European Parliament

DIRECTORATE-GENERAL FOR INTERNAL POLICIES

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Schengen Border Controls: Challenges and Policy Options

Study for the IMCO Committe

EN

2016

DIRECTORATE GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Schengen border controls: Challenges and policy options

Abstract

This compilation paper revisits the Schengen set up including recent developments triggered by both the migration crisis and terrorism, and subsequently presents and qualifies expert estimates of the potential economic impact stemming from the introduction of ID-checks, including a case study on the very key transport sector. Estimates by The Kiel Institute for the World Economy point at a burden on EU citizens and firms of between €7 and €14 billion for the entire EU. TML-Leuven assessed the cost for transport users of reinstating border controls in the entire Schengen area to amount between €2.5 billion and €5 billion annually (waiting times 10-20 minutes for passenger cars and 30-60 minutes for lorries). Effects, however, could prove much more costly if e.g. full-fledged border controls are permanently re-introduced. This paper has been prepared by the Policy Department A at the request of the European Parliament's Committee on Internal Market and Consumer Protection (IMCO).

IP/A/IMCO/2016-01 June 2016

PE 578.990 EN

This document was requested by the European Parliament's IMCO Committee.

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Original: EN

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Manuscript completed in June 2016
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INTRODUCTION AND EXECUTIVE SUMMARY

Several European countries have recently reintroduced temporary ID-checks at their internal Schengen borders as a response to the refugee crisis and recent terrorist attacks.

This compilation firsts revisits the Schengen set up including recent developments triggered by the migration crisis and then presents and qualifies estimates of the potential economic impact stemming from the introduction of ID-checks, including a case study on the very key transport sector.

The reintroduction of ID-checks at internal Schengen area borders entails a negative impact on the economies of the European Union. The loss of time resulting from such checks triggers a complex economic chain of effects. It is likely to come with a cost that is set to increase over time.

The first paper in this compilation by the Kiel Institute for the World Economy estimates that the burden on EU citizens and firms has so far remained limited or between 0.05% and 0.10% of GDP for affected EU Member States. If the current state of play is maintained this should result in a maximum annual cost of between €7 and €14 billion for the entire EU. However, these costs are to a large extent outweighed by the fiscal cost savings to individual EU Member States if ID-checks allow them to turn away significant numbers of refugees which arrive from other EU (i.e. safe) countries.

Extra costs, however, may prove higher if ID-checks are more systematically and durably re-introduced. In this case, the total direct cumulative macroeconomic costs, i.e. for road freight transporters, cross-border workers and public administration will be more significant and are estimated to range between €14 and €64 billion (0.1% - 0.4% of EU GDP) per year for effectively terminating the Schengen agreement.

A new case study presented by Transport and Mobility Leuven estimates the cost for transport users of reinstating border controls in the entire Schengen area to amount merely between €2.5 billion and €5 billion annually (waiting times 10-20 minutes for passenger cars and 30-60 minutes for lorries).

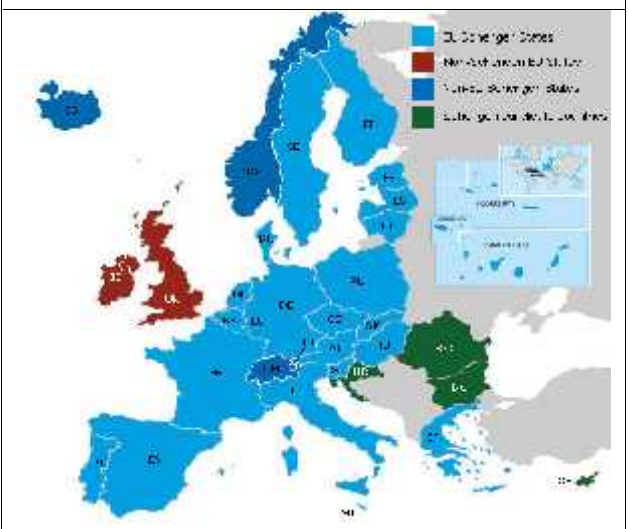
1. SCHENGEN SET-UP AND CURRENT BORDER RESTRICTIONS

The Schengen area has grown over time and today guarantees the free movement to about 400 million citizens from 26 countries. The Schengen Agreement was signed in 1985 by Belgium, France, West Germany, Luxemburg and the Netherlands. The Treaty proposed a gradual abolition of border checks at those five countries' common borders, together with a harmonization of their visa policies. In 1990 the Treaty was supplemented by the Schengen Convention, which proposed

i) the abolition of checks at internal borders between the Schengen Member States (i.e. creating the Schengen area);

ii) the creation of a common visa policy. Its actual implementation started in 1995, ten years after the first treaty was signed.

Figure 1: The Schengen area – participating Member States



Source: European Commission

With the Amsterdam Treaty in 1997, the Schengen treaties were integrated into the framework of the European Union, becoming legally binding for all EU member states, except for countries with an opt-out such as UK and Ireland, subject to the fulfilment of some pre-conditions.

All of this culminated into one of the most valued accomplishments of the integration process: the free movements of individuals in an area with no internal border checks for citizens, businesses and tourists.

In the course of the years some non-EU Member States became part of the Schengen area, which currently comprises (Figure 1):

i) all EU Member States, except for the four Schengen candidate countries (Bulgaria, Romania, Croatia and Cyprus) and United Kingdom and Ireland, which have an opt-out from the Treaties;

ii) the four EFTA countries: Iceland, Lichtenstein, Norway and Switzerland.

Schengen foresees the possibility for a Member State to temporarily reintroduce border controls at its internal borders only in exceptional situations. The rules laying down the conditions under which temporary internal border controls may be reintroduced are contained in the Schengen Borders Code (SBC).[1] Specifically, SBC provides for three scenarios of temporary border controls, limited to the time required to respond to the threat in question:

i) for foreseeable events (Art. 23 and 24 of the SBC) the duration is 30 days, renewable up to a total of six months;

ii) for cases requiring immediate action (Art. 25 of SBC) the duration is 10 days, renewable up to two months;

[1] The SBC is the regulation covering the legislative part of the integrated border management European Union policy.

iii) in case of exceptional circumstances that might put the overall functioning of the Schengen area at risk (Article 26), the SBC also allows Member States to undertake further actions, such as prolonging the internal border controls.

Under the SBC, there are no further possibilities for any form of suspension of Schengen and any border checks that are not in compliance with the SBC would be illegal and therefore subject to infringements proceedings.

Owing to the refugee crisis and the considerable influx of people into the EU trough certain countries, border controls on some domestic borders have been strengthened. Table 1 details the countries that currently have border controls in place, the period for with they are in place, the border crossing to which they apply, the article of the SCB on which they are bases the reason given. As the table illustrates, the fact that a country has decided to reintroduce temporary internal border controls does not mean that all borders are subject to such controls or that all persons crossing the border are necessarily checked. Rather, by triggering the mechanisms available in the Schengen Borders Code, countries have carried out more focused checks.

The economic impact of these measures is not yet clear. The evidence suggests a limited impact so far as the re-introduction of ID-checks has mainly delayed departures and arrivals. It is, however, important to stress out that border controls have so far restricted to a few countries, partial to a few borders of these countries and, more importantly, temporary. Should the border controls be kept for long, undermining the Schengen cooperation durably, it could eventually prove to be economically as well as politically very costly. A domino effect could lead to a deeper confidence crisis with respect to the prospects of EU integration, with consequences on intra-EU bilateral trade, foreign direct investments and financial integration. The integrity of the Single market could eventually be damaged.

Table 1: Temporary internal border controls in the Schengen area (situation on 12 April 2016)

Schengen Member State	Dates applicable	Border crossings covered	Article of the Schengen Borders Code	Reason
Belgium	23 February – 12 April 2016	Border between the Province of West-Vlaanderen and France	25 - emergency reintroduction (maximum 2 months)	Expected influx of people seeking to reach the port area of Zeebrugge following the closure of migrant camps in Calais
Denmark	4 March - 3 May 2016 (initially 4 January to 3 March 2016)	All, especially sea and land borders with Germany	23 - foreseeable events (up to six months)	Big influx of persons seeking international protection
Norway	15 January - 13 April 2016 (initially 26 November 2015 to 15 January 2016)	All, especially ports and ferry connections	23 – foreseeable events (up to six months)	Continuous big influx of persons seeking international protection
Sweden	10 January – 8 May 2016 (initially 12 November 2015 to 9 January 2016)	All, especially southern/western harbours and Öresund bridge between Denmark and Sweden	23 – foreseeable events (up to six months)	Continuous big influx of persons seeking international protection
Austria	16 November - 15 May 2016 (initially 16 September to 15 November 2015)	All, especially the borders Slovenia-Austria, Hungary-Austria and Italy-Austria. Only specific crossing points may be used	23 – foreseeable events (up to six months)	Continuous big influx of persons seeking international protection
Germany	14 November 2015 – 13 May 2016 (initially 13 September to 13 November	All, especially Austria-Germany border	23 – foreseeable events (up to six months)	Continuous big influx of persons seeking international protection
France	14 December 2015 – 26 April 2016 (initially 13 November – 13 December	Internal land borders and air borders	23 – foreseeable events (up to six months)	State of emergency following the 13 November 2015 terrorist attacks

Source: European Commission, DG HOME

2. ESTIMATING THE COSTS OF BORDER CONTROLS IN THE IN THE SCHENGEN AREA

Different motivations underlying recent re-introduction of border controls in the Schengen area. Scandinavian countries, Germany, and Austria aim to reduce or at least manage the inflow of refugee migrants. France and Belgium imposed border controls to help apprehend terrorists following the recent attacks in Paris and Brussels.

Estimates of the economic cost vary widely due to different assumptions and methodologies. The cost estimate may be done "bottom-up" by measuring the length of delays at border crossings and estimating the costs. But this approach involves several assumptions (i.e. on wages, capital depreciation) for which few hard data are available and is silent on potentially large indirect effects. Therefore, several studies pursue an alternative approach based on models of bilateral trade. According to this approach, the loss of time resulting from such checks is likely to trigger a complex economic chain of effects, increasing the "economic distance" between the member countries of the Schengen area. Note, however, that in models of bilateral trade the Schengen effect needs to be specified carefully and distinguished clearly from the larger effects of the simultaneous completion of the Single Market. Specially, there are risks to mix up the true effects of Schengen (elimination of border controls) with the (much larger) effects of the completion of the Single Market stemming from the elimination of full-fledged customs controls.

A scenario generally perceived as realistic points to a relatively small cost. Border controls are estimated to raise trade costs for goods by approximately 0.4% to 0.9% of the value of trade (depending on the assumed elasticity of trade to trade costs) at every Schengen border. Slightly higher costs apply to trade in services. For Germany and Austria, two prominent countries with controls at Schengen borders, these direct costs translate into a real income loss of 0.4% or less, depending on trade elasticity, if border controls are introduced at all Schengen borders; in the realistic case that border controls are limited to major refugee routes, real GDP declines by 0.1% or less. Table 2 reproduces the estimates of total economic cost under two (most realistic) scenarios: one with large-scale border controls (scenario 2); one focussed on all refugee routes (scenario 3). With comprehensive controls (Scenario 2), the simulated loss in real income is safely below one half of one percent for both Germany and Austria, even when the trade elasticity is assumed to be low. If controls remain limited to refugee routes (Scenario 3), the welfare loss is one tenth of 1 percent or less.

