1 and 2 percent, with Korea devoting the least amount of its national wealth to roads and West Germany devoting the most. As a share of total government revenue, Korea has the second highest level of road-user receipts among the four nations, second only to the U.S.

The revenue statistics presented in Table 8 were indexed to various scale factors regarding population and kilometers of road. The resulting statistics are shown in Table 9. Korea lags far behind the four developed countries in the amount of road-user revenue generated per capita. Japan, for instance, collected nearly nine times as much road-user revenues per citizen as did Korea. On a kilometer basis, however, Korea matches up favorably with both West Germany and Japan. Because of its extensive road network, America registered a fairly small amount of user receipts per kilometer of highway. Perhaps the best barometers of levels of road revenue receipts are shown in the last two rows of Table 9. While on a per capita basis Korea collected the least amount of road-user revenue, on a per vehicle basis it collected the most. On average, each registered four-wheel vehicle produced $884 (in U.S. dollars) in highway revenues in 1987. Additionally, every four-wheel vehicle driven in Korea in 1987 generated around $0.057 for each kilometer of travel, a rate second only to Japan's $0.066. Overall, then, it appears that both Korea and Japan exact the steepest user-related charges against drivers, while the U.S. collects the smallest amount.

Table 9

Comparison of 1987 Unit Statistics on Road User Revenues for Four Nations

	Korea	W. Germany	Japan	U.S.A.
Total Revenue per Capita (in US$ 1987 prices)	33.8	288.7	296.0	231.1
Total Revenue per Kilometer of Road (in US$ 1987 prices)	26,038	35,846	32,930	8,944
Total Revenue per Kilometer of Paved Road (in US$ 1987 prices)	45,521	36,958	50,352	15,919
Total Revenue per Four-Wheel Vehicle (in US$ 1987 prices)	884	595	725	310
Total Revenue per Annual Vehicle Kilometers Traveled (in US$ 1987 prices)	0.057	0.044	0.066	0.019

Source: International Road Federation, World Road Statistics: 1983-1987, 1988.

V.5 Summary of Highway Finance Programs

Below, the overall highway tax structure of each of the four nations are briefly summarized.

Korea

Korea uses an assortment of indirect taxes to finance its road development program. In general, Korea's road tax structure favors commercial trucks and other heavy vehicles. Commercial vehicles usually pay the smallest ownership, authorization, and special consumption taxes. In the case of the local vehicle tax, for instance, vehicles are classified into 45 groups according to their type, size, and commercial-use status. Owners of the largest automobiles pay as much as 486,700 won per year in taxes, whereas owners of much larger and heavier trucks pay at most 126,000 won per year. Moreover, only a 10 percent surcharge is levied on diesel fuels (which are consumed mostly by trucks and buses), compared to the 75 percent to 100 percent surcharge that is placed on petrol. In 1987, none of Korea's indirect tax revenues were earmarked specifically for highway projects. (In 1988, however, Korea began dedicating highway funds in a special reserve account.) Rather, all receipts ended up in the general treasuries of both central and local governments. Toll revenues, by comparison, were reserved solely for the construction and maintenance of expressways.

West Germany

The major source of Germany's road-user receipts is the motor-fuel tax. Around three quarters of the price of a liter of petrol purchased in West Germany is a user surcharge. About one-third of all revenues collected are earmarked for national roads and expressways (autobahns), while the remainder is distributed to local governments on a formula basis for financing municipal roads. Compared to the U.S., one recent study found that the owner of a 1,500cc

automobile in Germany paid, on average, nearly five times as much per year in road-user charges as the owner of a similar car in the U.S. (Pucher, 1988).

Japan

As in the case of Germany, Japan has hypothecated road-user receipts to highway programs. In 1954, the Japanese government created a special account under which fuel taxes and other road-user receipts were reserved. This has allowed the stable and systematic implementation of road projects, regardless of the condition of the national treasury (Fujii, 1989).

Japan exacts comparatively high taxes from automobile owners, in part because of the nation's severe space constraints and because the absence of any substantial petroleum reserves requires that vehicle ownership be rationed (McShane, Koshi, and Lundin, 1984). Besides acquisition, ownership, and usage taxes, Japan collects a commodity tax that is levied on the manufacturer. The cumulative tax burden increases very rapidly with vehicle weight, so that, for all vehicle classes above the smallest 550cc mini-cars, the annual tax burden for car owners is much higher than in the U.S.--up to six times as high for the largest cars (McShane, Koshi, and Lundin, 1984). As in the case of Korea, however, tax concessions have historically been granted to commercial vehicles, ostensibly for the purpose of stimulating national economic development.

