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AN APRAISAL OF THE COSTS AND BENEFITS OF A NEW FERRY BETWEEN UMEÅ AND VASA

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SUMMARY

The analysis shows that a new ferry over Kvarken is socioeconomically profitable within a wide spectrum of scenarios. A ferry link as an alternative to the longer road connection around the Bay of Bothnia would give considerably shorter travel times, which would benefit society, trade, industry, and travellers. A cautiously calculated basic alternative gives a net present value ratio of 0.71 and a payback period of 13 years for an investment of SEK 1.3 billion.

	Annual traffic growth			
	0 %	***1 %***	**2 %**	**3 %**
Socioeconomic gain (3.5 % interest), in SEK millions	2,057	***2,107***	2,427	2,656
Net present value ratio	0.58	***0.71***	0.87	1.04
Socioeconomic payback time	14 years	***13 years***	12 years	11 years

A new ferry has a potential to renew transport services over Kvarken. With a stronger regional development and an increased growth in traffic, ratios of around 1.0 can be achieved which indicates high profitability. The results justify a discussion being initiated with different actors regarding the funding of the investment. The objective should be to strengthen the transport system in northern Europe and increase its capacity to generate socioeconomic gain for the two countries and the regions that directly would be connected by the new link, but also and for Europe as a whole.

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1. INTRODUCTION

INAB has commissioned CERUM to do a general study of the socioeconomic costs and benefits that could arise of an investment in a new ferry on the Umeå-Vasa transport route. Is there any potential for socioeconomic profitability if the proposed investment is made?

There have not been enough economic resources or time for this study to include a comprehensive analysis such as that outlined in the Swedish Transport Administration's handbook for socioeconomic calculations or by using the Swedish Transport Administration's forecasting models. Unfortunately, the national forecasting models are not particularly suitable for analysing ferry investments. Moreover, there is only limited experience of socioeconomic calculations within Swedish ferry services. However, in principle, the analysis presented has followed the Swedish Transport Administration's method of calculations.

The focus of the study has been on examining the suggested cost of investment for the specific new ferry in relation to potential socioeconomic revenues during the depreciation period in order to identify, if only generally, whether the project would be feasible for regional, national and European financiers.

The purpose of the study has therefore been to find out whether the planned investment is justifiable from a socioeconomic perspective. Can the investment in the proposed ferry bear the socioeconomic benefits it will generate? One direct consequence of a deficit is that the concept of the ferry should be reviewed. On the other hand, a surplus indicates that there is potential to continue with the project.

As already mentioned, it has not been possible to do a detailed socioeconomic calculation within this assignment. Instead, the intention has been to investigate in a general way whether the benefits of such an investment could cover their

socioeconomic costs. If so, a more detailed business economics analysis of the project should be done, the socioeconomic calculation should be further refined in line with the Swedish Transport Administration's standards for socioeconomic calculations and a discussion on the funding of the investment should be initiated. A more in-depth analysis in accordance with the Swedish Transport Administration's standards would also make it possible to examine the investment with greater precision in relation to alternative potential investments for the financiers.

In the next section, we summarise some aspects of the history of the Kvarken ferry service up until the present day. Then in section three, we discuss the cost of the investment. In section four, we calculate the gains that could be generated for passengers and for freight using some cautious scenarios. We then calculate the net present value ratios and the socioeconomic payback time for these scenarios. Finally, in section five, we present some concluding reflections.

2. THE FERRY SERVICES

Shipping and ferry services across Kvarken have a relatively long history. The transport volumes of passengers and goods have grown over the long term but they have proved to be sensitive to changes in the rest of the world, changes in pricing and type of service offered, that is to say, the capacity, reliability, and overall service quality of the ferries.

During the 1990s, there was a dramatic increase in traffic, in particular passenger traffic. This expansion was due to a number of factors. One important factor was that the growing number of passengers made it possible to make the actual crossing more enjoyable for passengers, which in turn led to even more passengers. The way passengers perceive a ferry crossing is to a large extent dependent on the range of services and products offered on board, which in turn

is dependent on the number of travellers. Within significant intervals, more passengers thus give rise to even more passengers. During the 1990s, Sweden went through a major crisis period with a drop in disposable incomes. This meant that relatively speaking, the ferry became a more attractive travel option.

