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## Summary

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In July 2008, the European Commission published a strategy for the internalisation of the external costs in the transport modes<sup>29</sup>. In the short term, the European Commission intends to amend the Eurovignet Directive<sup>30</sup> according to the principle of internalisation. In the long term, the European Commission aims to internalise external costs for all modes of transport. The International and Strategy Directorate (Directie Internationaal en Strategie) of the Dutch Ministry of Transport, Public Works and Water Management (V&W) therefore asked KiM to investigate the effects on prosperity and on mobility of a number of variants.

In this study we consider five variants (and one sub-variant). Three of the variants explore the effects of partial internalisation of external costs, while the other two variants (and the sub-variant) explore the effects of complete internalisation. The latter variants in particular go further than the European Commission's current plans. The five variants are outlined in table 1.

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<sup>29</sup> The internalisation of the external costs means that the external effects of transport (i.e. CO<sub>2</sub> emissions, air and noise pollution and congestion) are factored into the transport cost in the form of a charge. Taxing the transport user in this way internalises the external costs once again, such that the transport user takes these costs into consideration.

<sup>30</sup> The Eurovignet is a certificate stating that the mandatory heavy vehicle tax (BZM) has been paid. This European Commission Directive regulates the amount that member states can ask in tax on lorries for the use of their highways and how they are allowed to levy this tax.

**Table 1**  
Qualitative outline of the variants

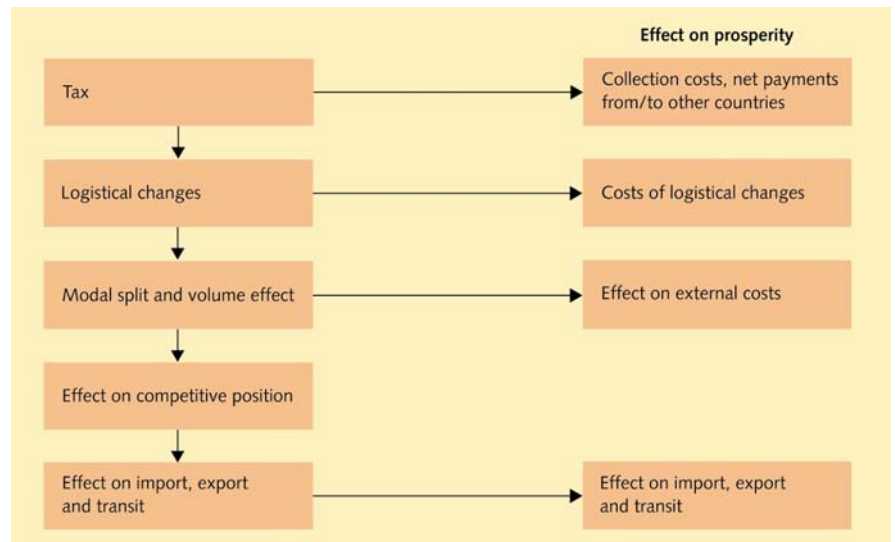
	Freight transport			Passenger transport	
	Road	Rail	Inland shipping	Road	Rail
Variant 1					
<i>what external effects?</i>	I/NP/AP	I/NP			
<i>excise duty and levies?</i>	current		current	current	current
Variant 2					
<i>what external effects?</i>	I/NP/AP/C	I/NP			
<i>excise duty and levies?</i>	current		current	current	current
Variant 3					
<i>what external effects?</i>	I/NP/AP	I/NP	AP/NP		
<i>excise duty and levies?</i>	current		current	current	current
Variant 4					
<i>what external effects?</i>	I/NP/AP/C/CC/A/ N/SWP	I/NP/AP/C/CC/A/ N/SWP	I/NP/AP/C/CC/A/ N/SWP	DPfM	I/NP/AP/C/CC/A/ N/SWP
<i>excise duty and levies?</i>					
Variant 5					
<i>what external effects?</i>	I/NP/AP/C/CC/A/ N/SWP	I/NP/AP/C/CC/A/ N/SWP	I/NP/AP/C/CC/A/ N/SWP	DPfM	I/NP/AP/C/CC/A/ N/SWP
<i>excise duty and levies?</i>	excise duty			excise duty	

I = Infrastructure (marginal costs in variants 1, 2, 3 and 4a; average costs in variants 4 and 5); NP = Noise Pollution; AP = Air Pollution; C = Congestion; CC = Climate Change; A = Accidents; N = natural environment; SWP = Soil and Water Pollution; DPfM = Different Payment for Mobility (*Anders Betalen voor Mobiliteit*).