Table 2: Estimates of direct cost and total welfare loss due to "non-Schengen"

Type	Impact
Direct cost of non-Schengen (ad-valorem equivalent)	0.39% to 0.90% (merchandise trade) 0.59% to 1.37% (services trade)
Impact on level of GDP/ real income	Scenario 2: controls at all Schengen borders, but not on extra-Schengen trade; merchandise and services trade Germany: -0.14% to -0.36% Austria: -0.15% to -0.38% Scenario 3: controls on Balkan/ Italy refugee routes only Germany: -0.04% to -0.11% Austria: -0.03% to -0.07%
Model type	Approximation based on Arkolakis, Costinot, Rodríguez-Clare (2012)

Source: Felbermayr, Gröschl, Steinwachs (2016)

These small costs are easily outweighed by fiscal cost savings for those countries that manage to turn away significant numbers of refugees that arrive from other EU (i.e. safe) countries. Austria is a case in point. The country is located in the centre of Europe on two major refugee routes: first, the Balkan route and the route from Italy via the Brenner mountain pass.

Austria has so far effectively limited influx of refugees via the Balkan route. The cost to Austria of these carefully targeted border controls is estimated at a maximum of €242 million by in Felbermayr, Gröschl, Steinwachs. The fiscal cost of caring for refugees in Austria during 2015, 2016, and 2017 combined has been estimated at €2.7 billion (Österreichische Nationalbank, 2015). Expenditures for one refugee are close to €11,000 per year. Thus if border controls reduce the number of refugees living in Austria by more than 22,000, which seems likely, fiscal cost savings exceed the economic cost of controls.

3. IMPACT OF BORDER CONTROLS WITHIN THE SCHENGEN AREA: A CASE STUDY FOR ROAD TRANSPORTS

A new case study presented by Transport and Mobility Leuven estimates limited cost for transport users of reinstating ID-checks in the entire Schengen area. Costs would amount merely to €2.5 billion (resp. €5 billion), assuming waiting times of 10 minutes for passenger cars (resp. 20 minutes) and 30 minutes for lorries (resp. 60 minutes). The countries expected to incur the largest costs are Germany, France and Belgium. This study aimed at calculating the direct transport costs, and did not take into account indirect costs, i.e. incurred by other sectors/economic agents as a direct result of transport costs/delays.

- Denmark closing all borders would cost the Schengen zone €70 million annually. Closing only the border with Germany would reduce that to €44 million. Denmark itself would lose the most in that case (€19 million), while Germany would incur a cost of €17 million and the Netherlands €2.4 million.
- If Norway closes its borders, the cost for the Schengen zone would be €32.5 million, more than half of which would be incurred by Norway itself, and another €12 million by Sweden. If the focus were only on ferry connections (i.e. borders with Sweden and Finland are not closed), the cost would be reduced to €4.1 million.
- Border controls in Sweden would cost €69 million, mostly felt by the Swedes (€33 million), Norwegians (€14 million) and Danes (€11 million). When considering only ferry crossings and the border with Denmark, the cost is halved to €34 million, but the cost to Denmark remains almost the same.
- Austria closing all its borders would prove very costly for Schengen area (€376 million). If only the Slovenian border is affected, the cost would be nearly €19 million.
- If Germany were to close its borders, total costs for Schengen would exceed €1 billion, with Germany itself absorbing 43% of that and Netherlands 11%. If only Austrian border is affected, costs drop to €168 million (about the same as Sweden, Norway and Denmark closing all their borders combined). Germany would still lose the most (€76 million annually) in such a scenario, but losses for Austria (€51 million) and Italy (€30 million) would also be significant.
- France closing all its borders costs €670 million annually.
- As for Belgium, the estimated annual cost is €207 million.

DIRECTORATE GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Key challenges of re-imposing border controls within Schengen for the Single Market

Matthias LU**EC**KE

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EXECUTIVE SUMMARY

- Existing estimates of the economic cost of ID checks, vehicle searches, and the resulting delays at Schengen borders vary widely. Most of the variation is due to different assumptions and methodologies for estimating the direct ("ad-valorem") cost of these trade barriers relative to the corresponding value of trade.
- Some of the large estimates of direct costs result from the inappropriate application of gravity models of bilateral trade. There are good reasons to believe that these studies mix up the true (small) effects of Schengen (elimination of ID checks) with the much larger effects of the completion of the Single Market (elimination of customs controls).
- One carefully specified study implies that ID checks raise trade costs for goods by approximately 0.4% to 0.9% of the value of trade (depending on the assumed elasticity of trade to trade costs) at every Schengen border. Slightly higher costs apply to trade in services.
- For Germany and Austria (two prominent countries with controls at Schengen borders), these direct costs translate into a real income loss of 0.4% or less (depending on trade elasticity) if ID checks are introduced at all Schengen borders; in the realistic case that ID checks are limited to major refugee routes, real income declines by 0.1% or less.
- These small costs are easily outweighed by fiscal cost savings for those countries that manage to turn away significant numbers of refugees that arrive from other EU (i.e. safe) countries.
- Arguably, the Schengen system will only survive if member states agree to manage the external Schengen border jointly, with shared administrative and fiscal responsibility (including a common asylum system).
- Member states can take interim measures to reduce the delays due to border controls, such as to provide adequate infrastructure for ID checks and vehicle searches (sufficient numbers of police, extra traffic lanes) and to coordinate controls across countries so as to shut down any irregular migration routes with minimum intervention. Countries of first arrival in the EU should continue to be supported with additional international staff and funding to police borders, process asylum applications, share fiscal costs, and redistribute recognized asylum seekers across the EU.

1. INTRODUCTION

Several Schengen countries have recently re-imposed ID checks at their internal Schengen borders. Their motivations fall into one of two categories: Scandinavian countries, Germany, and Austria aim to reduce or at least manage the inflow of refugee migrants. France and Belgium imposed ID checks to help apprehend terrorists following the recent attacks in Paris and Brussels.

Irrespective of their motivation, border controls impose a cost on cross-border traffic and put at risk the gains from integration that have been achieved through the Schengen agreement (Ademmer et al., 2015). Several analyses of the cost of "non-Schengen" have recently been released with widely diverging estimates. In Section 2, I review these studies, explain their methodologies, and conclude that the true costs are at the lower end of the range of available estimates.

While little can probably be done about the need to set up roadblocks in hot pursuit of criminals, it is not clear whether controls at Schengen borders to turn away refugees arriving from other EU (i.e. safe) countries are an appropriate instrument to address the refugee situation. I demonstrate in Section 3 that from the point of view of some individual Schengen countries, the economic cost of border controls is indeed far lower than the fiscal cost that they would incur if they did not limit the inflow of refugees.

However, member states that close their border to refugees arriving from neighbouring EU countries mostly shift their potential fiscal burden onto other countries. Therefore, I argue that in the medium to long run the Schengen area can only survive if Schengen countries fully share administrative and fiscal responsibility for managing their external border, including through a common asylum system. Since this may not come about in the very near future, I propose interim measures to reduce the delays due to Schengen border checks and to continue logistic and financial support for EU member states where refugees first arrive (Section 4).

2. ESTIMATING THE COST OF "NON-SCHENGEN": METHODOLOGY AND EXISTING STUDIES

ID checks on individuals at Schengen borders and the associated delays increase, first and foremost, the cost of cross-border travel and transport. Thus they affect all cross-border transactions where individuals move physically across a border: merchandise trade (ID checks on lorry drivers and vehicle inspections to ensure there are no blind passengers); trade in services (day tourism, shopping, etc.); labour mobility (cross-border commuters); etc. In each case, there is a direct cost involved: lorry drivers' wages; extra transport equipment needed because each trip takes longer; time lost by consumers and cross-border commuters, wages of border guards; infrastructure at border posts; etc.

Speaking in economic terms, this direct cost makes cross-border transactions less attractive relative to purely domestic transactions. This observation is key to understanding the true economic cost of "non-Schengen": Economic agents adjust to higher costs at the border by conducting more transactions domestically. As a result, the true economic cost of "non-Schengen" is lower than the hypothetical direct cost of controls at the original volume of cross-border transactions.

However, economic agents do lose some of the gains from open borders – such as the integration of national markets for goods (economies of scale, advantages of specialization, etc.); access to employment opportunities abroad; access to foreign service providers; etc. This is the basis for estimating the true cost of "non-Schengen". In the following subsection, I explain the basic methodology; further below, I review cost estimates from existing studies.

2.1 The true economic cost of "non-Schengen": methodology

Although ID checks and delays affect all cross-border transactions, most formal cost estimates focus on the impact on merchandise trade. This is justified because (i) merchandise trade represents the lion's share of cross-border transactions that involve the physical movement of individuals and are therefore affected by "non-Schengen"; (ii) the methodology of estimating the true economic cost of merchandise trade barriers is well-established, in contrast to other international transactions that would each require their own methodology. Accordingly, in this briefing note, I focus on merchandise trade while discussing other transactions when appropriate.

Formally speaking, ID checks and associated delays drive a wedge between domestic and export prices for goods and thus act as trade barriers. In this particular case, the difference between domestic and international prices represents a direct waste of resources. By contrast, other trade barriers such as customs tariffs also drive a wedge between domestic and international prices, but generate tariff revenue for governments. Therefore, the welfare loss to the economy from a tariff is much smaller than the ad-valorem tariff rate (or price wedge) might suggest.

The process of estimating the true economic cost of "non-Schengen" starts by estimating the direct cost of ID checks and associated delays (Step 1). This may be done "bottom-up" (Step 1a) by measuring the length of delays at border crossings and estimating various relevant categories of cost: extra wages; capital cost of cargo tied up in transport; capital cost and depreciation of extra transport equipment; etc. Finally, the resulting estimate of the total direct monetary cost is related to the value of trade before ID checks to estimate the "ad-valorem equivalent" increase in bilateral trade costs.

Depending on context, one may want to include items like the fiscal cost of ID checks at Schengen borders (staff, infrastructure, etc.) with the direct monetary cost of "non-Schengen". However, since fiscal costs are borne by the government rather than private economic agents, they would need to be accounted for separately (and tediously) when the true economic cost of "non-Schengen" is estimated in Step 2.

Bottom-up estimates of the direct cost of delays (Step 1a) involve several assumptions for which few hard data are available. Therefore, several studies pursue an alternative approach at estimating the implied increase in trade costs. Based on a gravity model of bilateral trade, they measure directly how much extra trade occurs across Schengen vs. non-Schengen borders. The extra trade may be translated back into the underlying difference in trade costs by assuming a standard value for the elasticity of bilateral trade to trade costs (Step 1b).

Finally, our estimate of the direct cost of "non-Schengen" (Step 1) needs to be translated into the true economic cost to the affected economies (i.e. after economic agents have adjusted to the new level of international transport costs; Step 2). The standard approach is to use a computable general equilibrium (CGE) model - in short, a numerical description of one or several economies, given our best knowledge and economic intuition from national accounts statistics, household surveys, and plausible assumptions about parameters such as demand and supply elasticities.

The "base run" of the CGE model reproduces the database and yields an estimate of real income under the original level of transport cost. The model is then re-run under alternative assumptions about the increase in the cost of bilateral trade. For example, ID checks and delays may either affect the full length of a country's border or selected border crossings only ("external margin"). Similarly, estimating the direct cost of non-Schengen (Step 1) is subject to data uncertainty ("internal margin"), including about the size of the trade elasticity (Step 1b). Alternative scenarios that reflect a range of assumptions provide a sense of how sensitive estimates of the true economic costs of "non-Schengen" are to the underlying assumptions. Real income in the economy under each scenario may then be compared to the base run to yield an estimate of the true economic cost ("welfare loss") of "non-Schengen".

CGE models have the advantage of providing fairly detailed insights into the structural change induced by changes in trade costs or other "shocks". However, they are also time-consuming to set up and maintain. If we are merely looking for an estimate of the overall welfare loss due to "non-Schengen", given an estimate of the direct cost, we may use a simple approximation that only requires assumptions about the change in the expenditure share of domestic goods and the elasticity of trade with respect to trade costs (Arkolakis, Costinot, Rodríguez-Clare, 2012). This information is available from Step 1b and greatly facilitates Step 2 of the analysis (see, for example, Felbermayr, Gröschl, Steinwachs, 2016).[1]

The economy-wide change in real income is also a good quantitative measure of how the welfare of consumers is affected by "non-Schengen". Because of higher trade costs, the prices of imports increase relative to domestic goods. While consumers may adjust by switching to domestic product varieties, they end up with fewer product varieties to choose from at higher prices. Other "non-Schengen" effects include reduced access to shopping opportunities in other Schengen countries, particularly in border areas.