However, the growth in traffic stopped dramatically at the end of the 1990s and during the first twelve years of the new century, passenger traffic was instead down at very low levels. One important reason for this was the abolition of tax-free goods on the route but at the same time, the range of entertainment on offer in Umeå increased greatly and Finland's education system was expanded. Up until then, these two shortages on the mainland of the two countries had been driving forces behind the positive development of shipping services. When incomes began to rise again, at the same time as the prices of alternative destinations went down, the number of travellers over Kvarken dropped. Turkey, Thailand, Florida and other destinations became more accessible at the turn of the century and people's travel patterns changed. As the number of travellers decreased, the positive development in number of passengers that had previously improved the ferry's travel offers were replaced by poorer accessibility and less attractive offers.

The new century started out with a decade of readjustment and a ferry that was primarily freight-oriented, had poor quality offers to passengers, and could not maintain a reliable regular service. Once again, the long land route around the Bay of Bothnia became an alternative for actors in the transport sector who wanted to retain their markets; others turned to other markets or reduced their range of services/products.

In recent years, a change of ferry and an improved service has made the transport over Kvarken more reliable for freight transport and attractive to passengers. Passenger flows have increased which has resulted in a better range

of travel offers. The positive feedback from economies of scale that is evident in the number of passengers is now once again contributing to growing traffic volumes.

The further development of the ferry service is therefore an intricate balance between regaining the confidence of passengers and freight carriers, developing services at the same pace as increasing flows facilitate better transport offers, keeping costs at a competitive level, and developing the ferry as such to reduce different negative impacts on the Kvarken environment.

An extended analysis of the potential demand for traffic on the link has been beyond the scope of this study, but other studies have indicated that the limited distance and growing demand around the ports on both sides of Kvarken could result in traffic volumes that are well over today's flows.

3. THE INVESTMENT COST OF A NEW FERRY

3.1 THE FERRY AS A PRODUCT

A ferry between Umeå and Vasa comprises a product that combines genuine private goods, i.e. work trips, pleasure trips or freight transport, with supplying an infrastructural product for a large number of players in society. The ferry thus is a transport link for freight and passengers in a northern European network of road and railway transport possibilities. The ferry strengthens the economy of the larger network at the same time as it serves as a collective item of infrastructure, which gives individual actors better prerequisites to realise their goals.

Different types of ferry concepts create different possibilities, with regard to both economy and capacity, to provide such a product. More leisure trip

passengers can finance a larger capacity, increase the frequency of services, increase reliability, and possibly reduce the price of freight transport and other service-oriented passenger flows. Conversely, an orientation towards freight transport and service-related travel can secure the flows needed during the "non-leisure trip season", thereby creating a stable and relatively high basic capacity on the ferry link.

At some flow levels, the Kvarken link may have ferries of different sizes and with different focuses on freight or passengers at different times of year. This would thereby better meet the fluctuations in demand from different transport players during the year. Over the years, different solutions of this kind also have been tested. It has been quite clear that when the service has consisted of only one ship and its properties have leaned too much either towards freight transport or leisure trips, an aspect of vulnerability has been built into the service with a risk of insufficient profitability.

The current situation is that because of the age of the existing ferry, its operational and maintenance costs, and the environmental disadvantages it implies, it has to be replaced or extensively renovated within the near future. The municipality of Umeå and the City of Vasa have therefore begun to develop the concept of a new ferry that will better live up to modern demands on transport, travel experiences, loading and unloading, and environmental properties.

This study has not been able to examine in detail the investments that have been proposed to achieve this. However, INAB has presented the investment costs believed to be linked to the new ferry and different measures in the ports on both the Swedish and Finnish sides, measures it is believed will be necessary in order to achieve the calculated flows of freight and passengers. The results of

this study are based on the assumption that these measures will be enough to generate the calculated flows.

