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A Policy Oriented Analysis of the Tire Product Charge

Abstract

In this paper we summarize an examination of the economic and environmental impacts of the 1995 Hungarian product charge on tires. We believe that economic instruments like the product charge can provide appropriate levels of environmental protection at low cost. Like any policy instrument, however, some instrument designs fit the circumstances better than others. To test the present product charge design we examine the benefits and costs of three policy elements that constitute the product charge policy: the taxes in tire markets; the transfer to, and disposition of tire tax revenues from, general budget categories; and the ear-marked disposition of tire tax revenues to the scrap tire disposal market. We focus our attention on responses in the two market elements and address selected policy options and behavioral uncertainties using a series of scenarios. Based on this analysis our major findings are that 1) the tire taxes are relatively efficient as revenue raising devices, 2) there are big differences in the cost-effectiveness of policy elements and sub-elements, 3) the tire product charges are probably twice as high as necessary, 4) proposed disposition of tire disposal subsidies are structured in an unnecessarily uncompetitive manner, and 5) the current prohibition on support for disposal of shredded tires in modern, well maintained landfills is excessively costly and unwarranted.

Introduction

The 1995 Hungarian product charge legislation (Act LVI of 1995) aimed to address the environmental problems originating with the disposal of the solid waste from four products, one of them being automobile and truck tires. The legislation can be viewed as a program with three elements: 1) a tax or product charge on the production or import of tires, 2) use of part of the product charge revenues to finance scrap tire collection and disposal, and 3) use of the balance of the product charge revenues for a variety of environmental projects and general government programs. We have focused our detailed examination on the first two elements because they are best defined and most amenable to objective analysis. Depending on implementation and market reaction a number of different outcomes can result from the tire product charge program. We therefore also use scenarios in our analysis.

The combination of scenarios that, in our judgment, are most likely under current implementation results in annual economic welfare costs of HUF 1.1 billion, more environmentally friendly scrap tire disposal of 38 thousand tons per year, and an average cost of scrap tire disposal of 24 HUF/kg (about HUF 150 per passenger car tire).[1] This

[1] It is important to clarify the meaning of the expressions economic welfare cost and transfer at this point, since these phrases will appear in the text a number of times. We use "economic welfare cost" to mean the efficiency cost of a change in the goods and services produced by an economy. In principle, one can include in such costs the value of environmental and other services that are not traded in a market. Coincident with the efficiency cost, there will also be changes in the financial flows that characterize changes in economic production and consumption patterns: some individuals and firms will benefit financially from changes, some will lose. We refer to these essentially distributional aspects of change as "transfers". Both economic welfare costs and transfers are denominated in HUF but they represent two fundamentally different ways of measuring economic change.

latter number implies that in order for the program to produce a net social benefit, the average environmental harm avoided by disposal must exceed 24 HUF/kg.[2]

We believe that improper tire disposal is an environmental, amenity, and health problem in Hungary and that the tire product charge is an effective way to address the problem. Our analysis shows, however, that the following amendments to current policy and associated regulations will provide equal or better levels of public protection at half the cost (average cost of about 10 HUF/kg). We recommend the following:

- allow modern landfilling of shredded tires to qualify for subsidies,
- cut the overall tire product charge by 60 percent,
- reduce the gap between the product charges on new and used tires, and
- provide support to acceptable disposal facilities based on open competition, letting the winners create a private and competitive system for collection and transportation of scrap tires.

The Threat: Improper Tire Disposal

Approximately 40-50 thousand tons of used tires are generated in Hungary annually, of which only a small portion is disposed of in environmentally preferable ways (see Figure 1), the rest is littered, stored or illegally landfilled together with municipal solid waste. What is the problem with these alternatives?

- Littered tires may end up in any place including forests, rivers, or the roadside, and will stay there for a long time, since tires are extremely slow to decompose. The material of tires is foreign to natural environments and their sight reduces the aesthetic value of the area.

- Tire storage sites are at risk of serious fire resulting in severe air and possible water pollution. Extinguishing tire fires is one of the most difficult and costly tasks fire departments are faced with.

- Tires in a community landfill provide shelter for rodents and pathogens. Whole tires often spring back to their original shape after compaction and tend to work their way to the surface during settling, disrupting the structure of the landfill. Potential damage arises from water infiltration through the disrupted cap possibly resulting in leaching of polluting materials from the landfill. Landfills that dispose of whole tires are subject to prolonged fires, which are also a source of air pollution.

