Revenu use from transport pricing

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Samenvatting
In het kader van het Europese project REVENUE is wordt gekeken naar de wijze waarop opbrengsten uit het beprijzen van infrastructuur wordt gebruikt. Ten behoeve van het onderzoek is een eenvoudig model ontwikkeld (het MOLINO model) waarmee de investeringen in infrastructuur en prijsbeleid kan worden geëvalueerd.
Met het MOLINO model is een case study uitgevoerd dat in dit paper wordt beschreven. Voor de haven van Rotterdam en Antwerpen is gekeken naar de investeringen en de investeringsbronnen in de havens, specifiek voor het containervervoer. Gezien de complexiteit van zeehavens en de eenvoud van het MOLINO model moeten de resultaten worden gezien als een 1^{e} orde benadering.
Eén van de conclusies is dat om de investeringen terug te verdienen, de heffingen dusdanig hoog zijn dat dit leidt tot een afname van het containervervoer. Dit leidt tot de conclusie dat investeringen in havens lastig terug te verdienen zijn. Praktisch gezien is er bovendien het probleem dat politieke afspraken worden gemaakt die de transparantie van investeringen vertroebelen.

Summary
The EU project REVENUE studies the revenue use from transport pricing. For analysing purposes a simple model has been developed (MOLINO) to evaluate the investments in infrastructure and pricing policy.
The MOLINO model was used in a case study, which is described in this paper. For the port of Rotterdam and Antwerp the investments and sources of investments have been studied, specifically for sea container transport. Given the complexity of the sea ports and the simplicity of the model the results are tentative.
One of the conclusions is, to recover the investment costs lead to high charges. This will result in a decrease of container transport. It is difficult to earn back the investments because the revenues are insufficient. Furthermore, in practice a political trade-off solution was chosen. This is considered a bad example from the point of view of making investments more transparent.

1. Background and objectives

The determination of correct prices for the use of transport infrastructure has been the focus of previous and current EU research. These projects have directly contributed to the development of European transportation pricing policy. Although the setting of correct prices is a basic requirement for any transportation policy, it has become obvious that how revenues from transport pricing can be used efficiently, is also highly relevant. Therefore, the REVENUE project focuses on analyzing the efficiency and equity impacts of different options to use revenues from infrastructure charges, and deals also with the acceptability and feasibility of these options.

The REVENUE project has three ambitions:

- to know what are current institutions and practice of transport revenue use of infrastructure pricing;
- to develop guidelines for a good revenue use in the presence of marginal social cost pricing on the basis of sound economic theory;
- to test guidelines on a large set of case studies.

Previous EU research projects have mainly focused on the optimal pricing of existing infrastructure. This is a necessary and important step forward for the optimal use of transport infrastructure. However, the introduction of marginal social cost pricing will give rise to important changes in revenues of infrastructure pricing. These can be positive (say in urban congested areas) or negative (say in low densely areas). These changes in revenues probably necessitate a reform of current practices and institutions of revenue use. Current practices of revenue use in the transport sector are complex: one can observe earmarking, public-private partnerships, investment funds that pool revenues over regions and over modes, price regulation, matched grants etc. The REVENUE project investigates these practices in the EU, confront them with the guidelines that the economic theory provides and tests the guidelines in a large number of case studies. Conclusions are drawn as to which are the most effective options for using revenues from transport pricing for funding transport investments and subsidies/deficits or for reducing other taxes. These conclusions will be used to prepare guidelines for policymakers, infrastructure managers, the users of infrastructure and others.

2. Structure of the REVENUE project

The REVENUE project consists of a number of activities.

1 The first activity sets the stage for the overall project, notably through the assessment of the range of policy issues addressed, the critical review of evidence provided by previous research, and the establishment of a common terminology of concepts;

2 The economic principles of optimal revenue use, comprises the second activity. The theoretical prescriptions to be developed will play a dual role: to help explain the failures of current practice, and to provide alternative (better) guidelines for revenue use. The case studies will cover different modes and countries. The main purpose of the case study work is to compare current practice of revenue use with the main theoretical guidelines to develop guidelines for a good revenue use in the presence of marginal social cost pricing on the basis of sound economic theory;

3 The third activity defines a common methodology for the case studies.

4 The fourth activity consists of an analysis of revenue use in inter-urban case studies, for example interurban road pricing in Finland, Swiss agglomeration and railway funds and the Rotterdam Port.