U.S.A.

One of the hallmarks of America's national highway finance program is the Highway Trust Fund. The Fund was originally set up as a mechanism for establishing a national system of highways, and in particular, to expedite the completion of the Interstate and Defense Highway System. In 1978, maintenance of the interstate, primary, and secondary systems became a permanent feature of the Trust Fund. Later, the diversion of funds to mass transit projects was allowed.

Essentially, the Highway Trust Fund is a holding device for dedicated funds. The Fund is made up of revenues derived from the assorted tax sources listed in Table 6. In addition to mass transit programs and administration, Trust Funds can be used for new construction as well as the 4 R's--reconstruction, resurfacing, restoration, and rehabilitation. The federal government is not in the road construction and upkeep business. Rather, most of its funds are distributed to state Departments of Transportation based on various formula programs. The federal government exercises differing degrees of control over the use of funds it passes along to states and local authorities, depending on the category of funds. In the case of interstate highways, for instance, all aspects of design and engineering standards are prescribed by the federal government.

All fifty states are actively involved in highway development through their respective Departments of Transportation. State highway user taxes generally account for around 50 to 60 percent of state road-related receipts, with federal grants making up much of the remainder. State highway user taxes generally consist of fuel taxes, motor vehicle registration fees, and driver license fees. Each state levies taxes on motor fuels in addition to the federal fuel taxes, ranging from a low of $0.075 per gallon of gasoline in Georgia, in 1987, to a high of $0.20 per gallon in both Montana and Wisconsin. Many states have earmarked excise taxes as well. The State of Washington, for instance, collects a 2.4 percent surcharge against the fair market value of automobiles sold within the state. Nearly one half of these revenues can be use to subsidize mass transit projects. In California, moreover, sales tax receipts collected from consumer goods as well as motor fuel purchases are set aside for highway and mass transit programs.

Lastly, most local governments collect an assortment of use-related revenues, including road and bridge tolls, parking charges, and traffic fines. Increasingly, America's municipalities and counties are applying receipts from property taxes, special assessment districts, and impact fees to pay for highway projects.

VI. ROAD EXPENDITURES

VI.1 Summary Statistics

The 1987 road expenditure levels for central, subnational (state), and local levels of government are shown for the four nations in Table 10. For all government levels combined, Japan stands out for its high road expenditure levels in 1987--over $70 billion (in U.S. dollars). In fact, Korea's total outlays for roads was only around 3 percent of Japan's for the same year. In all countries except Japan, subnational units of government (i.e., states, counties, and municipalities) spent larger amounts of monies on road development than central governments.

The relative breakdowns of expenditures for construction, maintenance, and administration are shown in Figure 6. In the cases of both Korea and Japan, both of which have witnessed dramatic increases in motorization levels over the past two decades, the bulk of total road expenditures goes for new construction. By contrast, both West Germany and the U.S., two nations with more mature highway networks, as much income goes for maintenance and administration as it does for new construction.

As was done with revenue data, expenditure statistics were indexed to various scale measures of population and kilometers of roadways. From Table 11, Japan appears to have the most ambitious road development program, at least for the year 1987. While, on a per capita basis, Japan spent more than ten

Table 10

Road Expenditures Among Government Units and Cost Categories for Four Nations, 1987[a]

	Korea	W. Germany	Japan	U.S.A.
Central Government:				
Construction	773.2	3,145.2	36,042.4	455.0
Maintenance	75.0	629.6	2,407.0	134.0
Administration and Other	64.9	181.5	92.3	381.0
TOTAL	913.1	3,956.3	38,541.7	970.0
State and Regional Governments:				
Construction	-	997.6	-	22,050.9
Maintenance	-	580.5	-	6,717.0
Administration and Other	-	438.2	-	9,108.0
TOTAL	-	2,016.3	-	37,875.9
Local Governments:				
Construction	935.8	4,378.9	25,333.8	7,127.1
Maintenance	271.2	3,300.0[b]	5,797.6	11,250.0
Administration and Other	142.0	2,990.9	1,155.7	6,524.1
TOTAL	1,349.0	10,669.8	32,294.3	24,901.2
All Governments:				
Construction	1,709.0	8,521.7	61,376.2	29,633.0
Maintenance	346.2	4,510.1	8,204.6	18,101.0
Administration and Other	206.9	3,610.6	1,248.0	16,013.1
TOTAL	2,262.1	16,642.4	70,828.8	63,747.1

Note: (a) All figures in US$ 1987 prices, in millions
(b) Estimated.