The major aim of the tire product charge is to decrease the environmental harm posed by tire disposal. This can be done preventively, by increasing average tire life or reducing use of tires. It can also be done by encouraging more environmentally friendly disposal. Some disposal options, such as tire grinding, retreading, and export, are both more environmentally friendly and already in limited use in Hungary. Other environmentally friendly means of disposal, such as monofill, or shredding and disposal in a modern landfill or combustion (with up-to-date emission control systems) in cement manufacture, electricity production, or simple solid waste management, could be introduced.

[2] All monetary values published in this paper are in 1995 HUF. A new automobile tire weighs about 7-8 kgs, the weight of a new truck tire ranges from 25 to 90 kgs. Scrap tires weigh 7-10 percent less than new tires due to wear.

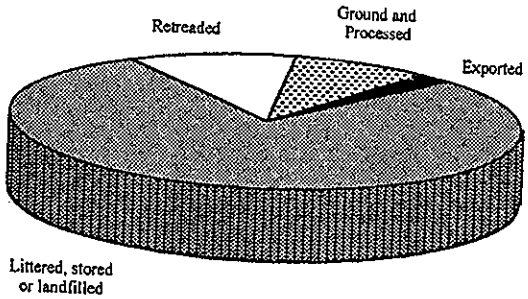

FIGURE 1 SCRAP TIRE FATE BEFORE THE INTRODUCTION OF THE PRODUCT CHARGE

The Tire Product Charge

The basis of the product charge is the weight of the tire. The product charge rates are included in Table 1. Domestically produced retreaded tires are not subject to the product charge directly, but according to the law, imported used tires (which is part of their input) are taxed. The product charge itself, together with the net price of the commodity, is subject to a 25 percent Value Added Tax (VAT). While the product charge is a revenue of the Central Environmental Protection Fund (CEPF), the VAT component accrues to the Central Budget of Hungary. A bigger part of the tire product charge revenues of the CEPF serves to finance scrap tire disposal, while a smaller share covers the expenses of CEPF operation and the costs of general environmental projects.

TABLE 1 LEVELS OF PRODUCT CHARGE ON TIRES

Name of the Product	Product Charge (HUF/kg)	Product Charge Together with VAT (HUF/kg)
New tires	30	37.5
Used tires	120	150
Used tires imported exclusively for retreading purposes[a]	30	37.5

a. These tires enjoy a reduced product charge level only in the first three years of the tire product charge and they are subject to a quota.

In Table 2 the unit product charges and the supplementary VAT are transformed into a potential price increase per tire (the actual price increase may differ from this depending on market reaction). The price of a new automobile tire is between HUF 4,500 and 10,000, used automobile tires cost about HUF 1,500. New truck tires are sold for HUF 22,000 to 80,000, while the price of a used truck tire is about HUF 8,000. We provide the percentage change in price due to the product charge and VAT in parentheses.

TABLE 2 POTENTIAL PRICE INCREASE PER TIRE DUE TO THE PRODUCT CHARGE AND VAT

	Price Increase of an Automobile Tire (HUF)	Price Increase of a Truck Tire (HUF)
New tires	270 (or 3-6 percent)	2000-2300 (or 2.5-10 percent)
Used tires	900 (or 60 percent)	7500 (or 25-90 percent)

The Analysis

Figure 2 shows the three components of the tire product charge policy and summarizes the advantages (benefits) and disadvantages (costs) of each of these elements. In evaluating a policy (or combination of policies), it is not enough to show that good things (benefits) are achieved, we need to show that net benefits are achieved - that the good things outweigh the costs of obtaining them. Better yet, we would like to find the policy that has the greatest net benefits - the policy that is most cost-effective or, in broadest terms, economically efficient.[3] In our analysis, therefore, we examine the benefits and costs of each of the policy components. We use market principles to "reveal" the size of the benefits and costs. Where possible, we monetize these values. In the case of the environmental benefits of the policy elements, however, we are reduced to using physical units - kilograms of reduced tire consumption or improved disposal - since good monetary measures of the benefits are not presently available.[4]

The Tire Market

The impact of the product charge on the tire market depends on how consumers, distributors, and producers respond to the charges. This, in turns, depends on the technical and structural conditions of the tire market. Before we could do our analysis, we therefore had to survey the market. We looked at the characteristics of tire consumption, tire production and distribution, and market conditions and trends. We found that the market for large tires used by trucks, buses and agricultural vehicles is distinct from the market for smaller sized automobile tires. Therefore we analyzed these markets as independent from each other. Based upon tax or institutional features, consumption patterns, and tire characteristics such as price, durability and safety, we further divided the markets into segments, six segments for the automobile and nine segments for the truck tire market. The first three columns of Tables 3 and 4 provide price and quantity data on the segments before the product charge. Higher priced tires are usually of better quality, more durable and safer. In the automobile tire market the difference between used commercial import and used personal import is that used tires imported by individuals are not subject to customs duty and the product charge on them seems easier to avoid or evade. Also, the average quality of commercially imported used tires is slightly better. The primary differentiation between imported and domestic retreaded truck tires is the amount of product charge they pay.

