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Odometer manipulation in motor vehicles in the EU

European Added Value Assessment

Accompanying the European Parliament's legislative initiative report (Rapporteur: Ismail Ertug)

STUDY

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Study

European added value assessment of further EU-level measures addressing odometer manipulation in motor vehicles

In accordance with Article 225 of the Treaty on the Functioning of the European Union (TFEU), the European Parliament (EP) has a right to request the European Commission to take legislative action in a particular area. Such requests are based on a legislative initiative report by the parliamentary committee responsible. On 11 May 2017, the Conference of Presidents of the EP authorised its Committee on Transport and Tourism (TRAN) to draft a legislative initiative report on odometer manipulation – revision of the EU legal framework.

All legislative initiative reports must automatically be accompanied by a detailed **European added value assessment** (EAVA). Accordingly, the TRAN Committee asked the Directorate-General for Parliamentary Research Services (EPRS) to prepare an EAVA to support the legislative initiative report on **odometer manipulation in motor vehicles: revision of the EU legal framework** (2017/2064(INL)), to be prepared by the rapporteur, Ismail Ertug (S&D, Germany).

The purpose of this EAVA is to support an EP legislative initiative by providing scientifically-based evaluation and assessment of the potential added value of taking legislative action at EU level. In accordance with Article 10 of the Interinstitutional Agreement on Better Law-Making of 13 April 2016, the European Commission should respond to an EP request for proposals for Union acts by adopting a specific communication. If the Commission decides not to submit a proposal, it should inform the EP of the detailed reasons therefore, including a response to the analysis on the potential European added value of the measure requested.

Abstract

The odometer readings of second-hand cars traded across the EU are manipulated more frequently than those of vehicles traded on national markets. Odometer fraud is difficult to track and leaves no trace. This incurs costs and creates challenges on the EU internal market. It can also impact EU road safety. Against this background, this European added value assessment identifies weaknesses in the existing EU legal system. Moreover, it outlines potential policy measures that could be taken at the EU level, and that could generate European added value through coordinated approaches and more harmonisation in this area.

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Executive summary

The European Union (EU) second-hand car market is much larger than the market for new cars. Illicit manipulation of odometer readers in second-hand vehicles is widespread in cars traded cross-border in the EU and is estimated to affect up to 50 % of cases. This rate can be even higher in the 'new' EU Member States, where odometer fraud in imported cars is between 2.5 to 3 times more frequent than in the 'old' Member States.

The main negative impacts of odometer fraud are borne by consumers, as their rights are breached, confidence is lowered, and maintenance and repair expenses are increased. Road safety is also impacted, as cars are not adequately maintained at the right time.

The total economic costs of odometer fraud in second-hand cars traded cross-border in the EU can be estimated to be at least €1.31 billion, with the most probable fraud rate scenario yielding €8.77 billion of economic loss.

This report, based on the annexed research paper, identifies five weaknesses in the current legal system, which should be addressed to limit odometer fraud in the EU cross-border trade of used vehicles.

Consequently, two policy options which could help solve the problem are presented, each comprising two variants. Policy Option 1 foresees creation of a Car-Pass-like system (which eliminated 97 % of odometer fraud in Belgium) in all EU countries with a cross-border EU information exchange. Variant 1 consists of creating a mileage certificate accompanying a car sold abroad, and Variant 2 envisages a mileage information exchange system between the Member States. Assuming the same success rate of odometer fraud reduction for the whole EU as for Belgium, this option could bring a benefit of €8.51 billion to the European economy.

Policy Option 2 envisages installation of a tamper-proof technological solution in vehicles – newly registered cars in Variant 1 and additionally in the entire existing fleet in Variant 2 – to better protect their odometers from manipulation. Assuming that the new technology could reduce odometer fraud by 70 %, it would yield benefits of €6.1 billion in the most probable research scenario.

Considering the cost-benefit analysis results and an assessment against efficiency, effectiveness and synergy, both Policy Option 1 with its Variant 1 and/or Variant 2, as well as Policy Option 2 in Variant 1, have a clear European added value, though each to a different extent. Moreover, the above-mentioned policy options and their variants do not have to be exclusive. If implemented jointly they would surely provide even greater European added value.