[1] The study by Böhmer et al. (2016), produced by the Prognos research firm on behalf of the Bertelsmann Foundation, is rather unusual in employing a global macroeconomic model (VIEW) at Step 2. The authors do not independently estimate the direct cost of non-Schengen (Step 1), but assume two scenarios (import prices rise by 1% and 3%, respectively). The authors find a tiny negative effect of "non-Schengen" on the annual growth rate of German GDP (-0.03%), which they compound over several years to arrive at a substantial total effect. This approach is in marked contrast to standard trade literature that suggests that any statement about a permanent effect of a trade barrier on the growth rate of GDP (rather than on its medium-term level) is highly speculative.

2.2 Direct cost of "non-Schengen": bottom-up estimates (Step 1a)

Bottom-up estimates of the direct cost of ID checks and delays at Schengen borders simply list the delays and their monetary cost equivalents that economic agents incur for various cross-border transactions. This is particularly useful for understanding the cost of ID checks and delays because there may be no direct historical precedent for the current situation. At present, many border controls are improvised, without sufficient personnel or infrastructure – such as motorway traffic from Austria to Germany being forced from three lanes onto one lane at the border, generating lengthy delays at daily peak times. By contrast, before the Schengen agreement, there would have been proper border stations with a sufficient number of dedicated traffic lanes for passenger cars, lorries and buses so ID checks could be undertaken with minimal delay (as is still the case at any European motorway toll station).

In their recent France Stratégie paper, Aussiloux and Le Hir (2016) offer an instructive list of possible effects and attempts to measure them. Their starting point is the recent imposition of ID checks on all incoming and outgoing traffic at all French borders, following the Paris terrorist attacks. They work with a low-cost and a high-cost scenario, where the high-cost scenario involves simply doubling all costs from the low-cost scenario.

Above all, the expected effects are very small (Table 1) – even for comprehensive ID checks on all traffic at all borders and even if we double the amounts in Table 1 for the high-cost scenario. French GDP in 2015 was close to €2,850 billion, whereas the various amounts in Table 1 are all below €1 billion. Foreign trade turnover amounted to approximately €956 million, of which just under 60% was with EU countries (and probably a little less with Schengen countries); the extra cost to lorry transport is estimated at €248 million under the high-cost scenario – less than one half of one tenth of one percent of the value of trade.

These figures are typical of similar estimates of the cost of delays at Schengen borders for different countries and under a wide range of assumptions (e.g. Felbermayr, Gröschl, Steinwachs, 2016, 19-20). The main conclusion is always that the effects are very small, measured by their ad-valorem equivalent in relation to the corresponding trade flows.

2.3 Direct cost of "non-Schengen": estimates based on gravity models of bilateral trade (Step 1b)

Gravity models have been used extensively to analyse the determinants of bilateral trade (cf. Luecke, Stoehr, 2015). By analogy with the gravitational force in physics, a bilateral trade flow is considered a function of the "mass" of the two economies (typically measured by GDP, or a combination of GDP per head and population) and their economic distance from each other. Economic distance includes many possible components: geographic distance as a proxy for transport costs; a common language (reduces transaction costs); a preferential trade agreement; etc.

Intuitively, the Schengen Agreement must have reduced the "economic distance" between its member countries through a variety of channels. As a first approximation, the impact of Schengen on merchandise trade may be captured by including among the explanatory variables of a gravity model a dummy variable that takes the value of 1 if both trading partners are Schengen members and 0 otherwise (Aussilon, Le Hir, 2016).

Table 1: The direct costs of "non-Schengen" – France – "low" scenario (Aussiloux, Le Hir, 2016)

International transaction affected	Length of delay (all individuals, all French borders)	Important additional assumptions	Annual monetary cost (€ million)
Loss in revenue from incoming tourists	Single-day visitors: -5% Two-day visitors: -2.5%	Tourist expenditures by categories	Loss in revenue (note this is not welfare loss in an economic sense) €498 million
French cross-border commuters	10 minutes twice daily	Value of travel time at €10 per hour	€253 million (€723 per commuter)
Lorry transport	0.5 hours per lorry crossing the French border	Value of time in goods, value of time for transport firm	€124 million

Source: own compilation.

One immediate concern is that the impact of Schengen may be difficult to identify if other developments around the same time also increased bilateral trade. The successive implementation of the Schengen Agreement coincided (broadly) with the completion of the EU Single Market in 1992 that involved the elimination of customs controls and other barriers at intra-EU borders and clearly increased intra-EU trade. Depending on the choice of data and the specification of the gravity model, the Schengen and Single Market effects may be difficult to disentangle; this problem appears to affect, in particular, the early study by Davis and Gift (2014) as well as the estimates by Mayer and Umana Dajud reported by Aussiloux and Le Hir (2016; Table 2).

By contrast, Felbermayr, Gröschl, Steinwachs (2016; book-lengh version: 2016a) address this concern by identifying the impact of Schengen based on the number of Schengen borders that trade flows between two countries typically cross. For example, their Schengen variable takes the value of 4 for trade between Poland and Portugal (once the two countries plus all in between are part of Schengen); for German-French trade, the Schengen variable takes the value of 1 from 1985. Furthermore, they use data starting in 1992 so that EU membership is equivalent to being part of the completed Single Market.

The extra trade effect due to Schengen from gravity models (Step 1b; Table 2) appears large compared with the direct cost estimates of "non-Schengen" (Step 1a). If we assume a trade elasticity of 5 with respect to trade costs (a fairly typical value), a 15% increase in trade due to Schengen implies a 3% reduction in trade costs; a 2.7% increase in bilateral trade for every Schengen border between the two countries implies a 0.5% reduction in trade costs for every border. Either figure is far higher than any of our bottom-up estimates suggest; there we found ad-valorem equivalents mostly below 0.1%. I draw two conclusions from this discrepancy:

1. Bottom-up estimates (Step 1a) represent a lower bound for the ad-valorem equivalent of the explicit and implicit trade barriers generated by ID checks at Schengen borders. For example, the average delay suffered by travellers may not fully reflect the cost of the uncertainty created by volatile delays, particularly in tightly organized supply chains. Anecdotal evidence from the German border with Austria suggests that the average delay is approximately 30 minutes, but delays of 90 or even 120 minutes occur often enough to be of concern for transport firms. Therefore, regression analysis of observed trade developments based on carefully specified gravity models (Step 1b) provides an important additional perspective.

2. In empirical gravity models (Step 1b), the Schengen effect needs to be specified carefully and distinguished clearly from the larger effects of the simultaneous completion of the Single Market. It seems intuitively plausible that the Schengen effect is larger when more Schengen borders need to be crossed from one country to another. Therefore, the specification by Felbermayr, Gröschl, and Steinwachs (2016; number of Schengen borders to be crossed) is more appropriate than a simple dummy variable for whether or not the two countries are part of the Schengen area (Aussiloux, Le Hir (2016).

2.4 Total economic cost of "non-Schengen" (Step 2)

The details of Step 2 are of considerable interest to economic modellers, but of less immediate relevance to understanding the size of the economic effects of Schengen border controls. The extra cost of transport due to delays is often modelled as an "iceberg" cost to international trade: a certain percentage of goods is assumed to "melt away" as they cross the border. This is a simple, yet appropriate way to model the direct loss of resources due to delays at the border.

Table 2: Estimates of the increase in bilateral trade through Schengen

	Aussiloux, Le Hir (2016)	Felbermayr, Gröschl, Steinwachs (2016)
Percent increase in bilateral trade due to Schengen	13% to 21% if both countries in Schengen area	2.7% for every Schengen border between two countries
Database	Alternative datasets (global, expanded Europe); disaggregated by major economic sectors; years not given	1992 to 2014 data; disaggregated by major economic sectors
Specification	Some important coefficients (dummies for FTA, EU, GATT, shared currency) are very volatile; no separate coefficient for the completion of the Single Market	Separate estimates for services trade; the Schengen border effect for services is only barely significant, but larger in size than for trade in goods (4.1%)
Comments	Gravity model estimated by Thierry Mayer and Camilo Umana Dajud	

Source: own compilation.

The simulations by Felbermayr, Gröschl, and Steinwachs (2016; Table 3) are especially instructive because their definition of the Schengen border variable allows them to create four scenarios depending on how extensive ID checks are: (1) all Schengen borders plus extra-Schengen trade also crosses one Schengen border; (2) all Schengen borders, but extra-Schengen trade not affected; (3) Schengen borders on Balkan and Italy refugee routes only; (4) German border with Austria only. The wide range of estimates reported in Table 3 reflects different assumptions about the elasticity of trade with respect to the cost of trade (a high elasticity of 7 implies a smaller welfare loss than a low elasticity of 3).

In Table 3, I reproduce the estimates of total economic cost only for the two most realistic scenarios: one with large-scale border controls (Scenario 2), one focussed on all refugee routes (Scenario 3). With comprehensive controls (Scenario 2), the simulated loss in real income is safely below one half of one percent for both Germany and Austria –

even when the trade elasticity is assumed to be only 3. If controls remain limited to refugee routes (Scenario 3), the welfare loss is one tenth of 1 percent or less.

Table 3: Estimates of direct cost and total welfare loss due to "non-Schengen"

	Aussiloux, Le Hir (2016)	Felbermayr, Gröschl, Steinwachs (2016)
Direct cost of non-Schengen (ad-valorem equivalent)	3% on all trade flows between current Schengen countries	0.39% to 0.90% (merchandise trade) 0.59% to 1.37% (services trade)
Impact on level of GDP/ real income	France: -0.5% All Schengen: -0.8%	Scenario 2: controls at all Schengen borders, but not on extra-Schengen trade; merchandise and services trade Germany: -0.14% to -0.36% Austria: -0.15% to -0.38% Scenario 3: controls on Balkan/ Italy refugee routes only Germany: -0.04% to -0.11% Austria: -0.03% to -0.07%
Model type	MIRAGE CGE model	Approximation based on Arkolakis, Costinot, Rodríguez-Clare (2012)

Source: own compilation.

I have explained above why I think the estimates reported by Aussiloux and Le Hir (2016) are too high (cf. Table 3). At the same time, their methodology to estimate the direct cost of border controls (Step 1b) is fundamentally similar to Felbermayr, Gröschl, and Steinwachs (2016). Therefore, it is reassuring that when the impact of Schengen is carefully distinguished from the completion of the Single market and, furthermore, the extent of departures from the Schengen regime is specified realistically, the estimated overall welfare loss becomes much smaller.

In conclusion, the true economic cost of "non-Schengen" is quite small – certainly smaller than some alarmist contributions to the public debate suggest. However, there is a well-documented cost – economic and in terms of political symbolism. If we wish to devise a policy strategy to return to open borders throughout the Schengen area, we must first understand what benefits some EU member states expect from ID checks at their Schengen borders.

3. THE MOTIVES FOR ID CHECKS AT SCHENGEN BORDERS

Some ID checks were recently implemented in an attempt to apprehend terrorists fleeing the scene of major crimes. Such border controls are normally short-lived and the disruption that they create is part of the disruption that inevitably results from terrorist attacks. Full cooperation among EU member states' security forces is the long-term answer to the threat posed by criminals that freely move across intra-EU borders. While this is widely understood, authorities about to implement a large-scale manhunt may still have to rely on temporary ID checks and roadblocks at traffic junctions and other traffic bottlenecks, both within member states and at Schengen borders.