5 Analysis of revenue use in urban case studies, for example cases in Oslo, Warsaw and Edinburgh.

6 The last activity concerns the consolidation and summary of the findings of the activities. The policy conclusions will be used to prepare a guideline, which will be disseminated to all parties involved (policy makers, EU community, academic community, operators, pressure groups and lobbies)

This paper primarily focuses on one specific part of the REVENUE project: the inter-urban case study: Rotterdam Port. However, before zooming-in on this case study, we will give a concise overview of one the main methodological tools developed in the REVENUE project: the MOLINO model. A general understanding of this tool is helpful, because it has been used in the case study for the Rotterdam Port (and most of the other REVENUE case studies as well). Furthermore, the MOLINO model clearly has a more general interest as well.

3. The MOLINO model

The MOLINO model is a tool to evaluate infrastructure investment and pricing policies. It can be summarized as follows:

- *Demand model*: Given the level of generalized cost, the model computes, using some behavioural assumptions, the number of users selecting the different modes, for different time periods. The demand model can deal with passenger as well as freight demand for any combination of modes.
- *Supply model*: Given the number of users selecting the different modes, the model computes, using congestion function (such as volume delay functions) the level of congestion on the different modes, for different time periods.
- *Equilibrium model*: Given the demand and supply functions, the model computes the corresponding fixed point solution in terms of prices and congestion levels (using for example an iterative model or a variable inequality approach).
- *Evaluation criteria*: The direct outputs of the model are: flows, travel times, tolls levied. Indirect output is computed using the direct output: a social welfare function, toll revenues, etc.
- *Control*: There are a variety of control variables: pricing, access control, maintenance policies and investment policies. There are different potential objectives: first or second best welfare maximization, revenue maximization, cost minimization, etc. These objectives are computed for the whole system or for a part of the system. The system is managed by one or several competing (or cooperating) agents. The objectives of the agents can be: social welfare maximization, cost minimization, constraint optimization (financial or equity constraints).
- *Accounting model*: For each setting, the model computes the accounts for some of the agents.

Theoretical prescriptions on optimal pricing, investment and revenue use are not straightforward to implement and depend on the problem characteristics. Often, the best solution is not obvious and one will need to compute numerically the advantages of the different options. Moreover, the optimal solution may depend on the normative preference of the policy maker (he may favour a particular equity/efficiency trade-off) and may be path dependent because some institutions have build up a better reputation by their past performance.

MOLINO is an abstract model to test alternative regulation schemes. By regulation scheme a complete description must be understand of the pricing, revenue use and investment rules that are used for a given infrastructure. The next table presents a few possible regulation schemes for one mode (a combination receives a name M1, where the first figure stands for mode 1, the second figure stands for the particular set of rules).

Table 1: Some examples of regulation schemes that can be studied with MOLINO

Type	Investments				Operation			Objective
	Residual finance	*Who decides investment*	*Who builds*	*Type of pricing*	*Residual Finance*	*Who decides prices*	*Service provider*	
M11	Labour tax	CG	Public Company (no tender)	Simple	Labour tax	CG	Public Company (no tender)	Welfare max
M12	Labour tax	CG	Tender	MSC or opti-mization?	Labour tax	CG	Tender	MSC
M13	Head tax	LG	Public Company (no tender)	Simple	Head tax[1]	LG	Public Company (no tender)	simple
M14	Head tax	LG	Tender	MSC	Head tax	LG	Tender	MSC
M15		PS	Tender	Profit max		PS	Tender	Profit max

Legend: CG= central government, LG= local government, PS= private supplier, MSC=marginal social cost pricing

M11 combines many sources of inefficiency, as both infrastructure and operation are organised within the government, residual funding via labour taxes and pricing is kept very simple and is not optimized. M12 is another polar case where all elements are optimized.
M13 and M14 are run by the local government, which has fewer sources of funding and optimizes only the welfare of its own citizens. M15 is a standard private case. One could imagine other cases (infrastructure public and operation private etc.).

The MOLINO model is programmed to deal with problems where there are *two* alternative transport modes. A regulation scheme requires therefore choosing one line in table 1 for each of the 2 modes. Because there are two modes and several types of decision makers the model is capable of analysing different market regimes (duopoly, purely private or mixed private/

[1] By a head tax we mean a tax that does not vary with income.

public) as well as local or central government welfare maximisation. In addition, the user needs to specify whether there is any cross subsidization between the modes and whether this happens via an infrastructure fund with specific operating rules (not shown in the table).

The theoretical guidelines are translated into the MOLINO model in two ways: via the choice of a regulation scheme (one line per mode in the previous table) and via the use of reduced form coefficients for the structure of the cost function, the procurement efficiency, cost of capital and marginal cost of funds.
For each investment and pricing problem, the operation of the model requires 3 steps. First, it is required to calibrate the model so that it reproduces a given baseline development (t=1…T) of transport needs and structure of behaviour (demand functions for passenger and freight transport) as well as a baseline policy. Next one chooses a regulation scheme that specifies completely the future pricing, investment and revenue use rules for the whole time horizon. Finally, a policy assessment module (consisting of transport market modules, investment module, financial modules, etc.) simulates the effects of this policy input and reports the outcome of this policy for the particular problem studied.