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[3] We refer to "broadest terms" here because we include in the scope of our analysis, and the scope of economics more generally, all valuable resources and most especially the amenity and health services provided by the environment.

[4] The benefits component of transfers to the central funds are not examined because we have little basis for determining the way in which these resources will be used. Instead, we make the "neutral" assumption that the value produced by these expenditures will be equal to the transfer and thus, indirectly, the value of activities and uses sacrificed in order to pay the tax that generated the revenues.

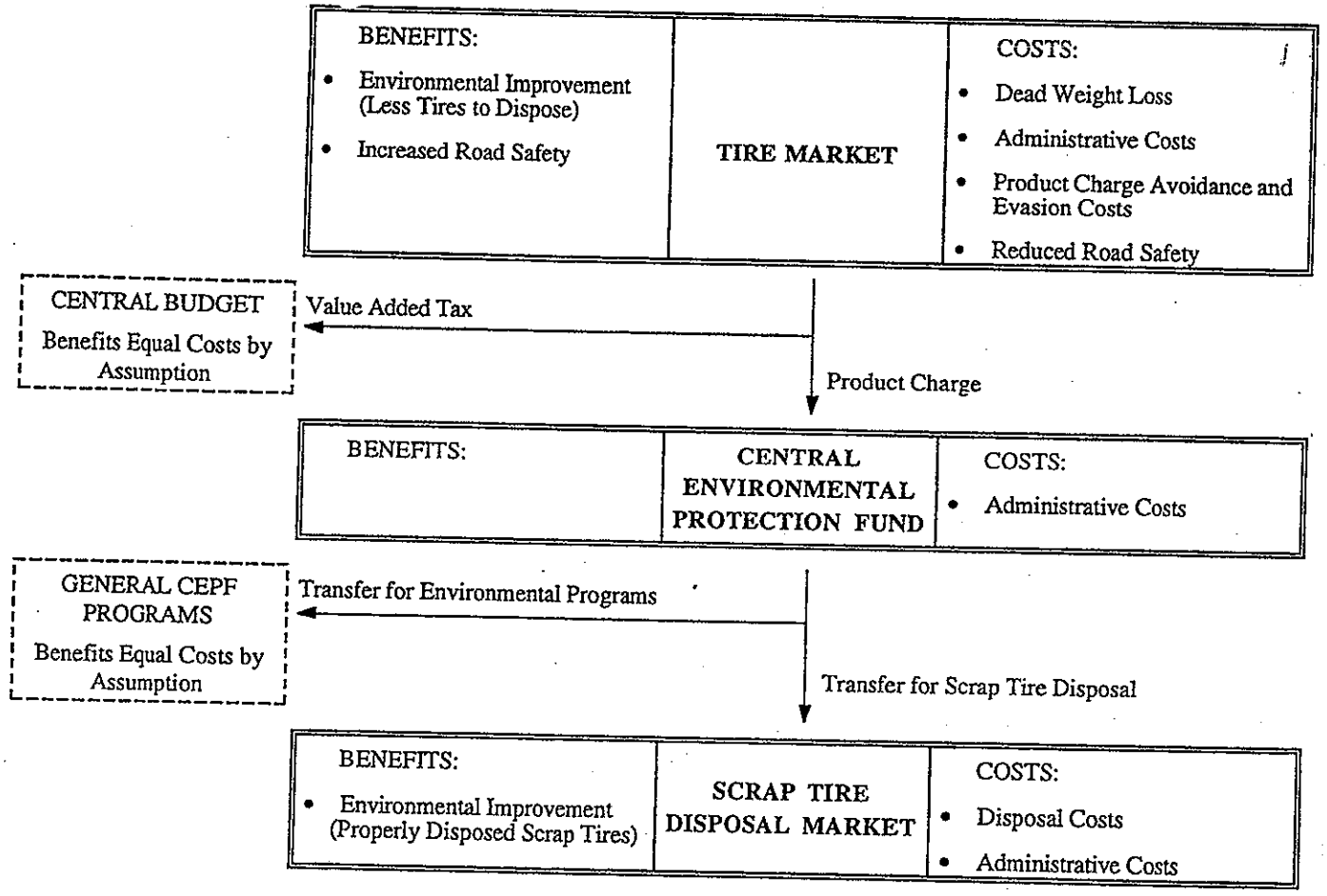

FIGURE 2 ECONOMIC WELFARE COSTS AND BENEFITS OF THE TIRE PRODUCT CHARGE PROGRAM

TABLE 3 ESTIMATED AUTOMOBILE TIRE MARKET SEGMENT PRICES AND QUANTITIES BEFORE AND AFTER THE PRODUCT CHARGE

Segment Name	Estimated Annual Quantity Sold Before the Product Charge (thousand tires)	Estimated Median Price Before the Product Charge (1000 HUF 1995/tire)	Percentage Change in Quantity (%)	Percentage Change in Price (%)	Estimated Annual Quantity Sold after the Product Charge (thousand tires)	Estimated Median Price After the Product Charge (1000 HUF 1995/tire)
Michelin	136	10.0	6.5	5.3	145	10.5
Good quality brands	664	7.7	2.8	4.6	682	8.1
Eastern European	458	4.5	8.3	10.8	496	5.0
Retreaded	200	3.5	-1.5	26.1	197	4.4
Used - commercial import	333	1.5	-22.0	32.8	260	2.0
Used - personal import	500	1.5	-17.4	26.0	413	1.9
Total	**2291**		**-4.3**		**2193**	

TABLE 4 ESTIMATED TRUCK TIRE MARKET SEGMENT PRICES AND QUANTITIES BEFORE AND AFTER THE PRODUCT CHARGE

Segment Name	Estimated Annual Quantity Sold Before the Product Charge (thousand tires)	Estimated Median Price Before the Product Charge (1000 HUF 1995/tire)	Percentage Change in Quantity (%)	Percentage Change in Price (%)	Estimated Annual Quantity Sold after the Product Charge (thousand tires)	Estimated Median Price After the Product Charge (1000 HUF 1995/tire)
Good quality brands (1)	24	80.0	9.9	6.5	26.4	85.2
Good quality brands (2)	102	70.0	4.1	4.6	106.2	73.2
Taurus Top	29	51.0	11.5	9.1	32.9	55.6
Imported retreads	10	35.0	-2.2	23.2	9.8	43.1
Central European	40	34.0	6.4	9.4	42.6	37.2
Taurus other than Top	118	32.0	1.9	7.3	120.8	34.3
Domestic retreads	70	27.0	-5.7	13.3	66.0	30.6
Russian and Ukrainian	40	22.0	2.1	11.1	40.9	24.4