Source: International Road Federation, World Road Statistics: 1983-1987, 1988.

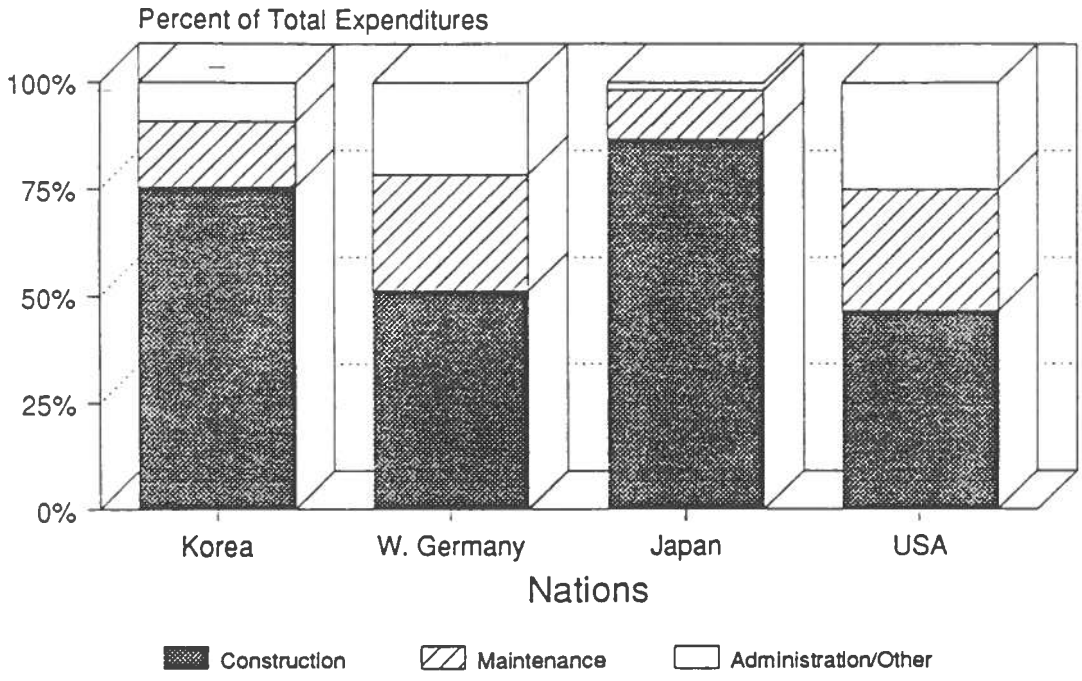


Figure 6. Distribution of Road Expenditures by Category, 1987.

Table 11

Comparison of 1987 Unit Statistics on Road Expenditures for Four Nations

	Korea	W. Germany	Japan	U.S.A.
Total Expenditure per Capita (in US$ 1987 prices)	53.8	272.1	579.3	263.9
Total Expenditure per Kilometer of Road (in US$ 1987 prices)	41,362	33,782	64,452	10,212
Total Expenditure per Kilometer of Paved Road (in US$ 1987 prices)	72,312	34,124	98,551	18,203
Total Expenditure per Four-Wheel Vehicle (in US$ 1987 prices)	1,404	561	1,419	354
Total Expenditure per Annual Vehicle Kilometers Traveled (in US$ 1987 prices)	0.090	0.041	0.129	0.022

Source: International Road Federation, World Road Statistics: 1983-1987, 1988.

times as much on roads as did Korea, on a per vehicle basis the national outlays were comparable. On a per kilometer basis, moreover, both Japan and Korea expended far more on roads than the other two nations. The breakdowns of per kilometer road expenditures among construction and maintenance categories are summarized in Figure 7. Again, Japan and Korea stand out for their high rates of expenditures for construction.

Perhaps the best indicator of how responsive road spending is to demand is the last one shown in Table 11. For every vehicle kilometer of travel, both Korea and Japan spent over twice as much on road development as did Germany and over four times as much as did the U.S. Again, given the mature stages of their road systems, relatively low expenditure levels could be expected for both Germany and the U.S.