More importantly in the medium and long run, some EU member states have implemented ID checks at their Schengen borders because the management of certain external borders of the Schengen area has collapsed. As a result, large numbers of refugees have entered the Schengen area – initially through Italy and more recently through Greece. Most were not registered in their countries of first arrival as they should have been according to EU law. As long as they could freely travel within the Schengen area, most of them chose to apply for asylum in a small number of countries where they believed conditions were most favourable. One after another, countries felt overburdened by a large number of asylum seekers and implemented ID checks at their Schengen borders in order to turn away refugees that were arriving from other EU member states (which are, by definition, safe countries for refugees).

3.1 Sweden

Sweden is a case in point. Since the beginning of 2016, ID checks affect individuals arriving in Sweden by ferry (where no extra time is lost because ferry passengers have always been subject to ID checks) as well as rail travellers, especially commuters, across the Öresund bridge from Copenhagen to Malmö. No ID checks are carried out on motor vehicle traffic on the Öresund bridge. These restrictions have effectively stopped the inflow of refugees that was beginning to overstretch Sweden's capacity to care for them.

Delays experienced by rail passengers probably constitute the lion's share of the direct cost of these ID checks. A bottom-up, back-of-the-envelope estimate helps to understand its order of magnitude. Approximately 30.000 rail journeys take place across the Öresund bridge daily. Most passengers are Swedes who have to go through barriers at Copenhagen's Kastrup airport to have their IDs checked before they return to Sweden. Let us assume that 15.000 individuals are delayed for half an hour each day and value their travel time at €10 per hour. Then the direct cost of the delays adds up to €27 million per year, plus infrastructure and guards.

By contrast, Sweden reportedly expects to spend €6.5 billion caring for refugees in 2016. If the inflow of refugees had continued in 2016 at the same pace as in 2015, the number of refugees in Sweden and the associated fiscal cost would have grown sharply. Let us assume that without the border controls, the fiscal cost due to refugees in 2016 would be 20% (or €1.3 billion) higher. From this example, it is clear that the small cost of ID checks, mostly to commuters in the Öresund region, is easily outweighed by Sweden's cost savings from not having to care for an even larger number of refugees.

states (which are, by definition, safe countries for refugees).

3.2 Austria

Because of its peripheral location in Europe, Sweden can relatively easily limit the inflow of refugees. The opposite case is Austria which is located in the centre of Europe on two major refugee routes: first, the Balkan route from Greece via Macedonia, Serbia, Croatia, and Slovenia (the first Schengen country after Greece) on to Germany (and, formerly, Sweden); and second, the route from Italy via the Brenner mountain pass on to

Germany. At the same time, Austria is itself a relatively attractive location to apply for asylum.

Austria has now worked with the Western Balkan countries to effectively close the Balkan route, preventing refugees from leaving Greece to enter Macedonia. Austria has also made it clear that it will similarly close its border with Italy to refugees if the inflow of refugees from Italy were to increase again to the much higher level last seen in the summer of 2015. One may speculate that France, Switzerland and Slovenia will follow suit if refugees from Italy were to try to circumvent Austria on their way north.

The cost to Austria of these carefully targeted border controls is probably below one tenth of one percent of GDP (a maximum of €242 million according to Scenario 3 in Felbermayr, Gröschl, Steinwachs, 2016; Table 3 above). The fiscal cost of caring for refugees in Austria during 2015, 2016, and 2017 combined has been estimated at €2.7 billion (Österreichische Nationalbank, 2015); expenditures for one refugee are close to €11,000 per year. Thus if border controls reduce the number of refugees living in Austria by more than 22,000, which seems likely, fiscal cost savings exceed the economic cost of controls.

3.3 Countries of first arrival

From the narrow point of view of the preferred destination countries of refugees (e.g. Sweden), re-introducing ID checks and closing borders to refugees may be a cost-saving proposition. However, if implemented fully, this approach leaves the countries where refugees first arrive in the EU in a difficult position. According to EU law (Dublin regulations), these countries are obliged to register asylum seekers, provide them with food and housing, process their asylum applications, and return them to their countries of origin if they have no legitimate claim to protection. In fact, they are supposed to bear not only full administrative responsibility for the asylum process, but also its full fiscal cost.

Observers have long argued that this allocation of administrative and fiscal responsibility is neither practical nor fair. Neither the countries of first arrival nor the refugees have any interest in following the rules: Most refugees want to move elsewhere, and the countries of first arrival have every incentive to limit their costs by allowing refugees to move on.

However, “waiving on” refugees becomes impractical when the next country in line (such as Austria) refuses entry to irregular immigrants. For a durable and fair solution, all stakeholders need to understand that the challenges of managing the external border of the Schengen area, which include caring for the refugees that arrive, have now become so large that they need to be addressed by the EU and member states together. Accordingly, all Schengen states should contribute to this task based on their administrative and financial capacity, rather than their geographic location either on the periphery of the Schengen area or further inland.

3.4 Managing the external Schengen border: towards joint administrative and fiscal responsibility

At present, it is difficult to imagine how a proposal to allocate administrative and fiscal responsibility for external border management (including the asylum system) comprehensively to all Schengen states could win the necessary political support. However, small steps in this direction have become possible because many EU member states are keen to avoid a repeat of the untenable situation of refugee migrants in the Mediterranean region in 2015.

Greece is now supported by civil servants from EU institutions and member states in the implementation of the EU Turkey agreement on refugee return. If things go well during the coming months, irregular migration from Turkey to Greece will be reduced; refugees without a valid claim to protection in the EU will be returned to Turkey; and Syrian

refugees will be resettled in the EU directly from Turkey in an organized fashion. All this will occur with substantial involvement of EU institutions and "willing" member states – rather than the countries of first arrival being left to their own devices.

Already there are plans to phase out ID checks on the German border with Austria because far fewer refugees are now arriving in Germany. It remains to be seen whether a coalition of "willing" EU member states can pull off a sufficiently comprehensive solution that would have to meet three important criteria:

- First, now that the Balkan refugee route has been closed, people smugglers will search for alternatives (through Albania, Libya/ Italy, etc.); EU member states need to pre-empt this – preferably without closing additional Schengen borders.
- Second, as long as many bona-fide refugees in the Middle East live in great poverty and under considerable insecurity, with little prospect of economic integration in their countries of residence, they have a strong incentive to move on to Europe by any means available to them. Arguably, it would not be feasible or even desirable to invite all refugees to Europe. However, the EU has the means and therefore the responsibility to ensure that all refugees in the European Neighbourhood region can live decently, if modestly.
- Third, while some EU member states find it politically easier than others to receive refugees, all member states should strive to share fiscal responsibility for the external management of the Schengen border according to their ability to pay – i.e. in line with their contributions to the EU budget.

An effective external Schengen border management system, including a common asylum system, would render ID checks at internal Schengen borders redundant. By contrast, if large numbers of refugees can enter the EU and then move on to a destination country of their choice (as until recently), some EU member states will inevitably find themselves overburdened and may seek to limit their expenditures on refugees by turning away those who arrive across Schengen borders from other (safe) EU countries.

4. CONCLUSIONS

At present, the economic cost of ID checks at Schengen borders is low (only a fraction of one percent of the affected countries' GDP). Even if controls were much more comprehensive, many countries would still find that the cost of controls is smaller than their fiscal cost savings by turning away refugees who arrive from (safe) EU countries.

Ultimately, only an effective common management of the external Schengen border will render ID checks at internal Schengen borders redundant. Since an important component – a common asylum system – will not be created overnight, it makes sense to think about interim measures to reduce the extent of ID checks and lower their economic cost:

- Some border controls at present are simply badly designed (the German border with Austria comes to mind). In a security emergency, improvised roadblocks may be inevitable. However, if border controls are maintained for any length of time, it is imperative to invest in the necessary infrastructure – for example, to widen roads to a sufficient number of lanes and assign enough border police to conduct checks with minimum delays, even at peak traffic times. Many motorway toll stations all over Europe demonstrate how easily this can be done.
- If EU member states consider border controls necessary to curb irregular immigration by refugee migrants, international cooperation may help to limit the extent of controls. For example, if a refugee route needs to be closed that runs through several countries, it may be possible to concentrate controls on selected stretches of border. Thus, if Austria's southern border is effectively policed and refugees are turned back or registered, there may be no need for additional checks at Germany's border with Austria. All parties would benefit from limiting controls in this way.

Even in the absence of a common asylum system, the EU countries where refugees first arrive may be supported by the EU and "willing" member states in several important ways:

- Administrative staff and security forces from EU institutions and member states may help with the processing of refugees and the policing of the external Schengen border.
- Refugees with a recognized claim to protection in the EU may be resettled within the EU.
- If countries of first arrival have disproportionately high expenditures on refugees, they may be supported financially by the EU or member states on an ad-hoc or (preferably) systematic basis.

All these would be politically feasible and, at the same time, significant steps by the EU and its member states towards the long-term objective of jointly managing the external Schengen border and re-establishing free travel within the Schengen area.

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NOTES

DIRECTORATE GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Impact of border controls within Schengen on the Single Market: Road transport sector case study

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EXECUTIVE SUMMARY

- In 2013, there were an estimated 285 million road border crossings in the Schengen zone with an origin and destination inside the zone. Around 80 million of them were heavy duty vehicles carrying freight. Road traffic from outside the Schengen area, even to and from the UK, is limited.
- If border controls are reinstated, this will create queues and vehicles will lose time waiting at the border. Depending on the intensity of the checks, we estimate the time lost at 10-20 minutes for passenger cars and 30-60 minutes for heavy duty vehicles such as trucks and buses.
- Waiting leads to costs for transport users. The value of time (VOT) depends on the motive of the traveller (business, commuting, other) or on the value of the cargo. For transport in a professional context, wage is also an important determinant of the VOT. We estimate the value of a car spending an hour waiting at the border at €30 for business travellers, €12 for commuters and €10 for travellers with a different motive (such as tourism). For buses, we estimate the VOT at €100 per vehicle per hour, while for freight, the cost is set at €50/vehicle/hour.
- Under simplified assumptions, the cost of time losses at the border in case the Schengen zone is fully disbanded is estimated between 2.5 and 5.1 billion euros annually. This assumes that there are no changes in behaviour of economic actors due to the reinstatement of border controls, i.e. no secondary effects are assumed on e.g. workforce mobility, tourism or logistic processes.

1. INTRODUCTION

Schengen cooperation enhances the free movement of persons by enabling citizens to cross internal borders without being subjected to border checks. The border-free Schengen Area guarantees free movement to more than 500 million EU citizens, as well as many non-EU nationals, businessmen, tourists or other persons legally present on the EU territory. Schengen provisions enhance good functioning of the Internal Market, as an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured.

Most EU Member States and four non-EU countries – Iceland, Liechtenstein, Norway, and Switzerland – are members of the Schengen area. However, Ireland and the United Kingdom maintain opt-outs and have not signed the Schengen agreement. Four other EU states – Bulgaria, Croatia, Cyprus and Romania – are Schengen candidate countries and wish to join the Schengen area.

As a result of recent terrorist attacks and a migration crisis, a number of internal border controls have been temporarily reintroduced:

- Denmark temporarily reintroduced border controls for the period 4 January - 23 February 2016 as a result of a large influx of persons seeking international protection: all borders with particular focus on the sea and land borders with Germany.
- Norway temporarily reintroduced border controls for the period 15 January – 14 February 2016 on all borders with focus on ports with ferry connections to Norway via internal borders.
- Sweden temporarily reintroduced border controls for the period 10 January – 8 February 2016 on all borders, with special focus on southern and western harbours and the Öresund Bridge between Denmark and Sweden.
- Austria temporarily reintroduced border controls for the period 16 November 2015 - 15 February 2016 on all borders but with special focus on the Slovenian-Austrian land border; the border can be crossed only at the authorised border crossing points.
- Germany temporarily reintroduced border controls for the period 14 November - 13 February 2016 on all borders, with special focus on the German-Austrian land border.
- France temporarily reintroduced border controls for the period 13 November – 26 February 2016 due to the emergency state as introduced on the French territory following the terrorist attacks in Paris.
- Belgium notified the European Commission on 23 February of a temporary suspension of the Schengen agreement on free movement on its border with France (tentatively 1 month).