Imported used	44	8.0	-39.9	68.4	26.4	13.5
Total	**478**		**-1.3**		**472**	

Tire Market Impacts

We built a model of the tire market to analyze the impacts of the product charge. This model includes a system of interrelated supply and demand equations (see Section 6 in Morris and Kis, 1997). The inputs to the model are the pre-product charge prices and quantities, the price increase caused by the product charge, and the own and cross-price elasticities of each market segment. The latter represent the responsiveness of consumers and producers in a given market segment to the price changes in that and other segments. The outputs of the model are the prices and quantities of the segments after the product charge.

We modeled three tire market scenarios. Scenario I assumes perfect compliance with the product charge law. Scenario II assumes small scale avoidance/evasion in the used automobile tire segments, while Scenario III assumes a larger scale avoidance/evasion in the used automobile tire segments. We are particularly concerned about avoidance/evasion in the used automobile tire market segments because the sixty percent product charge creates a high incentive to avoid/evade, these are currently large market segments, and automobile tires are easier to smuggle than truck tires.

Tables 3 and 4 show the equilibrium quantities of the tire markets before and after the introduction of the product charge as simulated by Scenario III (our "most likely" scenario). In the automobile tire market prices increase in all segments, while the quantities of only used and retreaded tires decrease. Some of the former customers of used tires switch to better quality tires. On the whole, however, consumption decreases by slightly more than 4 percent, from 2,290 thousand tires to 2,190 thousand tires per year. This means that annually 600 tons less tires get into circulation. In the truck tire market in a similar fashion both the quantities of used tires and retreaded tires decrease. The aggregate reduction in tire consumption is rather low, only 1.3 percent. This is equal to 6.2 thousand tires or 300 tons per year. The reason for the reduced number of retreads in both markets is that their major input, imported used tires is heavily taxed.

The quantity and price changes of used automobile tires are larger in Scenarios I and II, because here importers do not avoid the product charge as aggressively.