MOLINO works with a very simple model structure that can give different interpretations depending on the case study at hand. Table 2 gives the dimensions that are included in the transport module for every year of the time horizon.

Table 2: Components of the transport module in the MOLINO model.

	Passenger	Freight
4 User categories	2 types of users (poor vs. rich, or other distinction)	transit and local freight demand
2 Modes	-free highway vs. toll highway -road vs. rail -rail vs. air	-free highway vs. toll highway -road vs. rail ....
Subperiods	Peak and off-peak	Peak and off-peak
Elasticity of total trip demand	Elastic	Elastic
Service quality	Dimensions of quality can include: • congestion delay • smoothness of road surface • reliability • ease of toll payment	Dimensions of quality can include: • congestion delay • smoothness of road surface • reliability • ease of toll payment

The MOLINO model is programmed in Mathematica with an interface to MS Excel. The model was applied in a case study of the Port of Rotterdam, which is (given the previous description of MOLINO) obviously a non-standard application environment.

4. Case study Port of Rotterdam: Background

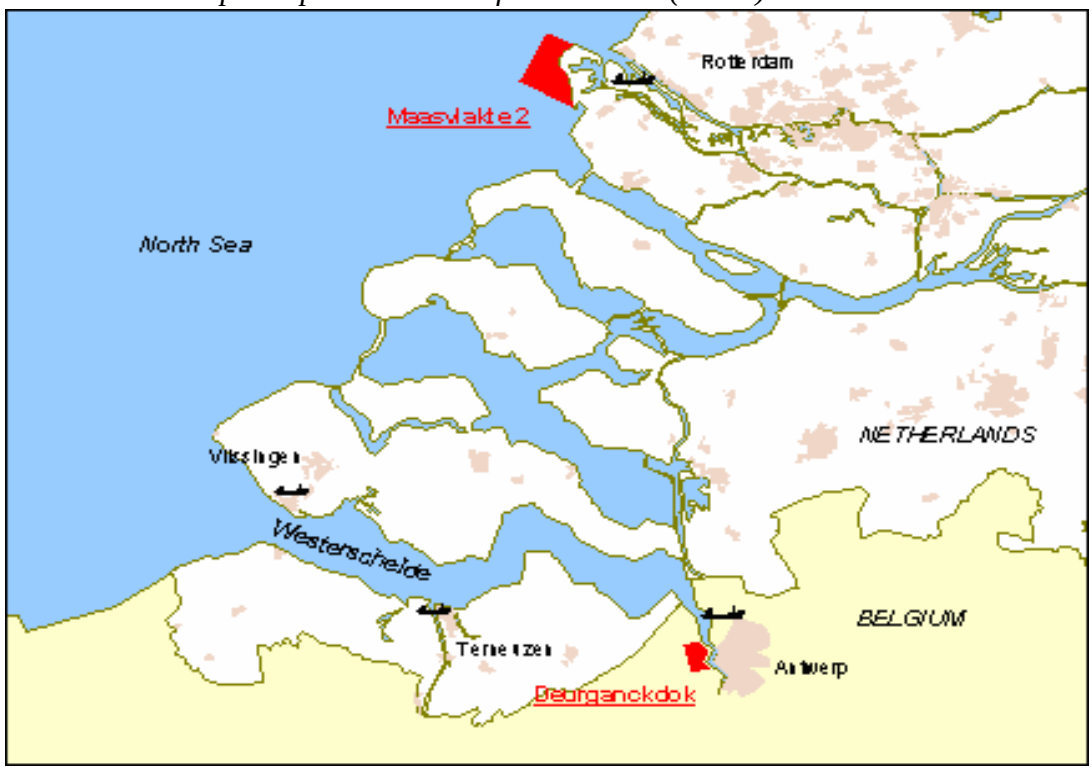
The Port of Rotterdam case study examines the existing practice on pricing, investment, revenue use and the respective effects at the competing ports of Rotterdam and Antwerp. Both ports target the same large-scale hinterland and market niches. The ports and the national and municipal authorities of the Netherlands and Belgium (Flemish Government) promote a sustainability policy to provide an optimal balance between the needs of the port, interacting transport modes, the economy and the society in general. The promotion of sea-rail, sea-inland waterways and see-pipeline transport chains and curbing of the sea-road share is a priority in the national transport policies of the Netherlands and Belgium.