1. Introduction

The unauthorised manipulation of odometer devices[1] in second-hand motor vehicles by reducing the displayed number of kilometres driven in passenger cars is a common malpractice in the EU, aiming at increasing a vehicle's market value. It is estimated that up to 50 % of used cars traded in the EU internal market have an illegally manipulated odometer.[2]

1.1. Background

This shady practice is mainly performed in cross-border transactions. Research on odometer tampering shows that imported cars have a much higher rate of manipulated odometers and the number of kilometres clocked is also higher than in the cars sold on national markets, where it is often easier to track a car's history.[3] According to the European Commission, it is estimated that **30 % to 50 % of second-hand cars** traded across the borders within the EU market **have their odometer manipulated**.[4] The annexed research paper estimates that there were 2.4 million used cars imported from one EU Member State to another in 2014.[5] Cars which are most likely to undergo odometer manipulation are corporate cars, private cars with high mileage, taxis and express vans, as well as short and long-term rental vehicles.[6]

Odometer tampering is highly problematic for all actors participating in the second-hand car market: consumers, car dealers, car leasing companies, garages, authorities, to name a few. The practice leads to an unjustified increase in a car's value, which can reach an average of €3 000 per car.[7] This seller's gain is usually to the detriment of a buyer, whose car is in reality worth less and is more likely to incur anticipated maintenance and repair costs. Consequently, as the vehicle has been used much more than stated on its odometer, it might not have received the required service and maintenance, which might **impact road safety**.[8]
This practice, known as 'car clocking', also has broader **negative effects on consumer confidence**. As European Commission consumer surveys reveal year after year, the EU second-

[1] An odometer is an instrument measuring the distance travelled by a vehicle.
[2] European Commission, Impact Assessment accompanying the Roadworthiness Package, staff working paper, SWD(2012)206.
[3] See e.g. Car-Pass, Impact study of mileage fraud with used cars & Adaptability of the Car-Pass model in other EU-countries, Brussels October 2010, and European Commission, European Commission, Consumer market study on the functioning of the market for second-hand cars from a consumer perspective, October 2014.
[4] European Commission, Impact Assessment accompanying the Roadworthiness Package, op.cit.
[5] Data for all EU-28 countries was not available, see Table 1 in the annexed research paper.
[6] Car-Pass, Impact study of mileage fraud..., op.cit.
[7] ADAC website.
[8] However, as demonstrated in different publications, this implication is not easy to estimate. To calculate a cost caused by impact on road safety, a number of accidents caused by technical defects must be known. The European Commission has assumed this figure in the Roadworthiness Package Impact Assessment at 6 % of all accidents. The Commission states that the higher the roadworthiness requirements is, the better is the technical condition of vehicles and the lower the emissions. However, figures related to how many accidents are actually caused by technical deficiencies are very controversial, as different studies yield different results (Commission Impact Assessment states that the figure ranges between 3 % and 19 % and that some data might be unreliable). Nevertheless, even assuming a 6 % rate, one would need to identify the ratio of accidents directly resulting from odometer tampering in total accidents caused by technical failure. Subsequently, to be able to estimate the effects one would need to establish what sort of mechanical failure was provoked and could have been avoided if it was not for a tampered odometer. This data is not available and could be difficult to collect, as there no systematic nor even incidental reporting exists.

hand car market scores as one of the least trustworthy compared to other goods markets.[9] Market surveys prove that **information asymmetry** between sellers and buyers is an important element creating distrust on this market. The study prepared for the European Commission on the functioning of the market for second-hand cars from a consumer perspective, revealed that 34 % of respondents did not receive or did not know if they received information on car mileage checks, when buying a second-hand car.[10]

Moreover, professionals involved in the second-hand car market are also harmed, as they face **unfair competition** from fraudulent competitors.