VI.2 National Expenditure Programs

The road expenditure programs of each of the four nations are summarized below.

Korea

Korea's central government is responsible for all budgeting decisions affecting expressways and national roads (Moon, et al., 1989). Specifically, the Ministry of Construction (MOC) prepares a budget that must eventually be approved by the nation's Congress. In addition, MOC is responsible for national roadway planning and programming. A separate quasi-government entity, the Korean Highway Corporation (KHC), is in charge of developing the national system of expressways. The bulk of its revenues come from user tolls.

A portion of local road budgets is supported by the central government. One source is grants provided by the MOC for financing road construction, maintenance, and emergency repairs at the provincial level. In addition, Korea's

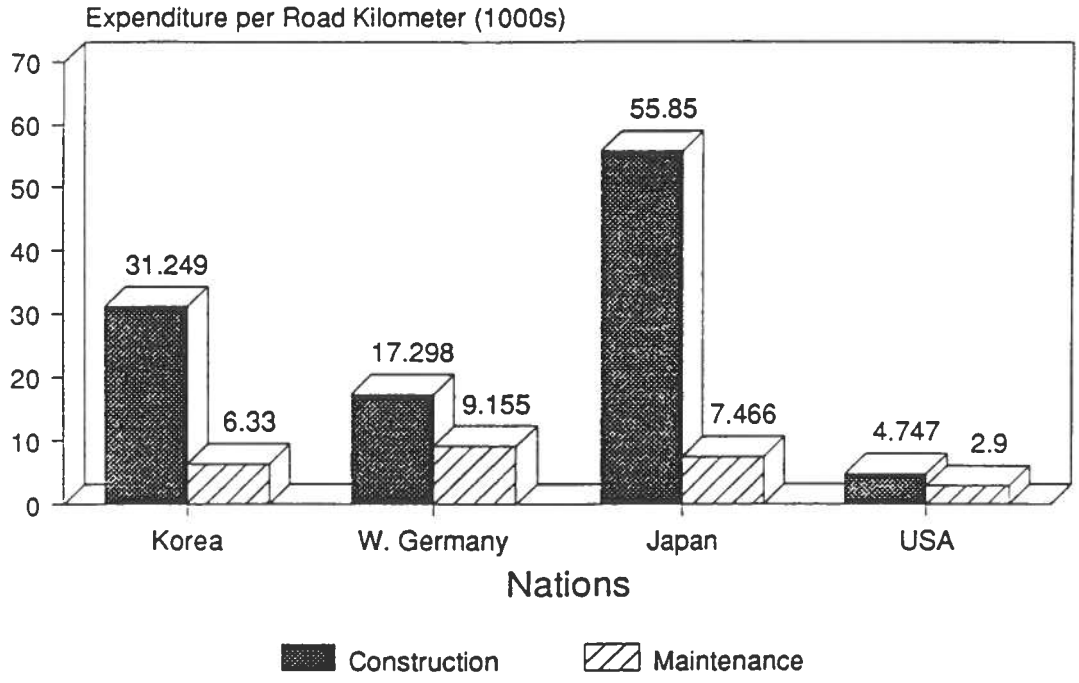


Figure 7. Per Kilometer Road Expenditures on Construction and Maintenance, 1987.

Ministry of Home Affairs (MOHA) assists local governments with finance road improvements through general budget transfers.

West Germany

Germany's federal government (Bundesregierung) finances 100 percent of the construction and maintenance work on the national highway system. Of fuel tax revenues (which constitute around three-quarters of all road-user receipts), around 15 percent goes to local transport projects and around 40 percent is allotted to general revenue accounts (Bureau of Transport Economics, 1982). The federal government's involvement with roads is purely financial, however. Each state (Landers) has its own road authority which is responsible for the planning, financing, and construction of state highways. In addition to federal transfers, state governments fund state highways from their own revenue sources. Currently, around 42 percent of state revenues come from annual motor vehicle ownership tax receipts.

Japan

In many ways, Japan's highway budgeting and expenditure programs parallel those of Korea. There is a quasi-independent Japan Highway Corporation, for instance, that, as in Korea, is in charge of constructing, managing, and maintaining the inter-city network of expressways, under the control of the Ministry of Construction. In Japan, all intra- and inter-urban expressways are tolled, and tolls are quite high by international standards--a 50-mile trip on an interurban expressway can exceed $10 (U.S. dollars). Where Japan's highway financing policies differ the most from Korea's is in the earmarking of funds for specific road construction and maintenance purposes. The dedication of revenues has enabled long-term road development programs to evolve with the assurance of a steady stream of funding.