Both ports have enjoyed a significant growth of container traffic over the last decade. They are presently experiencing capacity problems in handling the present volume of containers. Both ports are in a period of expansion. For Rotterdam this means the reclamation of sea land (project Maasvlakte 2) and the construction of additional container terminals. For Antwerp the capacity expansion means building a new tidal container dock (the Deurganck doc) on the left bank of the Scheldt River. In order to be able to accommodate larger container vessels and to improve the access to the port of Antwerp, the deepening of the Westerschelde sea waterway connection is considered necessary. This raises a number of cross-border issues and is rather politically controversial as the sea-access route to Antwerp is on Dutch territory. This controversy is intensified as Antwerp and Rotterdam are to a large extent competing seaports and therefore the societal impact on the Netherlands (despite having limited positive impacts on some smaller ports in the Sealand province) is expected to be very negative.

5. Case study objectives and research questions

The case study analyses two competing transport options, which are i) Container transport via the port of Rotterdam, ii) Container transport via the port of Antwerp. The analysis considers the direct investment in the port infrastructure expansion (for instance, sea land reclamation and additional container terminal building) and the investment sources both for Rotterdam and Antwerp. In figure 1 the expansion plans are marked.

Figure 1: Coastal map and planned new infrastructures (in red)



The research issues were driven by the strategic long-term targets of the national Dutch policy regarding the port of Rotterdam and can be summarised as follows:

1. Testing the existing and theoretical options, which comprise different combinations of (port) revenues, pricing/taxation and investment schemes to facilitate the targeted welfare for the port of Rotterdam.

2. The financial combinations mentioned in the first research issue are being looked at from the point of legal and environmental obligations. Due to the legal obligations of the Netherlands towards Belgium (to ensure good access to the port of Antwerp for the navigation on the Dutch part of the Westerschelde), the Netherlands is facilitating the development of the port of Antwerp, an important competitor for the Rotterdam port. The environmental obligations concern the conservation of nature and flood protection targets of the Westerschelde estuary. Both are endangered by the obligation of the deepening of the Westerschelde.

3. Currently the use of inland and sea access waterway network in the Netherlands is free of charge. Therefore, an insight on the “user pays” possibility in relation to navigation on Westerschelde is opted for the analysis of revenue-pricing-investment regimes combina-

tion. This theoretical option is also explored with marginal cost pricing on Westerschelde route in order to (partly) compensate the negative environmental implications and the effects of the indulged additional competition for the port of Rotterdam.

The above schemes were assessed from the efficiency and feasibility/acceptability point of view. Furthermore, there is a set of option-specific research *questions* to be analysed within the study case *from the Dutch point of view*.

Port of Rotterdam (Maasvlakte 2):

(1) What are the social costs and benefits of the expansion of the port infrastructure (restricted to the container handling facilities)?

(2) What are the impacts of the possible cost recovery mechanisms for the Maasvlakte 2 investments for the Netherlands (e.g. 'user pays' and other pricing mechanisms, port dues adjustment, creation of a Scheldt fund, port rent adjustment, financial transfers between authorities, etcetera) in terms of efficiency, equity, feasibility and acceptability?

(3) Can the proposed cost recovery mechanism from the Maasvlakte 2, as approved between stakeholders (Port Authority Rotterdam, Gemeente Rotterdam and the Dutch Government) be justified on the basis of the findings of the study?

Port of Rotterdam (Maasvlakte 2 in combination with deepening of Westerschelde):

(4) What are the social costs and benefits of the deepening of the Westerschelde for Dutch society?

(5) What are the impacts of the possible cost recovery mechanisms for the Westerschelde investments for the Netherlands (e.g. 'User pays" and other pricing mechanisms, port dues adjustment, creation of Scheldt Fund, port rent adjustment, financial transfers between authorities etc) in terms of efficiency, equity, feasibility and acceptability?

(6) What are the possible cost recovery mechanisms for the Westerschelde investments for the Netherlands (e.g. 'User pays" and other pricing mechanisms, port dues adjustment, creation of Scheldt Fund, port rent adjustment, financial transfers between various authorities etc) in terms of efficiency, equity, feasibility and acceptability considerations?

6. Case study objectives and research questions

Three principal regulation schemes (see table 3 for a more detailed description and for an outline of the scenario variants) were defined:

Status quo (2004-2006):

- Current pricing, revenue use and investment schemes in the ports of Rotterdam and Antwerp (harbor dues for container vessels 2004)
- Ongoing infrastructure investment financing (new infrastructure at ports, hinterland access)
- Applicable regulatory framework/welfare perceptions

Adopted policy (2004-2012):

- Launching new infrastructure (sea land reclamation Maasvlakte 2, Deurganck container terminal)
- Sea-wall for Rotterdam
- Obligation to maintain necessary depth on the Westerschelde access route (but no deepening)
- Status quo regulatory framework/welfare perceptions

Trade-off policy (2004-2012):

- Launching new infrastructure (Maasvlakte 2, Deurganck)
- Sea-wall for Rotterdam
- Obligation to maintain necessary depth on the Westerschelde access route
- Negotiated further deepening of the Westerschelde access route
- Nature/flood protection on the Westerschelde access route
- Status quo regulatory framework/welfare perceptions

The adopted policy scheme and the trade-off policy scheme are each further subdivided into two sub-scenarios A and B with the B-variant considering a cross-country transfer between Belgium and the Netherlands for the cost of Westerschelde deepening.