Despite the above-mentioned negative implications, **odometer manipulation, especially in second-hand cars in the cross-border market, is flourishing**. The first reason is that this fraud is practically impossible to detect, as the manipulation does not leave any trace in a car's electronic devices. New technologies allow easy and cheap (prices start below €100) tampering of odometers.[11] Second, the majority of car manufacturers do not install high security protection for odometers that could help strengthen anti-fraud prevention. Third, many Member States do not provide consumers with the necessary tools to enable them to check a second-hand car's history. Odometer tampering is a prohibited practice in 25 EU countries,[12] but sanctions are varied (from up to two years of prison in France to a €226 fine in Slovakia).[13] In three countries,[14] it is not an illegal practice and, as a consumer study reveals, only in five Member States[15] can consumers access 'pre-purchase mileage information'.[16]

As the interviews conducted by Professor Borkowski for the accompanying research confirm, the fraud seldom happens immediately after a car crosses the border. If the country of origin does not hold a reliable national registry, where a car's driving history can be tracked, it can be extremely difficult, both for individual buyers as well as for the authorities, to establish who can be legally held responsible for any illegal manipulation of the mileage record.

Additional reasons lie with the **characteristics of the European second-hand car market**. A consumer study conducted for the European Commission on second-hand car market in the EU shows that for 64 % of consumers, price is the predominant factor when deciding on the purchase of a second-hand car.[17] Car mileage scores second (35 %), with car brand (27 %) and mechanical condition (26 %) following.[18] A vehicle's mileage is the main factor affecting a car's price on the second-hand car market and the level of second-hand car depreciation. [19]

[9] European Commission, Consumer Markets Scoreboard, 2016 edition.
[10] European Commission, Consumer market study..., op.cit.
[11] Ibid.
[12] Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.
[13] ECC-Net, Cross border car purchases. What to look out for when you are bargain hunting, 2016.
[14] Cyprus, Latvia and Portugal.
[15] Belgium, Hungary, Netherlands, Sweden and the United Kingdom.
[16] ECC-Net, Cross border car purchases..., op.cit.
[17] European Commission, Consumer market study..., op.cit.
[18] Ibid.
[19] Ibid.

Moreover, there is an unabated **demand in the 'new' Member States** (defined as EU-12 in the accompanying research paper) **for attractive used cars** (ideally low-price with a low mileage) from 'old' Member States (EU-15).[20] This creates a continuous demand for vehicles, which might be difficult to find on the market in reality, such as 10 or 15 year-old cars that have travelled no more than 200 000 km.[21] To respond to these needs, car traders decide to illicitly lower vehicles' mileage record to make their product more attractive and more expensive. Surprisingly, some consumers might be aware that a car they are buying has a rolled-back odometer, but accept it (or as mentioned in the attached research even ask for it), as it will mean that they can still count on a capital gain when they sell the car in a few years.

Additionally, unaccounted mileage could generate further costs in the form of vehicle emissions. These might be higher than those reported due to a fraudulent mileage record. Therefore, these emissions might in reality generate higher costs than those officially registered. Whether EU legislation is breached depends on how the emissions are measured. If data comes from records of real kilometres driven then it can be impacted by odometer fraud.[22] As importantly stated in the annexed research paper 'reducing odometer fraud per se will not reduce emissions, rather it will only make emission records correct'.

1.2. Methodology and scope of the European added value assessment

Against this background, this European added value assessment (EAVA) follows a four-fold strategy. Firstly, it presents the illicit odometer manipulation market, subsequently outlining the EU policy context on the topic. Secondly, it describes the weaknesses in the existing EU legal system. Thirdly, it presents possible EU legislative actions for strengthening the legal system, thus preventing odometer manipulation in cross-border traded second-hand cars. Fourthly, it outlines the European added value of the possible EU legislative actions.

For the purpose of this EAVA, the term 'odometer manipulation' will be used in the context of an illicit action equally with terms such as 'tampering' and 'clocking', as per the accompanying research paper by Professor Borkowski. However, as also explained in the research paper, although the majority of odometer manipulations are fraudulent, some are carried out for the purpose of repairing or changing a dysfunctional device.

[20] As Malta was excluded from the annexed research paper due to lack of relevant data, the EU Member States equal 27 states and not 28.

[21] For example, on the Polish second-hand car market 200 000 km mileage is perceived by consumers as a psychological barrier for an acceptable maximum mileage in a used car. Above this record, the car is perceived as a scrap.