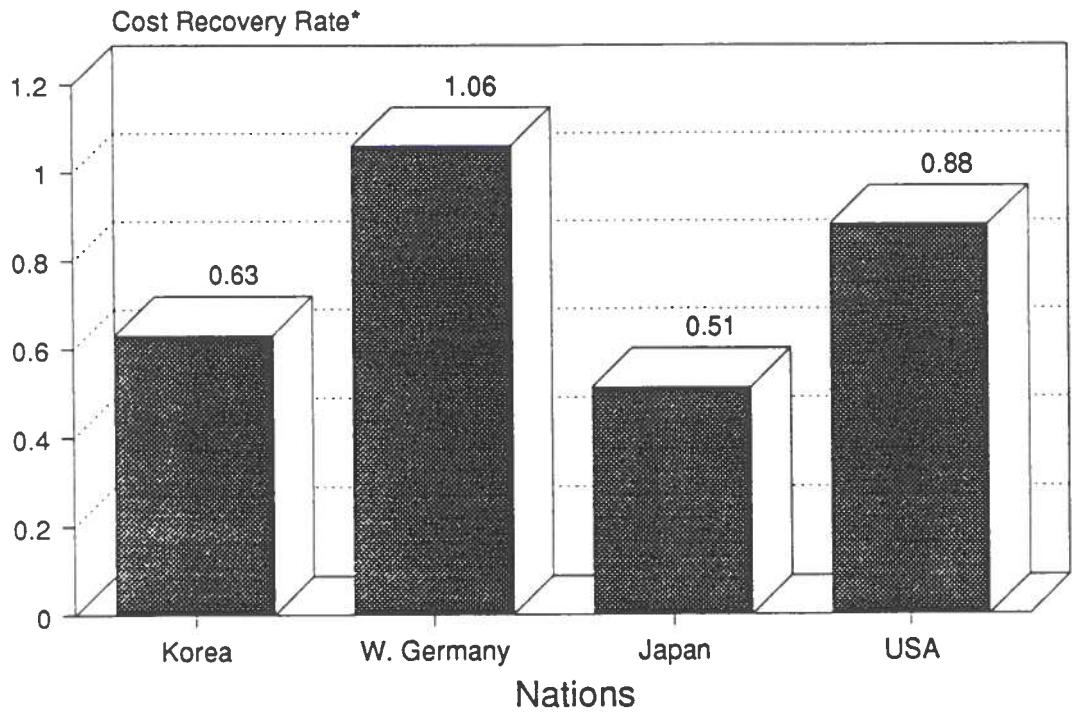
U.S.A.

In the U.S., the federal government pays for 90 percent of the cost of national highway construction. Most grants are special-purpose, targetted for such programs as expanding the interstate highway system, major urban arterials, or reconstruction of nationally designated roads. States generally provide the remaining match. All maintenance responsibilities fall with state Departments of Transportation. In addition, states are responsible for all aspects of planning, programming, and budgeting of state highway projects. Finally, municipalities and counties generally shoulder the responsibility of financing local road development, with some funds transferred from both federal and state sources.

VII. COST RECOVERY RATES

Cost recovery rates measure the ratio of total road-user receipts to total road expenditure outlays. Figure 8 summarizes the cost recovery rates of the four nations in 1987. Only Germany registered a surplus of funds that year. The U.S. covered 88 percent of its total highway expenditures, while both Korea and Japan covered much smaller shares. In the case of Japan, only around one-half of total highway expenditures were covered by road-user revenues. Ostensibly, the other half represented indirect subsidies from the general treasury.

It appears that the two nations with the largest and most mature network of highways, Germany and the U.S., have highway finance programs that are more or less self-sufficient. In the case of Korea and Japan, both of which have undergone rapid economic growth in the past decade, dramatic increases in motorization appear to have swayed governments to cross-subsidize road users through general revenue receipts. In both cases, central government support of



*Cost Recovery = Revenues/Expenditures

Figure 8. Cost Recovery Rates Among Four Countries, 1987.

road development has been pursued for the purpose of stimulating macro-economic growth.