Table 3 Regulation schemes for the Port of Rotterdam case study

Regulation Scheme	Scenario	Pricing	Revenue Use	Investment
Status Quo	(0) status quo 2004	• Reference • Fixed toll • MSC tolling	Revenues shared between the Port Authority and the Municipality of Rotterdam	*Option 1:* investment to build Maasvlakte 2 (Port Authority), hinterland access (State, local authorities); *Option 2:* Investment to build Deirganck dock (Port Authority, Local and Central Authority); hinterland access (State, local authorities);
Adopted Policy	(1-A) • *Horizon 2012* • *New container terminals* • *Westerschelde maintenance* • *Protection of nature* • *No Belgium contribution*	• Reference • Fixed toll • MSC tolling (no financial contribution by Belgium to Westerschelde costs coverage)	Maasvlakte profit to be shared 50:50 between the Municipality of Rotterdam and the State	*Option 1:* Maasvlakte 2 in operation; State investment into sea-wall, nature protection in Rotterdam area *Option 2:* Deurganck dock in operation;
	(1-B) • *Horizon 2012* • *New container terminals* • *Westerschelde maintenance* • *Protection of nature* • *Belgium contribution*	• Reference • Fixed toll • MSC tolling (Belgium contributes to Westerschelde costs coverage)	Revenues to be shared between the Port Authority, Municipality and the State. Revenues from Westerschelde charges to be used for maintenance of Westerschelde	*Option 1:* Maasvlakte 2 in operation; State investment into sea-wall, nature protection in Rotterdam area *Option 2:* Deurganck dock in operation; Belgium co-invests in the maintenance of port access on Westerschelde
Trade-off Policy	(2-A) • *Horizon 2012* • *New container terminals* • *Westerschelde maintenance* • *Deepening* • *Protection of nature* • *No Belgium contribution*	• Reference • Fixed toll • MSC tolling (no financial contribution by Belgium to Westerschelde costs coverage)	Revenues and costs from Maasvlakte to be shared between the Port Authority, Municipality and the State	*Option 1:* Maasvlakte 2 in operation (port Authority); Deepened Westerschelde (State & local authorities); State investment into sea-wall, nature protection in Rotterdam area; *Option 2:* Deurganck dock in operation; sea and hinterland access improved
	(2-B) • *Horizon 2012* • *New container terminals* • *Westerschelde maintenance* • *Deepening* • *Protection of nature* • *Belgium contribution*	• Reference • Fixed toll • MSC tolling (Belgium contributes to Westerschelde costs coverage)	Revenues and costs from Maasvlakte to be shared between the Port Authority, Municipality and the State, Revenues from Westerschelde charges to be used for maintenance and deepening of Westerschelde	*Option 1:* Maasvlakte 2 in operation (Port Authority); Deepened Westerschelde (State & local authorities of the Netherlands, Belgium contribution); State investment into sea-wall, nature protection in Rotterdam area; *Option 2:* Deurganck dock in operation; sea and hinterland access improved, Belgium co-invests in the deepening of port access on Westerschelde

Source: Rudzikaite et al. 2005.

7. Case study modeling considerations

In order to answer the research questions, the MOLINO model was applied. The MOLINO model was described in an earlier part of this paper. Although the original concept of MOLINO is specifically based on description of the 'costs- revenues use –investment" regimes for competing transportation options for road and/or rail, rather than ports, efforts were made to abstract the driving forces applicable to competing sea ports and translate them into the MOLINO concept. In this respect, a number of simplifications/restrictions were introduced:

- Abstraction towards two port competition only (third option is ignored)
- Artificial inclusion of passenger transport (technically required to make model running)
- Simplification of port ownership relations (to better trace revenue flow)
- Operator's concept is replaced with Resultant Operator concept (resultant shipper)
- Overcoming dual government problem (MOLINO assumes one central government)
- Costs related to tide-waiting are assumed as infrastructure capacity restriction costs