The sub-variant (which is variant 4a) is defined in the same way as variant 4, except that in the sub-variant the marginal and not the average infrastructure costs are passed on.

This study quantifies the effects on prosperity of internalising external costs according to these five variants. Internalising the external costs of traffic and transport will increase prosperity in the Netherlands, as can also be expected based on economic theory. Figure 1 shows the effect on prosperity if a charge is used to internalise external costs.

**Figure 1**  
Effects on prosperity of a tax on mobility



Levying a tax is not in itself an effect on prosperity for the Netherlands or Europe, but a transfer from citizens and businesses to the government. However, the tax does result in other effects on prosperity. Table 2 summarises the effects on prosperity of the five variants with a high and low estimation of the external costs. The effects described are the effects in a particular year after the implementation of the measure. In the years immediately after the implementation of the measure the effects will not be as large as the effects described. The effects are purely the effects of the measure – any other effects, such as an increase in mobility as a result of economic growth, have not been incorporated into these figures.

**Table 2**  
Overview of the effects on prosperity for the Netherlands; low and high variants (in € million/year)

**Overview of effects on prosperity**

	Variant 1	Variant 2	Variant 3	Variant 4	Variant 4a	Variant 5
External costs avoided	143 to 451	212 to 855	172 to 493	538 to 1,263	86 to 773	846 to 1,739
Collection costs	-70 to -100	-70 to -100	-72 to -115	-822 to -915	-822 to -915	-872 to -935
International transfers	73 to 152	104 to 273	114 to 252	373 to 657	70 to 354	498 to 783
Logistical changes	-42 to -99	-65 to -188	-50 to -119	-109 to -268	0 to -160	-201 to -360
<b>Total</b>	<b>104 to 405</b>	<b>181 to 840</b>	<b>163 to 512</b>	<b>-20 to 737</b>	<b>-667 to 53</b>	<b>271 to 1,226</b>

As shown in Figure 1, both the logistical changes and the reduction in the amount of traffic lead to a reduction in external costs. Internalisation leads to a reduction in external costs totalling between over €100 million and over €1.7 billion per year. The external effects (and the related costs) investigated in this study are congestion, accidents, air pollution, noise pollution, climate change and soil and water pollution.

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The internalisation of external effects also involves collection costs. The more complex the tax, the higher the collection costs. For the variants in this study, these collection costs result in a loss of prosperity of between €70 million and over €900 million per year, depending on the variant.

Some of the tax will be paid by foreign transporters to the Dutch government and vice versa. These are not effects on prosperity on an international level, but they are at the national level. As the Netherlands is a transit country, the net effect of international transfers will have a positive effect on the Netherlands' prosperity. The other way round we can argue that the Netherlands currently bears the external effects of consumption in other countries and that internalisation will correct this situation. Depending on the variant, the associated increase in prosperity for the Netherlands varies between approximately €70 million and almost €800 million per year.

The tax gives transport companies (and private individuals) an incentive to use transport more efficiently, for example by increasing the degree of loading or by choosing a smarter route. However, these logistical changes are linked to net costs - if this was not the case the changes would have been made already without the tax. These costs result in a loss of prosperity of between €40 million and €360 million per year. Transporters therefore avoid approximately 15 percent of the tax.

Transport costs are increased by the costs of the logistical changes and the portion of the tax that transporters are unable to avoid. This increase in costs will be passed on in the price and will therefore cause volume effects. These effects could involve a reduction in volume or a shift to other modes (modal split effect). In congested areas, a decrease in volume may lead to decreased congestion, shorter journey times and therefore reduced transport costs. Out of necessity, we are only able to take this into account on a qualitative level.

#### *Valuation of external effects*

We used a recent study conducted by the independent research and consultancy agency CE Delft on behalf of the European Commission (CE Delft et al., 2008) to convert the qualitative variants into taxes. The study, the 'Handbook on estimation of external costs in the transport sector' (known as the 'IMPACT Handbook'), forms the basis of the European Commission's proposals. We took the values from this study as a starting point for further analysis with a high and a low variant based on the underlying figures from the study.