VIII. TAX BURDENS

As mentioned earlier, Korea's current highway finance program appears to favor heavier commercial vehicles by virtue of the current tax structure and rates. Owners of heavy commercial vehicles pay substantially less in vehicle taxes than those who own private automobiles. Diesel fuel is likewise taxed at a substantially lower rate. Unlike in the U.S. and other industrialized countries, no axle-load or weight-distance tax programs exist in Korea. Thus, considerable cross-subsidies from private automobile users to commercial vehicle owners appear to exist in Korea.

Tax burden refers to who ends up paying a tax. In the transportation sector, this is typically defined in terms of classes of vehicles, mainly because differences in the costs occasioned in building certain types of facilities can be most directly attributed to different kinds of vehicles. For instance, the extra cost of building wide lanes, stronger bridge abutments, and high overpass clearances is incurred mainly to accommodate trucks and buses. Under most principles of fairness, a higher tax burden should fall on this class of vehicles to reflect the higher costs incurred in serving them.

Table 12 was prepared to investigate the equity implications of tax burdens under Korea's current highway finance system. The distribution of road-user receipts among five classes of vehicles are shown for both Korea and the U.S. in 1986. The final column of the table shows the cost responsibility assigned to each class of vehicles, based on the results of the highway cost allocation study conducted by the U.S. Federal Highway Administration, generally considered to be the most authoritative study on the subject. In this

Table 12

Comparison of Cost Burden Among Vehicle Classes Based on Highway Finance Programs of Korea and the USA in 1986

Vehicle Class:	Percent of Road User Receipts Collected from Each Vehicle Class: Korea	USA	Percent of Costs Assigned to Vehicle Class in USA[1]
Passenger Cars:			
Autos	63.2	36.1	21.5
Buses	11.7	14.1	2.4
Pick-ups/Vans	5.5	11.1	9.1
TOTAL	80.4	61.3	33.0
Trucks:			
Single Unit	14.7	30.6	11.9
Combinations	4.9	8.1	55.1
TOTAL	19.6	38.7	67.0

Note: (1) Based on cost allocation made to vehicle classes for all federal highway expenses incurred in the U.S. in 1977, from Table I-2 of the Final Report on the Federal Highway Cost Allocation Study.

Sources: Moon, D.J., et al., Study of Highway Investment Policy, Seoul: Korea Research Institute for Human Settlements, 1989; U.S. Department of Transportation, Final Report on the Federal Highway Cost Allocation Study, Washington, D.C.: U.S. Government Printing Office, 1982.

paper, the variable costs associated with constructing and maintaining each component of the roadway system were attributed to different size and weight attributes of each vehicle class in developing the pro-rations. While the assigned cost responsibilities are averages for the U.S., since the price of most factor inputs used to build roads are fairly similar across nations (e.g., cement, heavy equipment), the cost pro-rations shown should be universally applicable. Indeed, the pro-rations contained in the third column match up fairly closely with those estimated for Korea by Professor Dong Kun Kim of Seoul National University [and cited in the study by Moon, et al. (1989)].

It is apparent from Table 12 that considerable vertical inequities exist in the tax burden placed on different vehicle classes. While private automobiles, on average, are responsible for around 22 percent of the cost of constructing and maintaining roads, they contribute over 63 percent of all road-user receipts in Korea. By contrast, multiple-axle trailer trucks are estimated to impose around 55 percent of the costs on the roadway system yet contribute less than 5 percent of revenues. Overall, trucks and commercial vehicles are responsible for around two-thirds of all highways costs, yet contribute less than one-fifth of all road-user income. Clearly, the inequities inherent in Korea's highway finance program are alarmingly high.

IX. POLICY INFERENCES AND CONCLUSIONS

In general, a strong case can be made for reapportioning the contribution of Korea's road users to more closely reflect the cost and damage they impose. Korea's current financing arrangements result in costly market distortions and could be causing existing roads to deteriorate prematurely.

Ostensibly, Korean officials have consciously lowered the tax rate of commercial vehicles as a means of stimulating national economic growth. By

giving private businesses a tax break, the logic goes, higher corporate profits will be rechanneled into new investments and consequently the creation of new jobs. Such tax subsidies can have a number of drawbacks, however. The main ones are discussed below.