Under the Schengen Borders Code as amended in 2013, a Schengen country may temporarily reintroduce border controls at its internal borders for a limited time in cases where there is a serious threat to public policy or internal security.

Under these circumstances the benefits of the Schengen zone may be substantially reduced. However, where reintroduction of the border controls is based on a public order clause in the Schengen Agreement, the main issue that arises is not the cost of non-Schengen, but rather exceptions contained in Schengen provisions. At the same time there is a possibility of extension of border controls in the near future and/or a complete return to border-controls.

1.1 Objective of this study

The objective of this study is to provide an independent and transparent assessment of the expected costs of a de facto disbanding of the Schengen agreement for the road transport sector. To achieve this target, a three step approach is presented:

1. Determine the annual number of road border crossings for each pair of neighbouring countries;
2. Estimate the waiting time at the border for different vehicle types;
3. Assess the value of time (VOT) for waiting at borders to be attributed to the different vehicle types.

The focus of the present study is on the first step, for which a full analysis of passenger and freight movements by road in the Schengen zone is performed. For the other steps, a more simplified approach is used, generally based on literature.

While there are other methods to determine the cost of reapplying border controls, using a more macroeconomic top-down approach, the bottom-up approach presented in this briefing can provide some perspective on the matter.

2. BORDER CROSSING TRANSPORT VOLUMES

In the first part of this study, the annual number of border crossings (in each direction) is determined for each pair of neighbouring countries, separately for different vehicle types (for freight: heavy duty vehicles HDV, for passenger transport: passenger cars and buses). We also provide detail on the origins and destinations of the vehicles crossing borders, as well as their motives (for passenger transport: commuting, business, private, vacation) or commodity type (for freight: NSTR class).

Our approach consists of different steps :

a) determine the traffic between each pair of Schengen countries based on output of the ETISplus project;

b) convert the transport numbers for HDV and bus into number of vehicles (they are reported as tonne-km or passenger-km, not as vehicles);

c) determine for each pair of Schengen countries the routes used.

2.1 ETISplus: road transport between each pair of Schengen countries

Road transport numbers are taken from the ETISplus project for the year 2010. For passenger transport (car and bus) numbers from the « modelled » datasets are used, while numbers from the « harmonised » dataset are used for HDV.

It should be noted that for bus and coach transport, ETISplus only covers scheduled lines. Tourist coaches, which likely forms an important part of cross border bus transport, is thus not included in the results.

In this study, only traffic between Schengen countries is considered. Therefore a limited number of Schengen border crossings from transit traffic (e.g. traffic from the UK to Germany crossing the French-German border) is not taken into account. The ETISplus database suggest that the volumes to and from the UK are relatively small compared to continental volumes (e.g. there are 8x fewer trucks from the UK to Germany than from Belgium to Germany).

2.2 Convert the transport numbers for HDV and BUS into number of vehicles

To properly calculate the costs, information is needed on the amount of vehicles crossing the border. However, ETISplus only directly covers the number of vehicles for passenger cars. For HDV, the traffic volume is indicated in tonnes, and for bus in passengers. To determine the number of border crossings, all traffic numbers first have to be converted into vehicles.

For HDV, the ETISplus transport volumes have to be converted from tonness into number of vehicles, using load factors (ton/vehicle). We determined load factors based on EUROSTAT data for 2014 for EU28: table « Annual road freight transport by distance class with breakdown by type of goods [road_go_ta_dctg] ». The resulting load factors as used in this study can be found in Table 1.

For BUS, the ETISplus transport volumes have to be converted from passengers into number of vehicles, using occupancy rates (passengers/vehicle). We used an average occupance rate of 15.1 passengers/vehicle taken from TREMOVE v3.5c.

Table 1 : HDV load factors based on EU28 road freight transport numbers from EUROSTAT for 2014 (ton/vehicle)

NST07	<50km	50-149km	150-299km	300-499km	500-999km	1000-1999km	2000+km
GT01	13.2	14.4	14.2	13.9	13.4	14.8	16.2
GT02	14.9	14.6	14.0	16.4	16.1	15.4	15.0
GT03	19.0	23.8	25.2	24.7	24.3	20.2	21.0
GT04	9.6	9.5	11.1	13.5	15.8	16.2	17.2
GT05	4.3	4.6	5.1	6.9	8.8	10.6	11.1
GT06	8.9	11.2	12.9	14.4	15.9	16.7	17.7
GT07	12.8	15.0	14.7	17.4	19.1	19.8	21.8
GT08	11.1	10.9	11.8	13.7	14.9	15.2	15.6
GT09	13.1	15.3	16.1	16.6	16.7	15.9	19.6
GT10	8.4	10.3	12.4	14.4	15.5	15.4	16.2
GT11	7.4	7.7	8.2	9.2	10.8	11.3	12.1
GT12	7.5	7.6	9.0	10.0	9.7	11.1	12.6
GT13	4.6	5.2	5.7	6.1	6.9	7.0	11.6
GT14	8.4	9.8	12.6	16.7	18.0	18.3	18.1
GT15	5.2	5.9	8.5	10.8	12.5	12.9	15.3
GT16	2.8	3.7	5.1	6.2	7.5	8.9	9.5
GT17	5.3	6.5	7.7	8.8	7.9	7.6	4.2
GT18	7.7	7.7	9.6	11.4	12.7	13.0	14.7
GT19	9.0	11.0	11.4	12.2	12.2	12.5	11.5
GT20	10.6	11.5	12.0	12.9	14.5	14.1	15.2

Source: EUROSTAT, table road_go_ta_dctg EU28 for 2014

2.3 Approach to determine routes

The traffic numbers from ETISplus only determine the transport volumes between the country of origin and the destination country. To determine the number of Schengen border crossings, the transport routes have to be known for each OD-pair. In this context, a « route » is considered to be a series of border crossings ; e.g. for the country pair DE-IT, DE-CH-IT and DE-AT-IT are 2 different routes.

As there are 650 pairs of Schengen countries, and often several routes are possible between each pair of countries, we had to limit the analysis to the largest traffic flows to limit the amount of work in this limited study.

It should be noted that we also considered routes containing ferry transits (e.g. DK-NO).

A 2 step approach was followed :

- for most neighbouring countries, we assumed that all traffic only crossed the border between these 2 countries (e.g. all traffic between FR and ES only crosses the FR-ES border); some exceptions of note are BE-DE, DE-FR, FR-IT, LT-PL and DE-PL;
- for non-neighbouring countries, the routes were determined based on TRANS-TOOLS 2.5; as this analysis is very time consuming, only the most significant traffic flows were considered.

2.4 Analysis based on "TRANS-TOOLS 2.5"

For the detailed analyses of the road traffic routes between non-neighbouring countries, a series of TRANS-TOOLS runs was performed to determine the share of the different routes between each pair of countries. The detailed analysis of routes was limited to OD-pairs

where the OD-traffic is at least 5% of all traffic leaving the country of origin, OR at least 5% of all traffic arriving in the destination country. This means that a small share of total traffic between Schengen countries was not taken into account in our analysis : about 4% of total traffic for HDV, about 1% for cars and about 5% for bus. The same route share was assumed for both directions.

For each OD-pair considered, a TRANS-TOOLS run was performed using 2005 base data, taking only traffic between these 2 countries into account, to separate road traffic between the 2 countries considered from all other road traffic. This means that no congestion effects were taken into account.

From TRANS-TOOLS, separate road traffic flows are available for passenger transport and freight. The flows for passenger transport were analysed to determine the routes for cars, while the flows for freight transport were used for the routes for HDV and bus.

Example for country pair DE-IT :

Table 2 : Shares of different routes for country pair DE-IT

Route	CAR%	HDV%
DE-CH-IT	34%	2%
DE-AT-IT	55%	49%
DE-LU-FR-CH-FR-IT	0%	3%
DE-AT-LI-CH-IT	11%	46%

Source: Own calculation based on TRANS-TOOLS 2.5

Figure 1 Road traffic flows for country pair DE-IT for freight transport (TRANS-TOOLS 2.5 using 2005 base data)

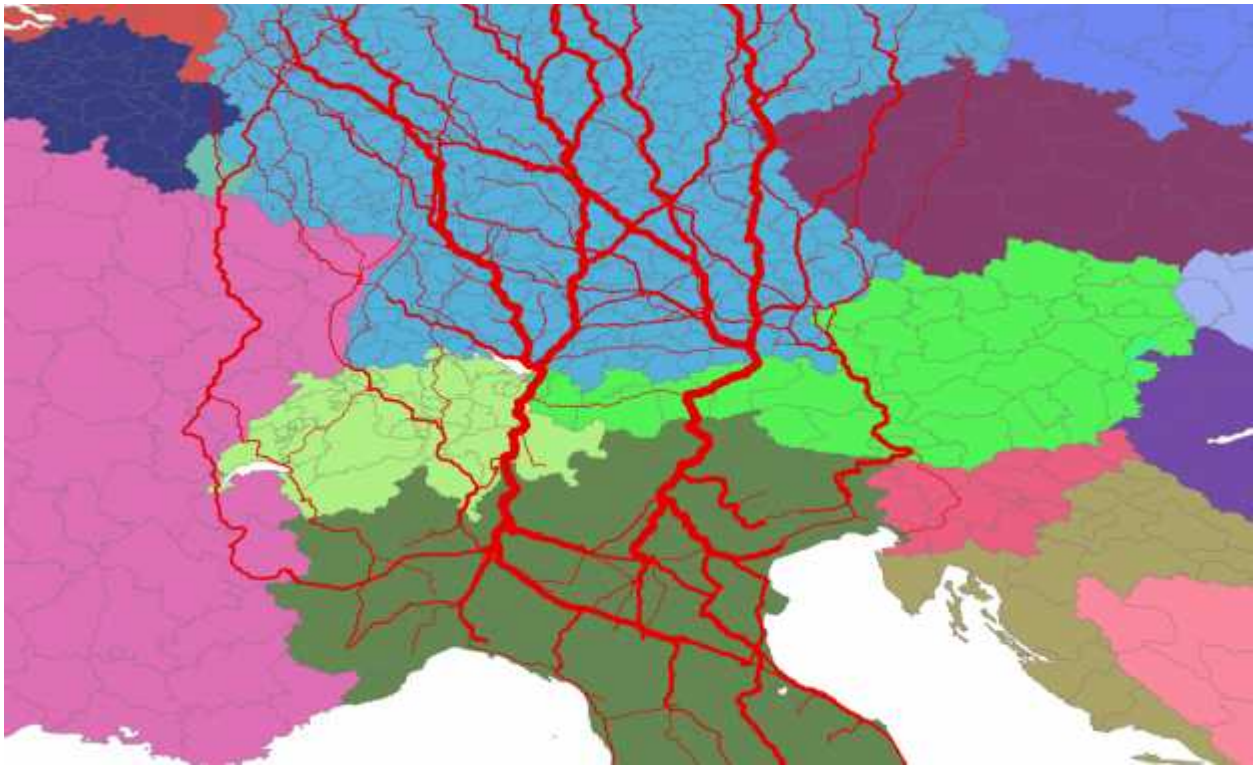
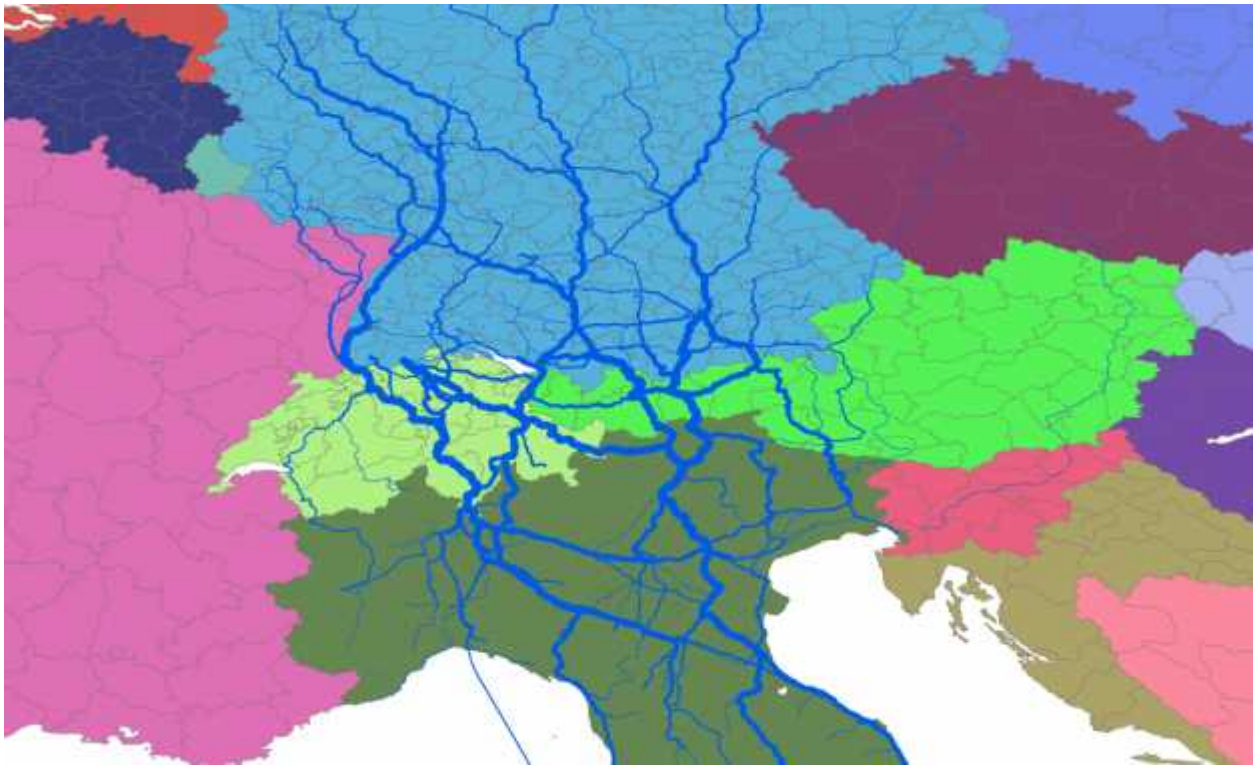