[22] See methodology discussion in Chapter 2 in the external research paper (Annex 1).

2. Illicit odometer manipulation in the EU

2.1. Size of the manipulated market

Unfortunately, information on the actual size of the EU second-hand car market is difficult to assess, as relevant data at the EU-level is not systematically available and for some Member States is missing. However, according to Professor Borkowski's annexed analysis of (see Table 1 in Annex 1), 24 Member States for which data was available, imported a total of 2.4 million cars from other EU Member States in 2014. In the EU-12[23] countries the import rates are the highest and can be substantially greater than the number of new registrations in the same year. In Lithuania, over 11 times more used cars were registered than new cars in the reference year, in Romania three times more and in Poland and Slovakia two times more. In the EU-15[24] countries the pattern is the opposite, new car registrations substantially outnumber registrations of imported cars.

The annexed research paper concludes that in the past decades, two-thirds of cars sold in the EU-12 and in some EU-15 countries were second-hand cars coming from abroad as opposed to new registrations. The TRT Trasporti e Territorio study for the European Parliament confirms this trend, although it does not seem to distinguish second-hand cars sold in cross-border transactions only.[25] Based on available studies TRT states: 'the second-hand car market is two to three times larger than the market of new cars'. In 2012, over 24 million used cars were traded in the five biggest EU markets (UK, Germany, Italy, France, Spain), whereas 9 million new cars were registered in these countries over the same timeframe.[26]

2.2. Odometer fraud in cross-border traded second-hand cars in the EU

It is much easier to trace a car's history within the same Member State than to do it abroad. The annexed research paper confirms that the main flow of used cars in the EU is from west to east, and that the **odometer tampering rate in cars imported to the EU-12 countries is between 2.5 to 3 times more frequent than in the EU-15**. The annexed research assumes that in the EU-15 countries, the fraud rate for imported used cars varies from a medium of about 20 % (a conservative approach), to a high rate of 40 %. Whereas for the EU-12 it is assumed that 35 % to 40 % of imported cars have their odometers tampered with in the medium fraud scenario, and 80 % in the high fraud scenario.

Regarding how many kilometres the odometers are rolled back, the Car-Pass study concluded that imported used cars across the five EU Member States it analysed[27] could have 60 000 km on average removed from their counter.[28] This number is believed to be slightly conservative.

[23] By EU-12 the research paper means: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia.
[24] By EU-15 the research paper means: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Portugal, Spain, Sweden, Netherlands, United Kingdom.
[25] TRT Trasporti e Territorio, Research for TRAN Committee – Odometer tampering - measures to prevent it, Policy Department for Structural and Cohesion Policies, European Parliament, 2017.
[26] Ibid.
[27] Belgium, France, Germany, Luxembourg and the Netherlands.
[28] Car-Pass, Impact study of mileage fraud..., op.cit.

Consequently, the number of kilometres rolled-back in imported cars can be different in the EU-12 countries, where the vehicle fleet is older than that in the EU-15 (see Table 4 in the annexed study). Therefore, when calculating the value that this illicit practice represents, the annexed research paper provides different variants of possible odometer manipulation scale.

Costs incurred through odometer fraud in passenger cars originate mainly from increased depreciation, as well as from maintenance and repair costs. The environmental costs of a higher amount of unaccounted-for emissions can also be factored in, especially if their level is calculated based on real kilometres driven. The annexed research paper reveals that the **total economic losses** due to odometer tampering **in EU cross-border trade** (for 2014) can be estimated at an **average** across all considered scenarios, of about **€9.5 billion** or **€**10.1 billion if an environmental component is included. Whereas for the most probable **medium-medium scenario** (a medium rate of tampering and mileage roll-back of around 60 000 vehicle kilometres (vkms per case) the resulting cost could reach **€8.77 billion** (€9.32 billion if emissions are factored in).