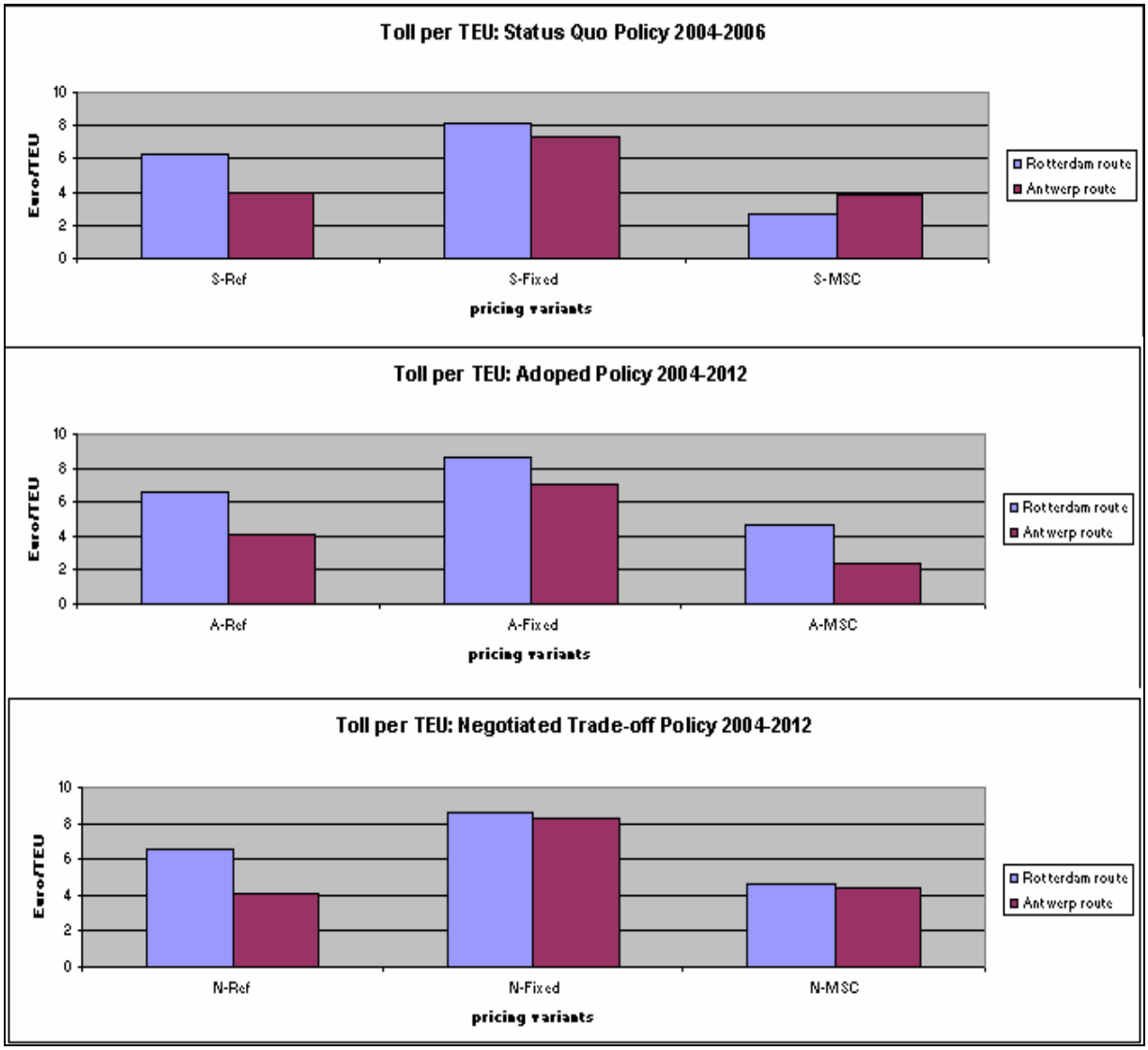
Having in mind the complexity of the port system and the restrictions of the model, the outcome should therefore be considered as tentative.

8. Case study main findings

Figure 2 shows the toll per TEU per regime (reference, fixed, MSC) for each policy scenario. The reference toll is adequate to presently applied port dues for container ships. The fixed toll in each scenario is estimated on the basis of the size of the investments foreseen in that particular scenario having the purpose to pay them back. The MSC toll is as far as the congestion part is concerned, computed internally by MOLINO, the remaining components are based on estimates from the case study team.

One can notice, that in order to pay back the investments foreseen in the Trade-off policy scenario both for Rotterdam and for Antwerp routes, the toll has to be increased up to euro 8,62 and 8,27 respectively. Similarly, the route-bound marginal social cost pricing would almost equal each other exceeding 4 euro/TEU value. The price difference per transportation option would become minimal. At the moment, the so called reference situation, the toll on the Rotterdam route is noticeably higher than the one applied at the port of Antwerp.