Figure 2 Road traffic flows for country pair DE-IT for passenger transport (TRANS-TOOLS 2.5 using 2005 base data).



2.5 Results

The following tables reflect the amount of border crossings between each pair of neighbouring countries. The rows show the outgoing border, the columns show the incoming border. For the rest of the study, it is assumed that border controls are only organised when entering a country.

We find that per year, there are around 286 million vehicles crossing internal Schengen borders via road (not counting those with an origin or destination outside the Schengen zone, as explained above). Over 70% of those are passenger cars. Centrally located Germany has over 20% of the incoming border crossings, mainly from Austria and the Netherlands. France has the second most incoming border crossing at 37 million,

Limited numbers were available for validation.

- In an online article on website bruegel.org, based on German MAUT statistics, it is estimated that 3.8 million trucks cross into Germany from Austria and 3.1 million from Poland, with only the Netherlands topping these countries at 6.5 million. We find that our overall numbers for the amount of border crossings generally matches quite well (ETISplus underestimates MAUT statistics by 17%), but at the level of individual countries, there can be differences up to 60%.
- The Economist mentions in an article published in February 2016 that 57 million trucks cross Europe's (assumed to be Schengen) borders annually. This is just under 30% lower than our ETISplus based estimate.

Table 3 : Amount of passenger cars crossing Schengen internal borders (2013)

#crossings	Border in																									
Border out	**AT**	**BE**	**CH**	**CZ**	**DE**	**DK**	**EE**	**ES**	**FI**	**FR**	**GR**	**HU**	**IS**	**IT**	**LI**	**LT**	**LU**	**LV**	**MT**	**NL**	**NO**	**PL**	**PT**	**SE**	**SI**	**SK**	**Grand Total**
AT			1,346,274	634,864	9,165,337							843,088		3,847,045	401,438										1,250,048	1,917,722	19,405,816
BE					1,387,034					8,189,220							3,282,668			8,358,616							21,217,538
CH	1,346,274				6,965,824					4,741,535				2,381,444	526,680												15,961,758
CZ	634,864				4,209,256																	1,046,065				493,317	6,383,502
DE	9,167,548	1,387,034	6,965,824	4,209,256		1,448,948			65,955	4,955,492							3,093,317			9,141,702		3,090,252		10,291			43,535,620
DK					1,448,948																165,936			2,826,347			4,441,230
EE									145,346									149,332						1,069			295,747
ES										2,361,622													3,887,522				6,249,144
FI					65,955		145,346														48,991			135,107			395,399
FR		8,189,220	4,741,535		4,955,492			2,361,622						5,729,264			1,343,970										27,321,103
GR														27,982													27,982
HU	843,088																					0			101,741	344,666	1,289,494
IT	3,844,834		2,381,444							5,729,264	27,982								23,310						591,976		12,598,810
LI	401,438		526,680																								928,118
LT																		418,534				64,414					482,948
LU		3,282,668			3,093,317					1,343,970																	7,719,954
LV							149,332								418,534									6,674			574,540
MT														23,310													23,310
NL		8,358,616			9,141,702																						17,500,318
NO						165,936			48,991															948,386			1,163,313
PL				1,046,065	3,090,252							0				64,414								81,283		142,898	4,424,912
PT								3,887,522																			3,887,522
SE					10,291	2,826,347	1,069		135,107									6,674			948,386	81,283					4,009,157
SI	1,250,048											101,741		591,976													1,943,765
SK	1,917,722			493,317								344,666										142,898					2,898,603
Grand Total	**19,405,816**	**21,217,538**	**15,961,758**	**6,383,502**	**43,533,409**	**4,441,230**	**295,747**	**6,249,144**	**395,399**	**27,321,103**	**27,982**	**1,289,494**		**12,601,021**	**928,118**	**482,948**	**7,719,954**	**574,540**	**23,310**	**17,500,318**	**1,163,313**	**4,424,912**	**3,887,522**	**4,009,157**	**1,943,765**	**2,898,603**	**204,679,602**

Table 4 : Amount of buses and coaches crossing Schengen internal borders (2013)

#crossings Border out	Border in AT	BE	CH	CZ	DE	DK	EE	ES	FI	FR	GR	HU	IS	IT	LI	LT	LU	LV	MT	NL	NO	PL	PT	SE	SI	SK	Grand Total
AT			1,502	27,533	17,103							14,300		23,494	6,396										993	3,779	95,099
BE					5,779					33,598							3,511			22,622								65,510
CH	1,502				16,073					49,037				10,166	6,396												83,174
CZ	27,533				47,698																	39,723				59,831	174,785
DE	17,103	5,779	16,073	47,698		15,372			0	13,887							4,653			8,581		10,928		162			140,235
DK					15,372																240			9,515			25,127
EE									0									11,280						0			11,280
ES										43,122													15,815				58,937
FI					0		0														0			48			48
FR		33,598	49,037		13,887			43,122						11,268			4,364										155,277
GR														516													516
HU	14,300																					21			3,649	6,583	24,553
IT	23,494		10,166							11,268	516								0						8,042		53,486
LI	6,396		6,396																								12,792
LT																		29,332				10,761					40,093
LU		3,511			4,653					4,364																	12,529
LV							11,280									29,332								0			40,611
MT														0													0
NL		22,622			8,581																						31,203
NO						240			0															28,924			29,164
PL				39,723	10,928							21				10,761								42		995	62,470
PT								15,815																			15,815
SE					162	9,515	0		48									0			28,924	42					38,691
SI	993											3,649		8,042													12,683
SK	3,779			59,831								6,583										995					71,188
Grand Total	**95,099**	**65,510**	**83,174**	**174,785**	**140,235**	**25,127**	**11,280**	**58,937**	**48**	**155,277**	**516**	**24,553**		**53,486**	**12,792**	**40,093**	**12,529**	**40,611**	**0**	**31,203**	**29,164**	**62,470**	**15,815**	**38,691**	**12,683**	**71,188**	**1,255,263**

Table 5 : Amount of trucks crossing internal Schengen borders (2013)

#crossings	Border in																								
Border out	AT	BE	CH	CZ	DE	DK	EE	ES	FI	FR	GR	HU	IS	IT	LI	LT	LU	LV	MT	NL	NO	PL	PT	SE	SI	SK	Grand Total
AT			150,393	414,116	2,376,521							169,753		1,217,350	537,981										263,281	114,610	5,244,005
BE					805,217					4,159,112							1,701,281			3,151,801							9,817,411
CH	61,804				446,423					559,698				1,042,776	597,801												2,708,503
CZ	439,004				2,114,092																	1,096,731				975,032	4,624,859
DE	2,611,987	800,151	806,684	1,987,457		706,720			6,582	1,606,230							1,862,137			3,965,099		1,914,244		42,914			16,310,205
DK					652,996																65,342			249,066			967,404
EE									35,256									99,252						0			134,508
ES										2,433,935													925,386				3,359,321
FI					7,325		34,430														26,235			190,481			258,470
FR		3,255,470	764,246		1,525,388			2,372,698						887,603			628,146										9,433,551
GR														38,520													38,520
HU	197,411																					3,645			354,003	562,274	1,117,332
IT	1,069,637		1,215,167							923,671	48,238														423,590		3,680,304
LI	559,595		575,533																								1,135,128
LT																		212,436				215,522					427,957
LU		1,532,665			1,672,746					752,639																	3,958,049
LV							134,899									229,434								15,239			379,572
MT																											
NL		3,785,036			4,065,365																						7,850,402
NO						47,575			7,570															357,637			412,782
PL				1,126,481	2,041,162							4,162				266,428								125,825		195,776	3,759,833
PT								866,463																			866,463
SE					40,013	215,138	0		146,691									16,426			398,786	120,118					937,173
SI	259,519											248,366		581,110													1,088,995
SK	156,656			908,993								724,817										173,044					1,963,511
Grand Total	**5,355,615**	**9,373,322**	**3,512,023**	**4,437,047**	**15,747,249**	**969,433**	**169,328**	**3,239,161**	**196,100**	**10,435,285**	**48,238**	**1,147,098**		**3,767,359**	**1,135,782**	**495,862**	**4,191,564**	**328,114**		**7,116,900**	**490,363**	**3,523,304**	**925,386**	**981,162**	**1,040,873**	**1,847,692**	**80,474,261**

3. VALUE OF TIME

3.1 The concept

Apart from the costs for fuel, vehicle purchase, insurance, maintenance, taxes, etc., another important but often overlooked cost of road transport is time. Travelling from one point to another is usually not the preferred way of spending time, and comes at the expense of available time for other, more pleasant or more productive activities. As such, time can be attributed a certain value that (usually) represents how much an individual or business would be willing to pay to reduce travel time.

For passenger transport, this information is usually collected through an extensive process based on a "Stated Preference" approach, using survey techniques that allow to isolate the specific value of a unit of time under given circumstances. Indeed the methodology takes into account that a different "value of time" (VOT) or a "value of travel time savings" (VTTS) is appropriate for different travel motives (e.g. commuting, business travel, leisure and tourism). In case of transport in a professional context (commuting and business travel), wage costs are often an implicit part of the valuation.

For freight transport, it is possible to estimate values of time based on more objective aspects, including but not limited to the wage of the driver, depreciation of the vehicle, fuel costs, insurance costs, nature of the cargo (e.g. perishable or refrigerated goods), and secondary costs for shippers or recipients of the goods (e.g. in case of a stock shortage).