From an environmental perspective the changes in aggregate quantity are welcome: the less tires are consumed, the less scrap tires will need to be disposed. The total reduction in the quantity of tires annually needing disposal in the two markets is 900 tons or about one-fiftieth of the annually generated scrap tire quantity in Hungary. The reduction of tire consumption may be due to longer use of a given type of tire, switch to a tire that is of higher quality and has a longer life, or even an actual decline in use of automobiles.

These environmental benefits may be counterbalanced by a potential reduction in road safety. If tires are used longer than previously, then the likelihood and cost of road accidents increases. This is especially the case for imported used tires, which are the lowest quality of all to begin with. Furthermore, their prices increase most dramatically, both in absolute and percentage terms, and their customers are mostly low income households that will have difficulty paying for tires at increased prices. There is, however, some uncertainty about the net effect of these changes on road safety. Traffic safety may actually improve if, as a result of the product charge, a sufficient number of low quality tire customers decide to switch to better quality, safer tires.

With the help of the tire market model we were also able to estimate the economic welfare costs associated with the introduction of the product charge. These welfare costs consist of the economic welfare loss due to the real resource costs of private firms as they administer or defeat the product charges and the economic distortions or dead weight losses (DWL) that remain after markets have made the best economic adjustment possible to the product charge[5]. Table 5 presents the economic

[5] Dead weight loss is the welfare loss suffered by those producers and customers who reduce production and consumption due to the product charge.

welfare changes for 1996 by scenarios. The role of avoidance/evasion (Scenarios II and III) is clear: the more tires avoid the product charge, the less administrative cost is incurred, the higher avoidance-evasion costs are, and the less dead weight loss is. Dividing the total economic welfare cost of a given scenario by the quantity of reduced tire consumption we arrive at the average cost of environmental improvement in the tire market. It varies between 55 and 65 HUF/kg, depending on the scenario.

The very striking feature of Table 5 is that we estimate a negative dead weight loss (a dead-weight "gain") in the truck tire market. This arises from the joint effects of multiple taxes (there is a pre-existing VAT on tires) and the particular own and cross price elasticities in the truck tire market. The results in the truck tire market indicate that the product charge on truck tires not only appears to be a much less distortionary tax than that on automobile tires but actually produces welfare gains.[6]

TABLE 5 ESTIMATED ECONOMIC WELFARE CHANGE IN TIRE MARKETS

Scenario and Market	Economic Welfare Changes (million HUF 1995/year)				
	Real Resource Cost		Dead Weight Loss	Total Economic Welfare Loss (Real Resource Cost + Dead Weight Loss)*	Total Economic Welfare Loss by Scenario
	Private Administration Cost	Avoidance-Evasion Cost			
Scenario I					*61.1*
Automobile	10.4	0	90.0	100	
Truck	2.1	0	-41.4	-39	
Scenario II					*65.9*
Automobile	9.5	15.8	79.9	105	
Truck	2.1	0	-41.4	-39	
Scenario III					*53.6*
Automobile	8.6	24.0	60.3	93	
Truck	2.1	0	-41.4	-39	

Scenario Definitions: I - no avoidance or evasion; II - low avoidance and evasion; III - high avoidance and evasion.

* Exclusive of economic benefits due to reduced tire consumption and assuming that the benefits of government expenditures supported by the tax revenue raised by the product charge are equal to those revenues.

Tire product charge revenues also vary with scenarios, from HUF 1.65 billion per year for Scenario I to HUF 1.4 billion per year for Scenario III. The decrease is due to less legally imported used automobile tires as we move toward scenarios with higher avoidance/evasion ratios. While in Scenario I truck tires contribute to 53 percent of product charge revenues, in Scenario III their shares increases to over 62 percent. In addition to the product charge revenues of the CEPF the Central Budget of Hungary enjoys VAT revenue from product charges. Depending on the scenario this sum is between HUF 351 and 413 million per year.

The total social cost of generating these revenues of HUF 1.75 to 2.06 billion is between HUF 100 and 120 million (these costs include private and public administration, dead weight loss and the costs of avoidance/evasion). The ratio of these costs and the revenues, called the excess burden, is

[6] The dead weight loss calculations in these markets are dramatically influenced by effects on substitute products which are already taxed. By convention, the entire tax revenue supplement produced by the substitution effect is treated as a welfare gain, offsetting any welfare losses due to reduced consumption in the market directly affected by the tax. In practice, welfare change depends on how the supplementary tax revenue so generated is used by the recipient government.

a little above 6 percent, which means that the tire product charge is a relatively efficient revenue raising device. (This is not true for the automobile tire product charge alone, however, suggesting that handling the two markets separately with individual product charge rates may more than pay off.)