Figure 2: Tolls per regime for different investment policies

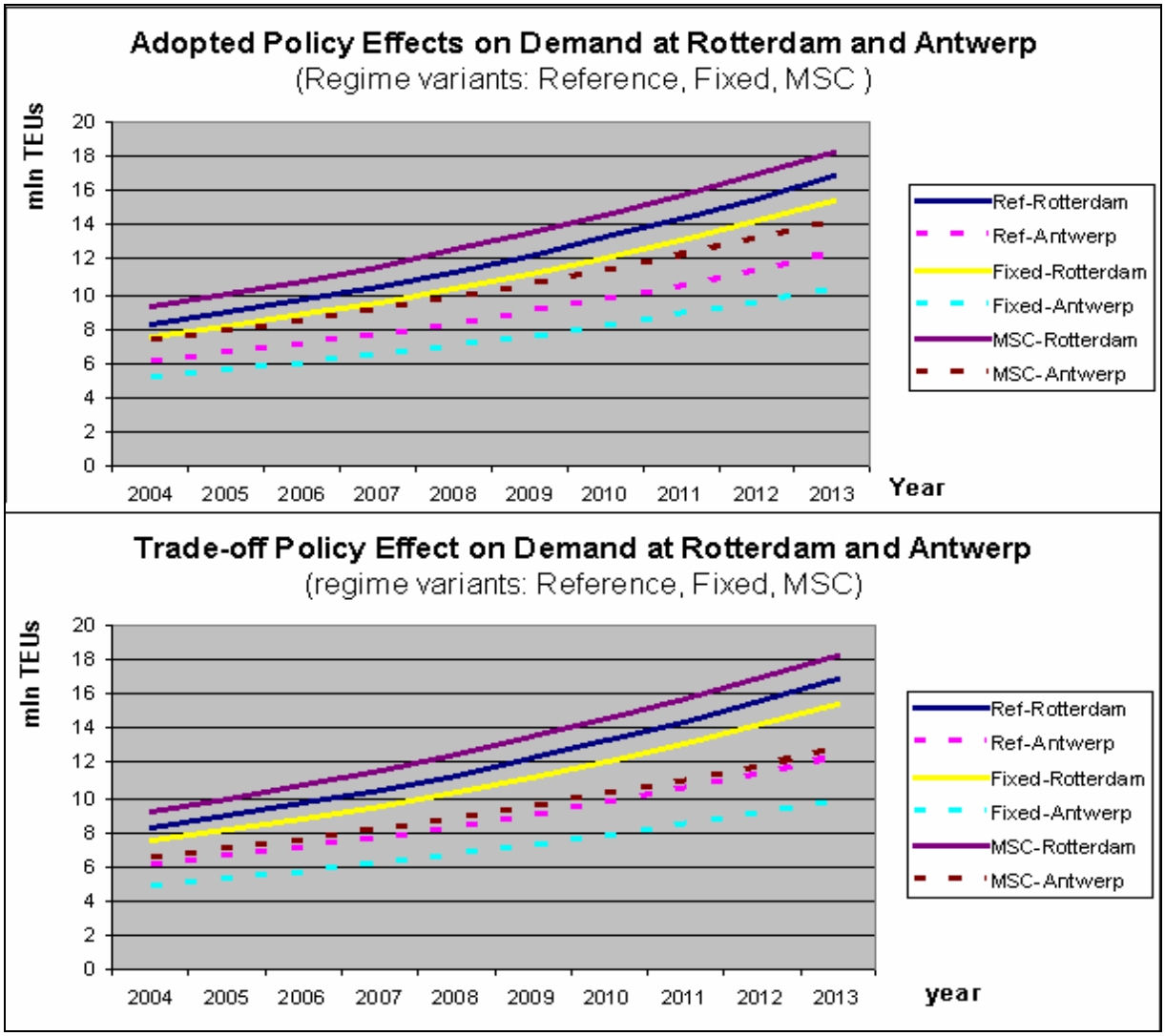


As shown in Figure 3, charging the Antwerp option in proportion to the investments planned for the deepening of Westerschelde would have the biggest effect on the container volumes at Antwerp port.

Revenues

The introduction of the fixed toll high enough to pay-back the investments would have caused the reduction of the total demand (for Rotterdam and Antwerp together) in every policy respectively by 11,5%, 15,3% and 17,2 %. This most likely would mean a recapture of this "lost" share by other seaports in the Le Havre-Hamburg region because the general trend of container traffic shipping is increasing both in Europe and in the rest of the world.

Figure 3: Effect of the tolling policies on demand



Obviously, the introduction of a fixed toll would cause higher toll revenues but lower tax revenues. The reduction of demand would subsequently cause reduction of the port related businesses and this affects the tax revenues of the authorities. At the end of the day the obtained benefits would be less than expected, although the investment costs for infrastructure expansion can be paid-off. This is therefore in general not an economically feasible situation, endangering the long-term sustainability of port activities.