3.2 Literature

The literature base describing the practice to come to VOT estimates and examples for different countries/regions and different travel conditions is extensive. We will present a few that are relevant for the issue at hand, and discuss which values could best be used in the context of the present study. The scope of the review will be limited to European countries only.

In the UNITE project (2003), different values (in €$_{1998}$) are provided for business travel (€21/person/hour), commuting/private travel (€6/person/hour) and leisure/holiday travel (€4/person/hour), as well as for light goods vehicles (€40/vehicle/hour) and heavy goods vehicles (€43/person/hour).

These values were also referenced in the European Commission's Handbook on External Costs of Transport (2008). However, the authors recommend to use more recent figures provided by the HEATCO study (2006), which also provided numbers (in €$_{2002}$) for more vehicles types (car and bus) and made a distinction between short and long distance travel. For business travel, the value is in line with the UNITE project, but for other motives, a higher value is recommended, particularly for car transport (€7-11/person/hour). For freight transport, the value is provided on a per tonne/hour basis (€2.98/tonne/hour). Assuming a load of heavy trucks between 8 and 25 tonnes per vehicle, that puts the cost per vehicle at around €25-75/vehicle/hour.

The Update of the Handbook on External Costs of Transport (2014) only provided a limited amount of additional data for the VOT assessment, based on the FORGE model (€$_{2010}$). While the model was developed by the UK government, the values are recommended for use at the EU level. A value of €35-50/person/hour is attributed to working time (business travel), while for commuting and other motives, much lower values are suggested (€8.30-9.38/person/hour).

Significance (2012) made an estimate of VOT for the Netherlands, in a study also covering the reliability of transport. For freight transport, they provide a separate estimate for containerised and non-containerised transport, with the value for container trucks notably higher than that for other trucks (€59/vehicle/hour vs. €37/vehicle/hour, average €38/vehicle/hour). These values cover all cost aspects as discussed in the conceptual

section, and are exclusive of VAT. For passenger transport, estimates are provided for three motives (commuting, business and other) and 2 road vehicle types (car and bus). They are generally in line with the values provided by HEATCO and the Handbook on External Costs of Transport.

TØI (2010) performed own research into the VOT of freight transport in Norway. Through a series of assumptions, they estimate the average value of time for a large truck on all trips (i.e. including a certain share of empty runs) at NOK 588/vehicle/hour, or €62/vehicle/hour.

As part of an assessment of the effects of road charging, TML (2012) made estimates of VOT for both passenger and freight transport in Belgium. The VOT for business travel was set at €26.36/vehicle/hour, for commuting €13.96/vehicle/hour and €7.32/vehicle/hour for other motives. It should be noted that this study already accounts for the average amount of passengers per vehicle, which is not the case for the other studies that refer to a value/person/hour. The average occupancy rate for passenger cars is around 1.2 for business and commuting trips, and just over 2 for other trips (TREMOVE, 2011). For freight vehicles, the average VOT was around €36/vehicle/hour. This mostly accounts for the wage of the driver and the cost of goods not being available to the customer, which is in line with the calculation methods of the other studies.

In a study for the French government, Quinet (2013) made estimates of VOT for all categories except freight, and reached a very similar outcome.

The table below provides an overview of the values found in the studies mentioned above.

Table 6 : Overview of value of time estimates from literature

Source	VOT	Applicable for?	Region	Unit
UNITE (2002)	€21/person/hour	Business	EU15	€1998
	€6/person/hour	Commuting/private	EU15	€1998
	€4/person/hour	Leisure/holiday	EU15	€1998
	€40/vehicle/hour	Freight, light goods vehicle	EU15	€1998
	€43/vehicle/hour	Freight, heavy goods vehicle	EU15	€1998
HEATCO (2006)	€23.82/person/hour	Business, car	EU25	€2002
	€8.48/person/hour	Commuting, short distance, car	EU25	€2002
	€10.89/person/hour	Commuting, long distance, car	EU25	€2002
	€7.11/person/hour	Other motive, short distance, car	EU25	€2002
	€9.13/person/hour	Other motive, long distance, car	EU25	€2002
	€19.11/person/hour	Business, bus/coach	EU25	€2002
	€6.10/person/hour	Commuting, short distance, bus/coach	EU25	€2002
	€7.83/person/hour	Commuting, long distance, bus/coach	EU25	€2002
	€5.11/person/hour	Other motive, short distance, bus/coach	EU25	€2002
	€6.56/person/hour	Other motive, long distance, bus/coach	EU25	€2002
	€2.98/tonne/hour	Freight	EU25	€2002
Update handbook on External Costs of Transport (2014)	€49.20/person/hour	Car driver, working time	UK	€2010
	€35.26/person/hour	Car passenger, working time	UK	€2010
	€37.64/person/hour	Bus passenger, working time	UK	€2010
	€9.38/person/hour	Commuting	UK	€2010
	€8.30/person/hour	Other motive	UK	€2010
Significance (2012)	€9.25/person/hour	Commuting, car	NL	€2010
	€26.25/person/hour	Business, car	NL	€2010
	€7.50/person/hour	Other motive, car	NL	€2010

	€7.75/person/hour	Commuting, bus/coach	NL	€2010
	€19/person/hour	Business, bus/coach	NL	€2010
	€6/person/hour	Other motive, bus/coach	NL	€2010
	€59/vehicle/hour	Freight, container	NL	€2010
	€23/vehicle/hour	Freight, non-container, 2-15T truck	NL	€2010
	€44/vehicle/hour	Freight, non-container, 15-40T truck	NL	€2010
	€38/vehicle/hour	Freight, average	NL	€2010
TØI (2010)	€62/vehicle/hour	Freight, large truck	NO	€2010
TML (2012)	€26.36/vehicle/hour	Business, car	BE	€2005
	€13.96/vehicle/hour	Commuting, car	BE	€2005
	€7.32/vehicle/hour	Other motive, car	BE	€2005
	€36.37/vehicle/hour	Freight	BE	€2005
Quinet (2013)	€32.7/person/hour	Business, car	FR	€2010
	€10.9/person/hour	Holiday, car	FR	€2010
	€14.4/person/hour	Other motive, car	FR	€2010
	€27.6/person/hour	Business, bus/coach	FR	€2010
	€9.4/person/hour	Holiday, bus/coach	FR	€2010
	€12.1/person/hour	Other motive, bus/coach	FR	€2010

3.3 Conclusion

Most of the values found in the consulted sources are similar. While older values are typically lower than estimates provided by more recent studies, this can be explained by inflation. As for differences between countries, wage costs are the main driver for different valuations between countries. However, in the context of the present study, the nationality of the driver cannot be determined from the data on transport flows. This leaves the use of European average values (per motive and vehicle type) as the best compromise.

For passenger transport, three motives can be clearly identified as having separate VOTs: business transport, commuting and other trips (private, leisure, holidays). Business trips fully account for wage and productivity, and particularly for car drivers (who have few possibilities for productivity while driving), the VOT is very high, in the range of €21-50/person/hour. For commuting, the VOT is a factor 2-3 lower (€10-14/vehicle/hour). For other travel motives, the value is another 15-40% lower (€8-12/vehicle/hour).

For freight, the original objective was to assign different values to different commodity types. However, insufficient data was available to allow for such a disaggregation. The literature suggests that a range of €30-60/vehicle/hour is a reasonable average. Literature also mentions that transport time reliability can be a more important factor for transport users than the actual transport time; in other words, delivering at the promised time is more valuable than delivering the shortest time. Due to the framework constraints of this study, more detail cannot be provided, but further research into this issue certainly has merit.

Based on the table above, we suggest to use the following VOT for the assessment of this study:

Passengers:

- Car, business motive: €30/vehicle/hour
- Car, commuting motive: €12/vehicle/hour
- Car, other motive: €10/vehicle/hour
- Bus: €100/vehicle/hour (most cross border bus trips are assumed to be coaches with a high occupancy rate but low value of time)

Freight:

- Singular value of €50/vehicle/hour.

While these numbers can be subject to different interpretations and they have a fundamental impact on the outcome of calculations, the use of a simple set of values makes it easy to use alternative values, for example within the context of a sensitivity analysis.

4. BORDER WAITING TIMES

Equally important for the outcome of the assessment as the value of time, the amount of time spent waiting at the border is much more uncertain. The thoroughness of the control procedure, the personnel available to perform the security checks and the amount of vehicles wanting to cross the border at a given location may all vary from day to day and from hour to hour. As the Schengen agreement has been active for over 20 years, recent data on average waiting times in Europe is scarcely available (with the exception of a few very recent studies already published on the effects of reinstating border controls). Following estimates provide some context.

- In a publication by the OECD/ECMT (2000), a target is set to reduce average waiting times for freight vehicles to less than 1 hour, with vehicles operating under TIR specifications experiencing less than 10 minutes of delay. Given the context, this is likely valid for borders with countries that were not part of the Schengen area in the year 2000.
- For the California-Mexico border, HDR Decision Economics (2010) estimated that average wait times for trucks were around 2 hours.
- Felbermayr (2016) estimates that average wait times in the post-Schengen period should not exceed 20 minutes, based on estimates from the USA's border with Canada and Mexico. This estimate is valid for freight transport only.
- A paper by France Stratégie (2016) mentions observed waiting times of 30 and 45 minutes. In its scenario assessment, it refers to wait times of 10 or 20 minutes for passenger cars. For freight transport, the scenarios assume 30 or 60 minutes of waiting times.

Clearly, the waiting time depends on the thoroughness of controls. As was done in other studies, we use 2 scenarios. The first scenario assumes non-systematic or superficial checks, leading to border wait times of 10 minutes for cars and 30 minutes for buses and trucks; the second assumes more in depth control procedures and causes average delays of 20 minutes for cars and 60 minutes for trucks and buses.

5. METHODOLOGICAL REMARK

In the current review, it is assumed that the European economy does not react to increased border waiting times by switching to other transport modes or consuming more local products for which border crossing transport is not required. While both are distinct possibilities, these options cannot be considered within the scope of the present study. Furthermore, we consider that the cost of waiting is a linear function of the waiting time, which is a valid assumption if queues do not become excessively long. In case they do, a more systemic review of the effects of transport delays would be needed.

In other words, we evaluate the costs based on a given number of border crossings, without assuming changes in the behaviour of economic actors.

6. RESULTS AND CONCLUSIONS OF THE STUDY

When bringing all of our results together in the two scenarios described above, we find that the cost for transport users of reinstating border controls in the entire Schengen zone would amount to between 2.5 (first scenario, short waiting times) and 5.1 (second scenario, longer waiting times) billion euros annually. The countries expected to incur the largest costs are Germany, France and Belgium. If those countries closed their borders, they would also cause the greatest cost to other countries.

Table 7 and Table 8 below contain the detailed information. They should be read as follows:

- The columns are the countries that close their borders – in this overview, it is assumed that a country would close all borders. The column total thus reflects what the cost to the entire Schengen zone would be if that country would go in full lockdown.
- The rows indicate the countries incurring costs. It is assumed that costs from waiting at borders are split evenly between the origin country and the destination country of the vehicle. Countries with important transit traffic are thus likely to incur lower costs from a closure of borders than they would cause to others by closing their borders. Switzerland and Austria are examples of this. Our numbers show that Luxemburg would also be in this case, though in practice, the effect would likely be more limited due to the country's size. The row total is the cost a country would incur if the entire Schengen zone would collapse.
- Table 7 reflects the numbers for the first scenario with low waiting times, Table 8 presents the numbers for the second scenario with high waiting times.

When investigating specific scenarios, a drill down into these numbers is required. We will assess the costs of continuing the border control practices mentioned in the introduction. The values mentioned refer to the high waiting times scenario only.