3.2 THE INVESTMENT AND HOW IT WILL BE FINANCED

INAB has estimated the total cost of the various parts of the entire investment; we have rounded this off to SEK 1.3 billion. SEK 1.1 billion of this is the cost of the actual ferry. The depreciation period for the ferry has been set at 25 years and the discount interest rate at 3.5 percent. The latter figure is in line with the Swedish Transport Administration's recommendation for socioeconomic cost-benefit calculations.

Are there reasons why some or all of this investment should be financed with collective tax revenue from different spatial levels (local, regional, national and European)? If the ferry were only a cruise ship, naturally this could not be justified. However, as mentioned above, the ferry serves as a link in a network of infrastructure where transport flow analyses show that the link shortens transport times and reduces transport costs for both freight and people within a relatively extensive area on both sides of Kvarken.

If Kvarken were considerably narrower, the National Transport Administrations in Sweden and Finland would probably handle the project as an investment in infrastructure. It could then be a matter of building a bridge over a sound, which

could be compared with the Öresund Bridge, Svinesund Bridge or the railway and road bridges between Haparanda and Torneå.

If Sweden and Finland were a united nation, the Kvarken ferry would be viewed in the same way as any potential bridge or ferry link within the country. Decisions and funding would therefore lie within the framework of the priority and decision procedures established within that country. In that respect, it is possible to compare this project with the extensive ferry services in Norway and the analysis of those investments.

The fact that the ferry and the transport link it represents crosses a national border out at sea means that this by tradition not is the case. There is therefore an obvious risk that different forms of socioeconomic inefficiency will arise in the total transport network because of various policy failures linked to a lack of decision structures. Socioeconomic resources are spent on transports that are unnecessarily long and expensive, while at the same time potential trade that could have been beneficial from a socioeconomic perspective does not arise.

The preservation of tax-free within parts of the transport network between the two EU countries Sweden and Finland is one example of such a policy failure. It makes the transport market between the countries inefficient and distorted. The regional political transport grant in Sweden moreover favours land-based transports to the national border and can thereby contribute to the diversion of transports from shorter, sea-based transports on international routes. In extreme cases, political failures of that kind can stop the ferry link from being established. In other circumstances, it is mainly traffic volumes that are affected and the possibility of making users pay the socioeconomic costs of their transports.

In the case of the Kvarken link, it is obvious that traffic can be maintained but the special and unique demands that winter traffic entails limits the number of

commercial players, especially when the traffic is in a building-up phase after a major disruption of the sort that has taken place.

However, irrespective of whether the traffic is run by a state or private player, the financing of a ferry could be seen as a cost that to some extent is first borne by the tax-paying collective at different spatial levels and then transferred to funding that instead to some extent is borne by the users of the ferry. As is the case with other infrastructure, a combination of such state and user-based financing is normally the best solution. Funding that is only based on the users risks bringing about socioeconomic inefficiency in the form of lower capacity and higher prices than would be the case with pricing that reflects the socioeconomic benefit of the link. The question is instead how much of the funding is to be borne by the various interested parties.

If there will be socioeconomic gains thanks to the ferry being available as a potential transport alternative, it is feasible for the tax collective or a large group of companies, using the Swedish infrastructure network to take part in the funding of the ferry as a link in the network. The total worth of the network will thereby be increased for all carriers. From this perspective, "Transport link Kvarken" will become an option for carriers and it should be guaranteed in order for potential socioeconomic gains to be realised. At the same time, some of these gains are of obvious transport economic benefit for the users of the ferry, which is why they must also co-finance the ferry via ticket prices and freight charges. The balancing of the private and the tax-funded or fee-funded parts is of course something that must be continually reviewed. However, there are no a priori reasons for users of the ferry to pay a relatively larger share than other users of equivalent links in the land-based road and railway networks that are used by many players and which constitute the total network of infrastructure.