Trying to recover the real investment costs only by increasing harbour dues is obviously not the optimal regime for the port authorities. The combination of charging, land/infrastructure renting or even land selling seems to be a more promising way to follow.

Table 4. Policy bound toll revenues versus investments

Toll revenues (Euro mln) /At end of the period/	Status Quo Policy Criteria End 2006		Adopted Policy Criteria End 2012		Trade-Off Policy Criteria End 2012	
	Rotterdam route	Antwerp Route (+maintenance Westerschelde)	Rotterdam route	Antwerp Route (+maintenance Westerschelde)	Rotterdam route	Antwerp route (+ deepening & maintenance Westerschelde)
Reference	171.5	79.0	563.6	231.7	564.5	231.6
Fixed	204.4	120.4	752.3	414.4	752.4	464.3
MSC	93.3	78.8	344.0	195.2	489.9	250.0
Investments	47.6	191.2	767.6	221.3	803.6	721.3
Required accumulative net payment to Westerschelde Fund ("User Pays")	-	153.5	-	107.8	-	311.8

Social marginal cost pricing leads in all cases to an improvement of freight volumes and welfare levels at a relatively low level of toll revenues. This would be attractive for the port users (container operators, transhipment companies) but the revenues would not be sufficient to fund the infrastructure investments made to realise container transport and transhipment capacity extensions.

Changes in welfare

For all regulation schemes with exogenously fixed tolls welfare decreases compared to the reference situation while for all scenarios with a MSCP regime welfare would increase. One can conclude that marginal social cost pricing leads in all cases to an improvement in freight volumes and welfare levels but to a relatively low level of charging revenues. This would be attractive for the port users (container operators, transhipment companies) but the revenues would not be sufficient to fund the infrastructure investments made to realise container transport and transhipment capacity extensions.

Acceptability issues

The major acceptability problem is that under the current legal arrangements the costs of maintaining and deepening the Westerschelde are being paid by the Dutch government and the regional authorities of Zeeland, e. g. to 100% by Dutch taxpayers. The users of the Antwerp port and the Antwerp port authority enjoy the benefits of this arrangement. Therefore, all sub-scenarios, which foresee a compensation payment for this burden (scenario-variants B), would increase acceptability.

With regard to political feasibility/acceptability it must be remarked that according to the latest (early 2005) developments in the negotiations between the Dutch government and the Flemish government in relation to deepening of Westerschelde, it was agreed to start the deepening in 2007. It was also agreed that the Dutch government and Zeeland authorities would pay the investment costs fully. Instead of agreeing on a direct financial contribution of Belgium to the Westerschelde deepening project, the Belgians will now ensure the necessary technical/financial arrangements for accommodating Dutch requirements with regard to services on the high-speed 'North-South' railway line from Amsterdam-Paris (thus creating a possibility for the citizens of The Hague to reach Paris by rail in 3 hours).

It is very difficult in such a political "trade off" between infrastructure projects to estimate welfare impacts, because it implies that one should also model other infrastructure projects. Furthermore, from a more general point of view, it must be observed that such cross-border political "deals" are not recommendable to make infrastructure financing more transparent. For example applying the "user-pays" principle may now become more difficult. Having in mind the above-mentioned agreement between the two governments, the trade-off scenario should be considered as purely theoretical.

8. Case study conclusions

- Fixing the level of charges sufficiently high to recover, in a reasonable time, the investment costs allocated to container transport, significantly reduces the volume of container transport and has a negative impact on the welfare levels. Only charging at marginal cost levels performs better on these indicators, but it does not produce a sufficiently high level of revenues to recover the investment costs.

- The case study results appear to suggest that it is not possible to self-finance port investments like those in the Westerschelde project and Maasvlakte 2 project (as far as these costs can be allocated to container traffic) to a significant extent by such charges. Either the flows of goods to the ports decrease too strongly or the revenues are insufficient. One should realise that in practice the elasticity of transport consumption might be even higher because of “third port” competition. It might be even more difficult to earn back the investments. This means that the rationale for such type of port investments may consist in indirect effects and not in shipping transport as such.
- One could think of a modification of current port tariffs in the implementation of charges. However, legally there may be problems in the Netherlands with charging on waterways. Furthermore, charging on marginal social cost levels may be technically difficult because it is not straightforward to determine transparent charge levels.

The practical solution of the cross-border problem of the Westerschelde-project, as recently agreed between Belgium and the Netherlands, is a purely political trade-off. From the point of view of making seaport related investments more transparent, it could be considered a bad example.

Website

www.revenue-eu.org

This website provides further details and reports on the REVENUE project.