Fiscal Management

The costs of fiscal management are the expenditures on administration of the tire product charge by the CEPF and the Customs Office. These expenditures are estimated as a percentage of the revenues collected and vary between HUF 52 and 62 million a year depending on the scenario. We assume that the additional costs of management by the Central Budget are negligible. Thus we have adopted the "neutral" assumption that benefits equal expenditures as noted above in footnote 4. As shown in Figure 2, the benefits of revenues produced by the product charge program associated with central expenditures by the Central Budget and Central Environmental Protection Fund are impossible for us to identify, much less measure or value.

The Impacts of Financing Scrap Tire Disposal

The product charge legislation together with the law on the CEPF channels part of the tire product charge revenues to scrap tire disposal and, together with the annually published disbursement guidelines, establishes the rules for disbursement. The major features of this system of disbursement are:

- both one-time grants for investment and regular subsidies for operation can be provided;
- only regional "program owner" is selected to exclusively organize and manage scrap tire collection and disposal in a given area;
- and collection, transportation, and disposal all qualify for subsidies directed by CEPF.

While consumers annually pay up to HUF 1.65 billion of product charges, not all this money may be used for scrap tire disposal. A complicated tangle of the product charge legislation and the law on the CEPF directs product charge revenues to a number of different environmental uses and coverage of administrative costs, leaving a maximum of 71.25 percent of these revenues for scrap tire disposal. This means that, depending on the scenario, between HUF 1 billion and 1.18 billion can be used for improved disposal annually. In order to test how this amount compares to the need for better scrap tire disposal, we create a hypothetical scrap tire disposal market and examine how the market would respond to various types and levels of subsidy. We do this by first assessing the technical and economic features of scrap tire disposal options. This assessment included consideration of credits for valuable products produced as a by-product of scrap tire disposal, by-product market size, and economies of scale. The new disposal options considered were:

Disposal of shredded tires in modern landfills. Even though tires are banned from solid waste landfills by local regulations throughout Hungary, they could be deposited in landfills where nothing else but scrap tires are placed. They can be deposited either in a chopped form or as whole tires. In either case the landfills should, by law, be state-of-the-art landfills in order to reduce environmental risks, particularly that of a tire fire. According to our calculations the unit cost of landfilling whole tires is 15.3 HUF/kg, including collection and transportation. The unit cost of landfilling shredded tires is about 9.2 HUF/kg, including collection, transportation and shredding. The reason why landfilling shredded tires is cheaper than landfilling whole tires is that the cost of chopping is more than offset by increased efficiency in using relatively expensive landfill volume. Even though economically landfilling of shredded tires seems to be attractive, present legislation excludes it from possible support by the CEPF.

Tire combustion in cement factories. Tires can substitute for part of the conventional fuel need in cement kilns and pulp and paper mills. The trade-off for this inexpensive fuel is that additional

investments into equipment such as air pollution filters (especially in oil or natural gas operated kilns), tire feeding devices, and tire chopping machines might be necessary. The average cost of combustion is 15.8 HUF/kg of tire, including collection, transportation, and necessary technological processes and investments, such as high-tech filters. There is capacity to combust about 6,000 tons of scrap tires per year in Hungary.

Producing and processing tire-grind. Scrap tire grind can either be sold at the international raw material markets, or further processed into rubber products such as rubber bricks. In either case, some subsidy is needed to cover part of the expenses. A grinding machine with a capacity to process 20 thousand tons of scrap tires a year could be an option for scrap tire disposal in Hungary. The operating loss in this case is estimated to be 11.4 HUF/kg of tire. (Presently in Hungary 3,700 tons of scrap tires are ground and processed annually.)

Generating electricity. Tires are excellent fuel because of their high energy content per unit of weight. Electric power plants fed exclusively by tires exist in several countries. A medium sized power plant which is able to process 20 thousand tons of scrap tires annually requires 33.9 HUF/kg of scrap tire subsidy.

Retreading. Retreading can be an environmentally preferred option for the disposal of used tires, because consumption of retreads reduces the need for new tires, and thus the ultimate need for scrap tire disposal. Financing retreading presents some special challenges, however. Since consumer preferences are fairly stable about retreaded tires, only a large subsidy (and a consequent price decrease) would be able to substantially raise the number of tires presently retreaded in Hungary. If this subsidy is extended to present retreading, then this disposal option would prove to be extremely expensive (about 600 HUF/kg). At the same time price discrimination (i.e. only additional retreading is supported) would be difficult to carry out in practice. (Presently in Hungary about 4,800 tons of used tires are retreaded annually.)