In 2016 in Poland, which is the biggest EU second-hand car importer, nearly 1 million used cars were bought from abroad, mainly from Germany.[29] It is estimated that as much as 80 % of these imported cars can have their odometers tampered with.[30] Germany is the biggest second-hand car exporter in the EU, where it is estimated that a third of used cars traded have their mileage lowered fraudulently.[31] According to the automobile club of Germany (ADAC), this illicit business costs the German economy around €6 billion a year.[32] One of the most comprehensive studies conducted to date on odometer tampering in the second-hand EU car market,[33] estimates that the economic cost of odometer fraud could amount to between €5.6 and €9.6 billion per year for the EU25.[34]

Table 1 – Cost of odometer fraud in cars traded cross-border in the EU in 2014 for selected variants

Variant	Total costs
Variant 5: medium – medium	€8.77 billion
	Total EU with emission costs factored in €9.32 billion
Variant 1: low – low	€1.31 billion
	Total EU with emission costs factored in €1.39 billion

Source: EPRS, based on Annex 1.

[29] See research paper in Annex 1.
[30] Ibid.
[31] ADAC, ADAC Recommendations for the 2014 European Elections. Making Mobility Sustainable, Position Paper, 2014.
[32] Ibid.
[33] Car-Pass, Impact study of mileage fraud..., op.cit.
[34] EU25: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

The commissioned research paper also reveals losses for the low-low scenario: lowest odometer fraud rate (ranging from 2 % to 10 % in the EU-15 and from 6 % to 20 % in the EU-12), and the lowest odometer manipulation scale (30 000 km rolled-back). This variant is very conservative, especially considering research results regarding the scale of odometer manipulation being much higher in the new Member States than in the 'old' ones. Therefore, its value **of €1.3 billion** could be perceived as a **minimum cost incurred through odometer manipulation in the EU**.

On a broader scale, the European Commission consumer study[35] revealed that overall, EU consumers lost between €1.9 and €4.1 billion due to different damages incurred within one year following purchase of a second-hand car.[36] This rate was the highest in Eastern and Southern European countries and applied both to cars imported from abroad and those bought on auctions.[37]

3. EU law and policy context

3.1. Main EU-level instruments

Steps were also undertaken to strengthen the EU legislative framework, as road transport has a strong cross-border dimension. Numerous stakeholders as well as the European Parliament have called on Member States to improve ways of exchanging information on the technical state of second-hand vehicles, compliance history and fraud detection. The three EU directives of 3 April 2014, which constitute what is known as the 'Roadworthiness Package', tried to address the odometer fraud problem in the EU.

The main EU legislative acts applicable to fraudulent odometer manipulation are:

- Directive 2014/45/EU on periodic roadworthiness tests for motor vehicles and their trailers, which addresses, among other things, the problem of odometer fraud;
- Directive 2014/46/EU amending Council Directive 1999/37/EC on registration documents for vehicles;
- Directive 2014/47/EU on the technical roadside inspection of the roadworthiness of commercial vehicles circulating in the Union and repealing Directive 2000/30/EC.[38]

[35] European Commission, Consumer market study..., op.cit.

[36] European Commission, Consumer Markets Scoreboard, op.cit. This figures represent a total annual consumer detriment for second-hand car post-purchase problems that occurred within one year of purchase (excluding wear and tear).

[37] The study showed that when applying purchasing power parity (PPP) to correct for differing income levels per country, the average financial cost borne by second-hand car buyers in the EU-13 (Eastern European and new Member States) were 65 % higher than the ones borne in the EU-15 countries (€816 vs €494).

[38] 1) Directive 2014/45/EU of the European Parliament and of the Council of 3 April 2014 on periodic roadworthiness tests for motor vehicles and their trailers and repealing Directive 2009/40/EC Text with EEA relevance, 2) Directive 2014/46/EU of the European Parliament and of the Council of 3 April 2014 amending Council Directive 1999/37/EC on the registration documents for vehicles and 3) Directive 2014/47/EU of the European Parliament and of the Council of 3 April 2014 on the technical roadside inspection of the roadworthiness of commercial vehicles circulating in the Union and repealing Directive 2000/30/EC.

Also, the most recent EU-level legislation addressed odometer fraud:

- European Commission Regulation (EU) 2017/1151 of June 2017 on type-approval of motor vehicles and on access to vehicle repair and maintenance information.