Table 3 shows the total for the individual cost items per vehicle kilometre for passenger traffic and per ton-kilometre for freight traffic. The overall total is an underestimate because some of the data is missing for the individual cost items.

**Table 3**  
The total valuation of the external effects of traffic and transport, per vehicle kilometre and per ton-kilometre (excluding infrastructure)

Valuation of external effects in euro cents	Road		Rail		Inland shipping	
	per vehicle kilometre	per ton-km	per vehicle kilometre	per ton-km	per vehicle kilometre	per ton-km
Passenger transport	1.8 to 8.2	-	32.6 to 100	-	-	-
Freight transport						
Liquid bulk	9.3 to 37.5	0.91 to 3.61	223.3 to 570	0.50 to 1.28	102 to 618	0.15 to 0.88
Dry bulk	9.3 to 37.5	0.80 to 2.83	223.3 to 570	0.27 to 0.63	102 to 475	0.13 to 0.59
Containers	9.3 to 37.5	1.26 to 4.49	223.3 to 570	0.40 to 0.93	616 to 810	1.10 to 1.44
Other	9.3 to 37.5	1.74 to 6.19	223.3 to 570	0.73 to 1.68	616 to 810	0.88 to 1.16

Table 3 shows that there is a difference between the high and the low estimate per vehicle kilometre of approximately a factor of 3 to 4. There is consequently a considerable amount of uncertainty regarding the estimates. This uncertainty is caused by two reasons. Firstly, there are significant differences between the factors which determine the severity of the external costs. For example, the risk of an accident is considerably lower on motorways than on other roads, and local environmental effects such as noise and air pollution weigh more heavily if there is a greater population density in the area. The development of the vehicle fleet also falls under this type of uncertainty. The second reason is the uncertainty about the development of the price of CO<sub>2</sub> rights.

The unit for external costs of euro cents per vehicle kilometre is a good basis for the tax. However, this unit makes it difficult to compare external costs between different modes of transport.

After the external effects have been translated into taxes for each variant, price increases are calculated for the various modes of transport. These price increases result in shifts between modes and a reduction in the demand for mobility. Table 4 summarises these effects for freight transport. The effects shown are the changes in mobility in a particular year as a result of the tax. Other effects, for example an increase in mobility as a result of economic growth, have not been included in this table.

Table 4 Mobility effects per variant (x1 billion ton-km; 'low' to 'high')	Mobility effects	Freight transport			Total
	(x1 billion ton-km)	Road	Rail	Inland shipping	
Variant 1		-1.3 to -3.5	-0.5 to -0.4	0.6 to -1.4	-1.2 to -2.5
Variant 2		-2.2 to -6.8	-0.5 to -0.2	0.9 to 2.5	-1.7 to -4.6
Variant 3		-0.8 to -2.3	-0.3 to -0.1	-1.0 to -2.2	-2.2 to -4.7
Variant 4		1.0 to -3.4	-1.5 to -1.4	-6.6 to -7.3	-7.1 to -12.1
Variant 4a		1.6 to -2.8	-0.6 to -0.5	-2.6 to -3.2	-1.6 to -6.5
Variant 5		-2.5 to -6.9	-1.3 to -1.2	-5.4 to -6.1	-9.2 to -14.2

The mobility effects in the above table range from relatively small with variant 1 to considerable with the last two variants. The reduction in mobility results in a reduction in the external costs. In addition, the internalisation of external costs means that products which require a relatively large amount of transport become more expensive compared to products which require less transport. This is primarily a shift in economic activity, because we assume that the revenue from the tax will be used somewhere. In the short term, there are likely to be friction costs; in the longer term there will be no effect on economic activity.

If the Netherlands levied a substantially higher tax than Belgium and Germany, then that could have a negative effect on the competitiveness of the Netherlands as a transit country and therefore also on the position of the port of Rotterdam compared to Hamburg and Antwerp. However, the competitiveness of a port depends on several factors. In addition, the costs of inland transport from the port make up a relatively small portion of the total costs of intercontinental transport.

Of course, we have made a number of assumptions in the calculations which led to the results in table 2. We checked whether these assumptions significantly affect the results by changing a number of the assumptions. This showed that the size of the effects is affected by the assumptions, but that the qualitative conclusions from the analysis do not change.