In order for the ferry to be co-funded by more people than those who happen to be using the link now, it must be shown to be plausible that there are socioeconomic revenues that cover the socioeconomic costs the investment in a new ferry will entail.

4. CAN THE INVESTMENT IN A NEW FERRY BE JUSTIFIED FROM A SOCIOECONOMIC POINT OF VIEW?

4.1 SCENARIOS FOR TRANSPORT VOLUMES

The socioeconomic gains of a new ferry consist of benefits from freight and passenger traffic. The alternative the investment in a new ferry is compared with has been chosen as the case where there is no ferry link. Because of its age, operational costs and negative impact on the environment, the existing ferry is not a long-term alternative. On the contrary, even now there are strong reasons to take measures, purely for environmental reasons. The physical and functional age of the current ferry, mean that extensive renovation would be an investment with a low rate of return.

The main function of the existing ferry is that it is once again building up confidence in the transport link on the transport market, at a reasonable cost, after a decade of inadequate transport possibilities. Both freight and passenger markets have reacted positively to this new alternative. In that respect, the ferry can be seen as an interim solution, with the implication that the utilization of a new ferry would be at a considerably higher level during the important initial years, compared with a situation where a new ferry is introduced to a market that has had no ferry at all for a period. During the period with the current ferry, the various actors on the transport market have been able to build up

competitive transport chains and customer contacts, which can be transferred straight away to the new ferry service when it begins to run.

In the calculations presented in this study, it has been assumed that a new ferry will be in operation by 2020. With a depreciation period of 25 years, calculations thus are made for different forecasts during the period from 2020 up to and including 2044.

When it comes to freight traffic, we assume that 270,000 tons of freight will be transported on the link during the first year the new ferry is in operation. In 2015, the existing ferry transported 276,641 tons of freight. We have done calculations for different alternatives with a growth of freight transport of 0, 1, 2 and 3 percent per year. The alternative with a one percent increase in traffic is our main scenario. The lower zero growth alternative gives an indication as to how sensitive the investment is to starting up in a period of weak economic growth. The alternative with two percent's growth is INAB's own main scenario. The assumption of three percent's growth shows a development where the two cities of Umeå and Vasa are able to develop a strong common growth compared with their national averages where each city expands by two percent yearly.

A growth in traffic of one percent per year is not in this perspective unreasonable. If the Swedish and Finnish economies grow by two percent per year and an environmentally certified transport alternative can follow that development, or even develop slightly more slowly, the main forecast would be fulfilled. We can expect a positive development of the transport sector's environmental efforts at the same time as local tourism in the region is expected to expand. Increased interaction between and integration of the growing economies of the Umeå and Vasa regions will give an expanding basis for more transport work from urban economies of scale when the economies become

more intertwined. Thus, the alternatives with two and three percent's annual growth of freight and passenger volumes represent effects of such urban economies of scale. That would primarily mean a significant growth of freight flows in relation to how flows have been previously.

4.2 THE BENEFITS OF FREIGHT TRAFFIC

We will in this section start by describing the benefits of freight flows and then discuss the effects of passenger flows in the next section. The annual transport economic gains of transporting goods around the Bay of Bothnia by lorry instead of taking the shorter route by ferry has been estimated at just over SEK 222 per transported ton. For the start-up year, we estimate that 15,000 lorries and 270,000 tons of freight will be transported on the ferry. The total cost of transport and travel time for the longer route around the Bay of Bothnia is estimated to be SEK 8,380 per lorry. The gain of instead doing the transport by ferry is estimated to be SEK 4,100 per lorry. The total gain for all lorries is SEK 60 million during the first year, 2020. This would imply a gain of SEK 222 per transported ton.

The calculation is based on input data to the Swedish Transport Administration's SAMGODS model. The SAMGODS model is not ideal for calculating transports that is crossing Swedish national borders and especially not for calculations where the investment under consideration is ferries and other shipping. A separate calculation was therefore needed in order to get a credible result.