Knowing the unit cost of scrap tire disposal we can examine how much disposal the available funding can provide. We investigated this question through the use of three different disbursement scenarios to see not only the adequacy of the funding, but also the impact of different disbursement rules. Table 6 lists the characteristics of the disbursement scenarios.

TABLE 6 ATTRIBUTES OF THE DISBURSEMENT SCENARIOS

Scenario Name	Is There Price Discrimination?	Is Landfilling Supported?
S1	No	No
S2	No	Yes
S3	Yes	No

Price discrimination means that all successful applicants will receive only their unit cost as subsidy. When there is no price discrimination, however, all competitive applicants will receive the unit cost subsidy received by the most expensive of supported disposal options. While, in principle, price discrimination offers the prospect of stretching a given subsidy budget without economic distortions, it will create inefficiency in practice because the CEPF does not know what the real unit costs of disposal are, and in a setting of price discrimination, organizations have an incentive to overstate needs and to seek preferential treatment from the CEPF. Attempting price discrimination may also make it more difficult to achieve such public management goals as having an open, fair, and competitive disbursement process (see Lehoczki and Morris, 1995)

Table 7 presents the disposed quantities, subsidies (expenditures) and economic welfare costs annually of the different disbursement scenarios. The difference between expenditure and welfare cost is that expenditure includes both real resource costs and money transfers, while welfare cost in this case is the real resource cost of disposal. Therefore while the CEPF experiences expenditure

as "cost" or support it provides, from the perspective of the society not all disposal subsidy is necessarily a real cost of disposal. Table 7 shows that the least expensive scenario is S2 where modern landfilling of chopped tires is allowed and supported. Not only is S2 the cheapest but it could also take care of twice the annually generated scrap tire quantity from presently available revenues if this disposal alternative was permitted by law. S1, where there is no price discrimination seems to be cheaper than S3, but S1 only takes care of about two third of the annually generated scrap tires, while S3 can handle them all. It should be noted that if S1 took care of more tires[7], then its average expenditure would be higher than for S3, but its average economic welfare cost would be the same. We need to keep in mind, however, that the price discriminating S3 is likely to be difficult to carry out in practice in the way shown.

TABLE 7 DISPOSAL, SUBSIDIES AND WELFARE COSTS IN THE SCRAP TIRE DISPOSAL MARKET SCENARIOS

Disbursement Scenario	S1	S2	S3
Tons of Scrap Tires Annually Disposed through			
Retreading and Grinding (Existing Before the Product Charge)	8,500	8,500	8,500
Additional Grinding	20,000		20,000
Combustion in Cement Factories	6,000		6,000
Modern Landfilling of Chopped Tires		100,000	
Electricity Generation			20,000
Total Quantity (tons/year)	34,500	108,500	54,500
Total Subsidy Provided (million HUF/year)	545.1	998.2	1000.8
Total Economic Welfare Cost of Disposal (million HUF/year)	322.8	920.0	1000.8
Average Subsidy (HUF/kg)	15.8	9.2	18.4
Average Economic Welfare Cost of Disposal (HUF/kg)	9.4	8.5	18.4

Disbursement Scenario Definitions: S1 - no price discrimination, landfilling not allowed; S2 - no price discrimination, modern landfills allowed; S3 - perfect price discrimination assumed, landfilling not allowed.

Summary of Impacts

Here we sum the costs and benefits of the three elements of the tire product charge policy we depicted in Figure 2. The aggregate results are shown by Table 8. By and large we can say that benefits range from 27-120 thousand tons per year of reduced or improved tire disposal. On the cost side, there are economic welfare costs ranging from HUF 430-1,220 million per year. The

[7] Which is unlikely, because the next available disposal option, electricity generation, cannot be carried out from available revenues after the rest of the options are utilized. This is due to economics of scale, the revenue balance is not enough to subsidize a medium sized plant, while the average cost of combustion in small sized plants is much higher.

average cost effectiveness (the quotient of cost matched with its corresponding benefit), ranges from 10 to 24 HUF/kg, depending on the scenarios.