- Denmark closing all borders would cost the Schengen zone € 70 million annually in time losses at the border. Closing only the border with Germany would reduce that to € 44 million –. Denmark itself would lose the most in that case (€19 million), while Germany would incur a cost of € 17 million and the Netherlands € 2.4 million. If the controls last 1.5 months, the cost would be € 5.5 million.
- If Norway would close its borders for a year, the Schengen zone would lose € 32.5 million, more than half of which would be incurred by Norway itself, and another € 12 million by Sweden. If the focus were only on ferry connections (i.e. borders with Sweden and Finland are not closed), the cost would be reduced to € 4.1 million. For a month, it would have costed around € 340,000.
- Border controls in Sweden would create a cost of € 69 million annually, mostly felt by the Swedes (€ 33 million), Norwegians (€ 14 million) and Danes (€ 11 million). When considering only ferry crossings and the border with Denmark, the cost is halved to € 34 million, but the cost to Denmark remains almost the same. For 1 month, the cost is around € 2.8 million.
- Austria closing all its borders would prove very costly (€ 376 million). For just the border with Slovenia, the cost would be nearly € 19 million (€ 4.8 million for a 3 month period).
- If Germany were to close its borders, it would create a cost of more than € 1 billion. Germany itself would absorb 43% of that, with the Netherlands suffering the second most at 11%. If only the land border with Austria is subject to controls, the cost drops to € 168 million (about the same as Sweden, Norway and Denmark closing all their borders combined). For the 3 month period as it happened, the cost is estimated at around 42 million. Germany would still lose the most (€ 76 million annually) in such a scenario, but losses for Austria (€ 51 million) and Italy (€ 30 million) would also be significant.

- France closing all its borders for 4.5 months may have cost around € 250 million (€ 670 million for a full year).
- If Belgium closes its border with France for a month, it would cost around € 17 million (€ 207 million for a full year).

This brings the total cost of controls that have already happened to an estimated € 320 million in waiting time losses, most of it caused by the full lockdown of France after the 13/11 terrorist attacks. In practice, the value may differ due to e.g. seasonality of traffic and active avoidance of trips to or crossing France, as described also in the methodological remark above.

Table 7 : low waiting time scenario

Costs	Country closing all borders																								
Country incurring cost	**AT**	**BE**	**CH**	**CZ**	**DE**	**DK**	**EE**	**ES**	**FI**	**FR**	**GR**	**HU**	**IT**	**LI**	**LT**	**LU**	**LV**	**MT**	**NL**	**NO**	**PL**	**PT**	**SE**	**SI**	**SK**	**Grand Total**
AT	55,111,318		3,689,239	3,146,289	26,542,089					1,570,047		3,247,459	11,931,010	418,366										2,694,697	3,590,869	111,941,383
BE	1,073,149	95,646,603	2,730,258	1,207,501	30,336,841	414,363		2,053,014		43,026,057			1,697,756	858,520		36,355,108			37,186,638		1,968,285	220,744			240,996	255,015,834
CH	2,401,039		35,464,153	1,239,169	13,828,719					6,241,609			3,440,940	941,091		111,800					577,263					64,245,784
CZ	5,545,500	559,680	431,370	34,666,583	21,658,308					1,112,830		2,252,589	1,557,190	431,370					661,916		5,550,012			2,381,690	9,889,114	86,698,152
DE	55,447,285	44,942,700	30,381,144	35,607,430	217,164,213	9,666,319	129,119	6,402,977	144,544	41,900,228		3,957,462	12,755,282	11,338,365	1,625,425	45,274,237	555,854		65,578,586	527,660	26,719,212	661,574	1,674,236	1,246,135	8,524,922	622,224,908
DK		319,933			11,530,992	14,839,023													1,603,290	732,729	931,704		5,440,137			35,397,808
EE					148,471		2,289,498		419,150						1,039,150		2,238,437				400,410					6,535,117
ES		3,935,842		1,549,272	6,907,895			42,568,134		42,465,928			3,606,833						1,521,440		1,193,980	13,538,034				117,287,357
FI					155,143		940,422		2,897,777						364,103		538,148			367,518	120,075		2,516,553			7,899,739
FR	4,102,618	71,808,441	17,877,431	4,081,311	39,424,284			21,336,699		133,304,419	41,184	70,887	18,974,112	1,719,779		14,611,046		3,208	19,786,994		2,407,090	1,277,333		448,397	108,263	351,383,494
GR	77,792			1,353,457	667,070					86,812	640,840	954,603	730,368											297,743	1,353,457	6,162,144
HU	4,236,388			5,792,375	2,517,774							12,360,959	1,908,364								98,629			3,726,564	9,262,815	39,903,868
IT	44,442,342	4,230,867	33,984,705	6,476,934	19,223,702			4,050,794		35,917,293	599,656	4,115,088	64,608,140	14,081,741		6,523,893		19,291	1,175,958		2,725,193	425,088		10,363,794	1,837,197	254,801,679
LI	364,507		1,129,186		193,317									1,276,743												2,963,753
LT					656,908		500,769		44,764						4,814,280		2,734,164				2,324,799					11,075,684
LU		5,779,700	129,860		5,450,023					3,935,416						17,060,665			744,369							33,100,033
LV					383,734		1,279,459		62,864						3,614,992		3,505,319				1,071,957					9,918,325
MT										3,208			25,706					22,499								51,413
NL	540,703	57,135,408	2,414,316	925,016	55,668,213	1,193,718		1,675,373		15,686,316			1,697,017	82,043		2,945,109			88,752,226		2,703,177	131,385				231,550,019
NO					463,091	1,516,520	1,870		149,792						1,309		1,870			8,150,709	239,744		6,848,095			17,372,997
PL	5,285,948	2,743,398	805,926	26,382,254	45,797,642	944,209	537,134	748,289	138,641	4,721,255			2,374,580	178,694	3,547,831		1,570,504		2,524,835	403,020	47,640,100		1,882,543		2,627,403	150,854,207
PT		512,128			852,444			18,233,745		4,689,046			324,645						204,373			16,254,158				41,070,538
SE					1,533,142	6,476,059			1,969,179						408,099		408,099			6,119,782	1,766,260		16,281,079			34,961,700
SI	5,388,395	144,324		453,695	1,804,971					466,971		1,079,272	3,864,927			144,324								8,021,812	353,816	21,722,507
SK	4,205,815	183,463	5,918	11,414,508	2,897,898							5,138,893	1,153,648	5,918							2,343,259			1,852,688	18,374,153	47,576,162
Grand Total	**188,222,799**	**287,942,488**	**129,043,507**	**134,295,794**	**505,806,884**	**35,050,211**	**5,678,271**	**97,069,025**	**5,826,711**	**335,127,435**	**1,281,681**	**33,177,212**	**130,650,518**	**31,332,630**	**15,415,190**	**123,026,182**	**11,552,395**	**44,997**	**219,740,625**	**16,301,417**	**100,781,151**	**32,508,316**	**34,642,642**	**31,033,519**	**56,163,005**	**2,561,714,606**

Table 8

Costs	Country closing all borders																								
Country incurring cost	**AT**	**BE**	**CH**	**CZ**	**DE**	**DK**	**EE**	**ES**	**FI**	**FR**	**GR**	**HU**	**IT**	**LI**	**LT**	**LU**	**LV**	**MT**	**NL**	**NO**	**PL**	**PT**	**SE**	**SI**	**SK**	**Grand Total**
AT	110,222,636		7,378,479	6,292,578	53,084,178					3,140,095		6,494,917	23,862,021	836,731										5,389,393	7,181,737	223,882,766
BE	2,146,299	191,293,207	5,460,516	2,415,002	60,673,682	828,727		4,106,029		86,052,114			3,395,512	1,717,039		72,710,217			74,373,277		3,936,570	441,487			481,992	510,031,669
CH	4,802,078		70,928,307	2,478,338	27,657,438					12,483,219			6,881,880	1,882,182		223,599					1,154,527					128,491,567
CZ	11,091,000	1,119,359	862,740	69,333,165	43,316,617					2,225,660		4,505,177	3,114,380	862,740					1,323,833		11,100,024			4,763,380	19,778,228	173,396,304
DE	110,894,569	89,885,400	60,762,288	71,214,860	434,328,425	19,332,638	258,238	12,805,953	289,088	83,800,455		7,914,924	25,510,563	22,676,730	3,250,850	90,548,473	1,111,709		131,157,172	1,055,320	53,438,425	1,323,149	3,348,472	2,492,270	17,049,843	1,244,449,817
DK		639,866			23,061,984	29,678,046													3,206,580	1,465,458	1,863,409		10,880,275			70,795,617
EE					296,943		4,578,997		838,300						2,078,300		4,476,873				800,820					13,070,234
ES		7,871,684		3,098,543	13,815,790			85,136,268		84,931,856			7,213,665						3,042,879		2,387,960	27,076,067				234,574,713
FI					310,286		1,880,844		5,795,555						728,206		1,076,295			735,036	240,149		5,033,106			15,799,478
FR	8,205,235	143,616,882	35,754,862	8,162,622	78,848,567			42,673,399		266,608,837	82,368	141,773	37,948,224	3,439,558		29,222,093		6,416	39,573,988		4,814,180	2,554,666		896,793	216,526	702,766,988
GR	155,585			2,706,914	1,334,141					173,624	1,281,681	1,909,207	1,460,736											595,486	2,706,914	12,324,287
HU	8,472,776			11,584,749	5,035,547							24,721,919	3,816,728								197,258			7,453,128	18,525,630	79,807,736
IT	88,884,684	8,461,735	67,969,410	12,953,868	38,447,403			8,101,589		71,834,587	1,199,313	8,230,176	129,216,281	28,163,483		13,047,787		38,582	2,351,916		5,450,386	850,177		20,727,587	3,674,394	509,603,358
LI	729,013		2,258,372		386,635									2,553,486												5,927,506
LT					1,313,817		1,001,537		89,527						9,628,560		5,468,328				4,649,598					22,151,368
LU		11,559,401	259,720		10,900,046					7,870,833						34,121,329			1,488,737							66,200,066
LV					767,468		2,558,918		125,729						7,229,984		7,010,638				2,143,915					19,836,651
MT										6,416			51,413					44,997								102,826
NL	1,081,405	114,270,817	4,828,632	1,850,032	111,336,426	2,387,436		3,350,746		31,372,632			3,394,035	164,086		5,890,218			177,504,451		5,406,354	262,770				463,100,038
NO					926,182	3,033,040	3,739		299,583						2,617		3,739			16,301,417	479,487		13,696,189			34,745,994
PL	10,571,897	5,486,795	1,611,853	52,764,508	91,595,285	1,888,419	1,074,269	1,496,577	277,282	9,442,510			4,749,159	357,388	7,095,663		3,141,009		5,049,670	806,040	95,280,200		3,765,085		5,254,806	301,708,415
PT		1,024,255			1,704,888			36,467,490		9,378,091			649,290						408,746			32,508,316				82,141,077
SE					3,066,284	12,952,117			3,938,358						816,199		816,199			12,239,563	3,532,521		32,562,158			69,923,400
SI	10,776,790	288,649		907,389	3,609,942					933,941		2,158,543	7,729,854			288,649								16,043,624	707,633	43,445,015
SK	8,411,630	366,926	11,836	22,829,017	5,795,795							10,277,787	2,307,297	11,836							4,686,519			3,705,377	36,748,305	95,152,324
Grand Total	**376,445,598**	**575,884,975**	**258,087,015**	**268,591,587**	**1,011,613,768**	**70,100,422**	**11,356,542**	**194,138,051**	**11,653,423**	**670,254,870**	**2,563,361**	**66,354,423**	**261,301,037**	**62,665,261**	**30,830,379**	**246,052,365**	**23,104,791**	**89,995**	**439,481,250**	**32,602,835**	**201,562,302**	**65,016,633**	**69,285,285**	**62,067,038**	**112,326,009**	**5,123,429,213**

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ISBN 978-92-823-9292-8 (paper)
ISBN 978-92-823-9293-5 (pdf)

doi: 10.2861/496808 (paper)
doi: 10.2861/489678 (pdf)

Publications Office