In addition to gains to traffic economy, one must also consider the relation between the negative environment externalities that are caused by the alternative road route around the Bay of Bothnia and those caused by transport with a new ferry. The existing ferry has considerably worse environment values

than a lorry that drives round the Bay of Bothnia, so from that point of view, the environment economic effect of the existing ferry service is probably negative. However, knowledge about environmental impacts both above and under water are highly uncertain when it comes to different forms of shipping.

The new ferry proposed, has better environmental values than the existing ferry, and in absolute emissions numbers it is better than road transports around the Bay of Bothnia. At the same time, part of the negative environment externalities on road transports with heavy goods vehicles is internalised via taxes and charges on the traffic. Therefore, a reduction of road traffic's negative externalities must not be counted in full as a benefit for the new ferry, only the part that is not internalised by taxes etc.

With the help of VTI's reports on the degree of internalisation of externalities in road traffic, we have estimated that *the environmental gain based on non-internalised externalities* because of reduced lorry transports will amount to SEK 7 billion during the start-up year of 2020. That is about 40 percent of the total externalities of a road transport.

However, the new ferry will also have negative environment externalities, at least initially. As explained, the values are much better than those for the existing ferry are, but they still exist. The new ferry will run on LNG and will therefore have considerably better environment values than the existing ferry. Hence, we have reduced the socioeconomic gain during year one by 7 million because of the ferry's negative environment externalities. As already mentioned, the overall picture is very uncertain and it is unclear whether the taxes and charges imposed by shipping also in part may internalise this environmental cost. In order not to overrate the gain, we assume that this is not the case.

We have moreover not taken into account the added environmental cost for road traffic around the Bay of Bothnia as the number of vehicles increases, while better use of the ferry's capacity can reduce the ferry's environmental impact per transported ton as long as the frequency of the service does not increase. The growth of freight flows may mean that the frequency of the ferry service has to increase and thereby the non-internalised negative environment externalities will increase.

It is on the other hand also quite possible that the negative externalities of both road and ferry traffic will decrease during the forecast period because of introduction of new technologies. The purpose of the new ferry is precisely to achieve this. However, we have not had sufficient supporting documentation to say anything about this development and therefore we have not considered this in the calculations presented here. Overall, this will give a socioeconomic gain during the start-up year, including the net of the transfer from road to ferry, of 60 + 7 - 7 = SEK 60 million kronor, or SEK 222 per transported ton.

How large proportion of the freight traffic on Kvarken with a new ferry would be newly generated traffic? The total flow over Kvarken is made up of the total amount of traffic transferred from the longer route around the Bay of Bothnia and newly generated traffic. Transferred traffic is the traffic that would have taken the long route around the Bay of Bothnia if there had not been a ferry, but which now chooses to take the shorter link.

Newly generated traffic is traffic that has arisen because the cost of transport between Sweden and Finland has been reduced by the new ferry compared with the alternative without ferry connection. The socioeconomic gain of newly generated traffic should be reduced, since those businesses earlier assessed that the advantages of the transport were less than the cost of the route around the Bay of Bothnia. Even for new users, the assessed benefit of the new link can be

expected to decrease marginally down to the transport that is prepared to pay precisely the price of the ferry crossing but would not accept a somewhat higher price for the transport. Companies who find the price of the ferry too high will not use the ferry; nor is it predicted they would use the more expensive Bay of Bothnia route, all other factors being the same.

Here, the pricing of the ferry in operation, the business economic calculation including any socioeconomically justifiable grants to the ferry from society, is of course of great significance for where the marginally critical price ends up and thereby what transport economic gains and transport volumes are achieved. The purpose of the total financing by user charges and state funding is of course to attain the transport volume that is optimal from a socioeconomic perspective. Table 1 below presents central data for the analysis of the socioeconomic gains of the freight flows with a new ferry.

Table 1. Freight flows and annual socioeconomic gain from freight transports during the final year of a new Kvarken ferry.