TABLE 8 AGGREGATED COSTS AND EFFECTIVENESS OF THE TIRE PRODUCT CHARGE

	Tire Market Scenarios	Disbursement Scenarios		
		S1	S2	S3
Total Economic Welfare Costs (million 1995 HUF/year)	Scenario I	448	1220	1134
	Scenario II	448	1128	1134
	Scenario III	431	1029	1107
Affected Total Tire Disposal (tons/year)	Scenario I	27,276	120,325	47,417
	Scenario II	27,157	110,247	47,314
	Scenario III	27,035	101,172	46,899
Average Cost Effectiveness of the Tire Product Charge (HUF/kg)	Scenario I	16.43	10.14	23.91
	Scenario II	16.48	10.23	23.96
	Scenario III	15.94	10.17	23.61

Tire Market Scenario Definitions: I - no avoidance or evasion; II - low avoidance and evasion; III - high avoidance and evasion. Disbursement Scenario Definitions: S1 - no price discrimination, landfilling not allowed; S2 - no price discrimination, modern landfills allowed; S3 - perfect price discrimination assumed, landfilling not allowed.

Outstanding Issues Identified

Based upon this analysis the following issues are central to assessment of the current product charge program:

Should modern landfilling of chopped tires be allowed as a supported disposal option?

Table 8 shows that if landfilling scrap tires is supported (Disbursement Scenario 2), then the average cost effectiveness of the tire product charge program is at least 6 HUF/kg better than in any other case. Since the aim of a reasonable policy is not to achieve the best state of the environment technically possible, but to balance the social costs and benefits of environmental protection, we need to ask the question whether it is worth paying between 6 and 14 HUF/kg more for much the same reduction in the basic problems of fire hazard, bad sanitation and decreased aesthetical value associated with the present practice of littering, storage, and traditional landfilling of scrap tires. It is also worth noting that as a result of landfilling the scrap tires are not lost as a future source of energy or material. If the price of energy escalates in the future, tire monofills can be utilized as a fossil fuel mine.

Is the level of the product charge appropriate?

There is a gap between the cost-effectiveness of the two main elements of the tire product charge program: introducing the product charge in the tire market is more expensive per tire "disposed" (about 55 to 65 HUF/kg) than subsidizing proper disposal facilities (10-24 HUF/kg). By reducing the level of the product charge (especially the automobile tire product charge) the efficiency of the tire market program, and consequently the whole of the program, would be enhanced. Furthermore, the possibility for decreasing the charge exists: two-fifths of the present revenue

would be sufficient, through modern landfilling of shredded tires, to dispose of somewhat more than the annually generated scrap tire stock. In this case it does not make sense to extract extra resources from the economy for improved tire disposal.

Is the gap between the product charges of new and used tires justified?

As it was described earlier, new tires are subject to a product charge of 30 HUF/kg, why imported used and retreaded tires have to pay 120 HUF/kg. Since the level of the product charge should correspond to the damage caused by the improper disposal of scrap tires, differentiating between the product charges for new and used tires should be based on the difference in the present values of the damages they cause. The damage caused by the two types of tires is virtually identical, the only difference is the timing of this damage. Through economic discounting calculations we have found that this difference in disposal time may account for a difference in product charge of 50 to 60 percent at most, as opposed to the present scheme of 300 percent. Therefore the used tire product charge should be reduced even more dramatically then the new tire product charge. Such a modification would not only enhance the economic performance of the product charges, but it would also relieve the burden on lower income households.

Can the present system of disbursement be improved?

A number of problematic points have been identified with the present system of disbursement. 1. The present laws and regulations promote the establishment of regional monopolies as opposed to a competitive market for disposal. 2. When making disbursement decisions the applications need to be objectively measured against each other. This, however, is difficult to do, because the CEPF provides several types of support (e.g. one-time or regular assistance, loan, subsidy, loan guarantee) which lack a common basis for comparison. 3. When subsidies are awarded, price discrimination is applied, and this, as noted above, is likely to lead to overexpenditure. 4. Collection and transportation without disposal is supported, and this may lead to the accumulation of scrap tire stockpiles, which are also a fire hazard. Furthermore, since collection and transportation is monopolized the same way as disposal, the efficiency of the program is further impaired.

Based on our analysis, we offer the following four points for improvement:

- Applications are compared with each other by some common measure, such as unit cost/subsidy.
- There is no discrimination based on regions or size, the applicant offering the better offer is supported.
- No price discrimination is applied. All winning applicants are awarded the unit support of the last, still competitive applicant.
- Only disposal is supported, and not collection and transportation. When applicants calculate their subsidy need, they have to keep in mind to include the cost of collection and transportation. By paying for scrap tires, disposing facilities create a competitive and efficient market for collecting and transporting scrap tires. Furthermore, the CEPF, the Ministry of Environment and Regional Policy, and the regional inspectorates experience lower management costs, since they only have to administer applications for disposal, but not for collection and transportation.

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