(1) The failure to exact charges that recover costs invariably leads to overconsumption. In Korea's case, mispricing has led to more truck travel than would otherwise occur if fees fully covered costs. Excessive truck travel means that existing road investments will deteriorate fairly rapidly due to the high level of wear and tear imposed by high volumes of heavy vehicles. In general, pavement damage is known to increase geometrically as a function of the dead axle weight of a vehicle. The passage of a single 10-ton double-axle truck, for instance, can inflict as much pavement damage as the passage of 4,600 standard-size passenger vehicles (U.S. Department of Transportation, 1982). By underpricing truck travel and thus encouraging the overuse of trucks, Korea's current funding policies unavoidably cause the accelerated deterioration of roads. For a country which is rapidly industrializing and whose road expenditures are shifting more and more from new construction to maintenance, this poses a serious dilemma. Increasingly, additional funds for maintenance and repairs will be needed, yet current funding policies favor those vehicles that cause the most roadway wear and tear. Should truck traffic grow faster than maintenance funds, then the resulting scenario must be one of poorer-quality roads. The most efficient funding program in an environment where increased maintenance monies are needed would involve the collection of high tax payments from heavy vehicles.

(2) Mispricing or under-taxation results in inefficient resource allocation. This generally takes the form of modal choices that favor artificially cheap road transport at the expense of more economical and energy-efficient

transport like railways (World Bank, 1983). In the goods movement area, the chief competitors to trucks are railroad, inland and coastal water transport, and air cargo shippers. By subsidizing truckers, competitors are placed at an unfair disadvantage. Indeed, there could be a number of circumstances where it would be cheaper to haul goods and commodities via rail, air, or water, yet overland truck routes win out because of the substantial subsidies they enjoy. Society at large loses because the cargo ends up being more expensive than it otherwise would have been, had a more economical form of goods movement been used. In any competitive environment, such subsidies waste resources.

(3) By forcing automobile owners to cross-subsidize commercial vehicle owners, Korea's current highway finance program has suppressed levels of motorization. Clearly, fewer households currently have cars than they otherwise would if tax burdens were distributed more fairly. While there might be a conscientious government policy to restrict vehicle ownership, such policy could end up being counter-productive, even on economic development grounds. Lower taxes on automobile ownership, for instance, would likely spur Korea's automobile industries to increase production, since there would be a larger domestic market. To the extent economies of scale exist in Korea's automobile industries, an enlarged domestic automobile market could in turn spur increased production of vehicles for export. The net effect could very well be a larger inducement to economic growth and job creation than that generated by the present policy of low taxes on trucks.

While a shift of the tax burden from private automobiles to commercial automobiles might be an efficient and fair policy, it would nonetheless result in higher levels of motorization. The increase in automobile traffic could cause such significant increases in congestion levels and accidents that some disproportional taxation of private autos might be deemed necessary. Such

second-best departures from efficient taxation might very well be called for to reduce congestion and encourage more motorists to switch over to mass transit modes. Overall, however, it appears that the tax burden levied against Korea's private automobile owners is excessive. As Table 12 showed, passenger cars generate around 80 percent of Korea's road-user revenues, yet are responsible for an estimated one-third of all costs. Such disparities are excessive by any reasonable criteria.

Korea's policy-makers need to seriously consider overhauling the nation's highway finance structure. While other nations also have funding programs that are shaped by political rationales as much as economic ones, the level of inefficiency in Korea's current system seems unacceptably high, even by international standards. As a nation experiencing rapid economic growth, it is imperative that efficient infrastructure financing programs be put into place. The economic costs of not doing so during periods of rapid change can be staggeringly high.

In general, tax rates should be altered to collect higher fees from heavier vehicles. Weight-distance taxes probably represent the fairest way of exacting higher payments from heavy vehicles. In addition, taxes on diesel fuels should be raised substantially, both to indirectly capture the higher use-related costs associated with serving commercial vehicles and to improve air quality in urban centers like Seoul. Moreover, Korea should continue its aggressive policy of financing new expressway construction through tolls. Short of vehicle metering, tolls represent the most direct and efficient way of collecting user fees.

The one area where Korea's central government might benefit the most by following the practices of the other three nations discussed in this paper is the earmarking of funds for financing roads. A reserve account enables a

systematic, forward-thinking road development program to evolve. With some assurance of a steady flow of revenues, it is possible to plan over longer time horizons. Rights-of-way, for example, are more likely to be secured and protected well in advance of demand when revenues are dedicated. Experiences in Japan, Germany, and the U.S. strongly suggest that integrated national networks of roadways are most likely to emerge where long-term dedicated funding commitments exist.

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