	Annual traffic growth			
	0 percent	***1 percent***	**2 percent**	**3 percent**
Freight flow, final year, tons	270,000	***340,800***	434,300	548,854
Socioeconomic gain during the final year, SEK	60 million	***68 million***	78 million	91 million

In the calculations shown here, we have used the "rule of the half" for the socioeconomic gain of the annual transport growth of new users, the newly generated traffic, in addition to the transports assumed to take place during the

start-up year. The transport volume of the start-up year is entirely assumed to be transferred traffic, that would have taken the route around the Bay of Bothnia if the ferry had not existed. Of course, this is just an estimation. As already mentioned, we have not been able to use the Swedish Transport Administration's SAMGODS model in its existing version in order to estimate more precisely the transport flows from different alternatives.

4.3 THE BENEFITS OF PASSENGER TRAFFIC

The passenger flows provide the other part of the ferry's socioeconomic revenues. During the start-up year, we assume that 160,000 passengers will use the new ferry. This may be compared with the 168,557 passengers in 2015, using the existing ferry. How large will the socioeconomic gain for each passenger be? We estimate that the cost of driving the land route from Umeå to Vasa is SEK 720. This is the estimated cost of a bus ticket from Umeå to Vasa via Haparanda. The cost of a ferry ticket from Umeå to Vasa is assumed to be SEK 360. This gives a reduced transport cost of SEK 360 per passenger. In addition to that, there is the advantage of a shorter journey, which is a part of the consumer benefit the ferry creates for its users. We estimate that the journey time will be reduced from 14 hours to 5 hours, door to door. This gives a travel time reduction of 9 hours per passenger. Based on ASEK's calculations, we have set the average gain from reduced travel time at SEK 50 per hour. A more detailed analysis would distribute the gains from reduced travel time among different categories of travellers and their different assessments of reduced travel time. We have been cautious in this assessment too, so as not to risk overrating the benefit of the ferry. Overall, this gives a gain of SEK 810 per passenger.

In the alternative used for comparison, we assume that the passengers must take the road route around the Bay of Bothnia. This would probably mean that a significant share of the flow of passengers between Umeå and Vasa would disappear. Of course, some people would still travel around the Bay of Bothnia; others would travel via Åland, and others by air. In a detailed analysis, these people would be counted as transferred traffic and their entire gain would be accredited to the project.

However, a large share of the passenger traffic must be regarded as completely newly generated traffic. For that traffic, we again use the "rule of the half". Here, we apply that rule to all passengers so as not to overrate the socioeconomic gain. We thus assume that all passenger traffic is "newly generated" traffic. This gives an average gain of SEK 405 per passenger. Table 2 below presents central data for the socioeconomic gains from the new Kvarken ferry's passenger flow under those assumptions.

Table 2. The passenger flows and the annual socioeconomic gain from passenger transports during the final year with a new Kvarken ferry.

	Annual traffic growth			
	0 percent	***1 percent***	**2 percent**	**3 percent**
Passengers in 2044 (final year)	160,000	***203,100***	257,000	325,247
Socioeconomic gain during the final year, SEK	65 million	***82 million***	104 million	131 million

How should we view the negative environment externalities of the passenger traffic? We have already taken the negative environmental impact of the ferry

into account when we calculated the effects of the freight traffic. Road traffic with cars tends to pay its negative externalities with taxes and charges. In the European air traffic, the system of emission rights neutralises the negative socioeconomic effects of air traffic's externalities. Of course, every passenger and car on the ferry will contribute somewhat extra to the emissions that occur because of the ferry's freight transport but much more detailed analyses are needed to find out the size of these emissions and how they can be compared with emissions in the alternative used for comparison. We do not therefore count on any other positive environmental effects of the passenger traffic.

4.4 SOCIOECONOMIC PROFITABILITY

The total socioeconomic gain of a new ferry is calculated from the present value of the gains during the 25-year depreciation period with an interest rate of 3.5 percent, as recommended by the Swedish Transport Administration. These gains must be viewed in relation to the estimated investment cost of SEK 1.3 billion.

Table 3 below presents the total socioeconomic gains, the net present value ratios, and the socioeconomic payback period of the new ferry for the three growth alternatives. As mentioned, we have been cautious in our calculations so as not to overestimate the socioeconomic gains. We have not been able to use the Swedish Transport Administration's calculation model, hence the calculated net present value ratio of 0.71 cannot be used straight off in a comparison with projects calculated using the Swedish Transport Administration's model.

The results we have found anyhow indicate that a new ferry that manages to attract the transport flows we have counted on and which can be financed within the SEK 1.3 billion framework, with high probability should be justifiable from a socioeconomic perspective. Even with zero growth in the flows, the investment appears to be robust.

Table 3. The total socioeconomic gain, the net present value ratio and the socioeconomic payback period for the different annual forecasts for transport volume growth with a new ferry over Kvarken.

	Annual traffic growth			
	0 percent	***1 percent***	**2 percent**	**3 percent**
Socioeconomic gain (3.5 % interest), SEK millions	2,057	***2,107***	2,427	2,656
Net present value ratio	0.58	***0.71***	0.87	1.04
Socioeconomic payback period	14 years	***13 years***	12 years	11 years

Do the total traffic-related economic gains, the evaluation of shorter travel times, and the estimated negative environment externalities include all the benefits to society? Yes, in certain situations, they can be assumed as suitable approximations. However, there may be effects on land that have not been included. This could be such positive externalities that arise when the new, more accessible nodes on both sides of the ferry link increase their businesses and thereby give rise to increasing economies of scale, e.g. reduced prices and increased competitiveness. It may also be of interest for different actors to relocate their businesses, moving them closer to the two ports in order to create better logistical solutions. We have tried to include such effects when in the three percent traffic growth alternative. At the same time, there may be relocation within the entire region that comprises "the ferry's catchment area" to either the Swedish or the Finnish side, which could reduce the gain for disadvantaged financiers or actors on the property or labour markets. Improved accessibility can of course also make the region interesting for actors from

outside the region. This may increase external supply to the region and thereby put the region's own players out of business. The zero growth alternative can be seen as a test of the ferry's robustness in a situation where the region is subjected to that sort of strong competition from surrounding regions and consequent poor growth.

5. SUMMARY

In this study, we have done a general calculation of the socioeconomic gains of a new ferry on the transport link over Kvarken between Umeå and Vasa. The gains have been examined in relation to the given cost of a new ferry including necessary port-related measures. The net present value ratios we have found must be viewed as indicators rather than definitive values. However, the results clearly show that it is justifiable to proceed with detailed analyses of the investment and its impacts on society and business.

There are also reasons to discuss in what ways discrepancies between business economic and socioeconomic results should be financed through various taxes and charges. In that context, there are also reasons to do an analysis of the socioeconomic outcome within the framework of the Swedish Transport Administration's analysis method to see how the results presented here can be made more precise to make them comparable with other infrastructure projects.

For example, in this case, we have not added a "tax factor" to the cost of the investment to take care of the alternative use of state funding. Tax factors are controversial but they can be of theoretical relevance in certain analyses. The funding of the ferry's infrastructure properties is not just a national issue; different tax collectives and economic solutions should make it possible to apply different tax factors. The tax factor of 0.3 that was used previously in Swedish national infrastructure appraisals would reduce the net present value

ratio under the assumption of a one percent traffic growth to 0.32 and extend the social payback period to 18 years. The size of the tax factor clearly has a significant effect on the net present value ratio. However, even under such assumptions, a new ferry seems to be socioeconomically profitable according to our cautious calculations.

As already stated, the analysis could be made more precise by using the Swedish Transport Administration's analysis system. It could also contribute to the development of the cost and benefit appraisals made by the Swedish Transport Administration for shipping and ferries, and contribute in the development of the two existing national software used for forecasts of traffic, i.e. SAMPERS and SAMGODS. Both those forecast models have to be improved in their handling of international transport flows, ferries and other shipping so that relevant and comparable socioeconomic calculations can be done for the entire infrastructure network in Sweden. Of course, corresponding coordination with the methods and routines used in Finland and at European level would also be desirable.

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