Roadworthiness Package

Directive 2014/45/EU establishing some minimum requirements for a regime of periodic roadworthiness tests for motor vehicles and their trailers, envisages that during a technical check – a periodic technical inspection (PTI) – an obligatory odometer reading needs to be performed and information has to be included in a roadworthiness certificate.[39] Another important provision is that the directive defines odometer fraud as a punishable offence liable to a penalty. Also, a previous roadworthiness certificate should be made available to inspectors, as well as to the holder of the registration certificate, as soon as it is available electronically.

Importantly, the issue of EU-wide data exchange system of odometer readings was also addressed in Directive 2014/45/EU. The Commission was tasked with **examining ways of facilitating exchange of information** between the EU Member States on odometer readings at roadworthiness tests and accident history. This information should be accessible in an anonymised form to inspectors, holders of registration certificates and accident researchers. This mechanism should enable detection of kilometre fraud based on solid data. The Commission was bound to examine feasibility, costs and benefits of an **electronic vehicle information platform** that should be based on existing IT solutions and allow links between national system facilitating exchanges of information, among others on odometer readings. The Commission has to report to the Parliament and to the Council by 30 April 2020 on the implementation and effects of the directive and if appropriate, come forward with legislative proposals.

Directive 2014/46/EU on registration documents for vehicles, from the same package, introduces a principle of **mutual recognition** according to which Member States should recognise validity of a roadworthiness certificate issued in another Member State, even if there is an ownership change.[40] The Directive 2014/47/EU foresees an odometer check during a roadside inspection a 'visual inspection and/or using electronic interface' and reasons for failure include the odometer being 'obviously manipulated (fraud) to reduce or misrepresent the vehicle's distance record' or if it's 'obviously inoperative'.

The Roadworthiness Package combining the three above-mentioned directives had to be transposed by the Member States by 20 May 2017 at the latest, and will apply from 20 May 2018 (with some exceptions).

[39] Directive 2014/45/EU.
[40] Directive 2014/46/EU.

Regulation 2017/1151

In July 2017, the European Commission adopted a regulation (Regulation (EU) 2017/1151)[41] supplementing the type-approval regulation, among other things, on access to vehicle repair and maintenance information.[42] It applies to passenger cars since 1 September 2017 and introduces an **obligation on car manufacturers to improve the technical security of the odometer device against fraud**.

According to the new law, before a new make of car receives its type-approval and can thus be released on the European market, the manufacturer shall submit 'a description of the provisions taken to prevent tampering with and modification of emission control computer, odometer including the recording of mileage values' to the approval authority. Moreover, the regulation specifies in the provisions for electronic system security that 'manufacturers shall effectively deter reprogramming of the odometer readings in the broad network, in any powertrain controller as well as in the transmitting unit for remote data exchange if applicable. Manufacturers shall include systematic tamper-protection strategies and write-protect features to protect the integrity of the odometer reading. Methods giving an adequate level of tamper protection shall be approved by the approval authority'.

Despite the above-mentioned instruments, odometer fraud in cross border second-hand car trade remains frequent. The fact that no harmonised data information exchange system exists between the Member States does not help to solve the problem.

4. Weaknesses in existing EU legal system

4.1. Effectiveness of national instruments

As stated in the TRT study conducted for the European Parliament, EU legislation leaves EU Member States enough flexibility to develop national settings aimed at reducing odometer fraud.[43] Despite this, only 10 EU Member States introduced systems which allow consumers to check a car's history before purchase.[44] Regulatory gaps in the context of addressing fraud in cross-border trade of used cars are even more blatant. Nevertheless, two schemes are admired for their efficiency: the Belgian Car-Pass and Dutch Nationale AutoPas.

[41] Commission Regulation (EU) 2017/1151 of 1 June 2017 supplementing Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information, amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) No 1230/2012 and repealing Commission Regulation (EC) No 692/2008.

[42] This regulation implements the Worldwide harmonised Light-duty vehicles Test Procedure (WLTP) adopted at the United Nations level.

[43] TRT Trasporti e Territorio, Research for TRAN Committee…, op.cit.

[44] ECC-Net, Cross border car purchases..., op.cit.

The **Belgian Car-Pass system** is considered by many stakeholders[45] as the best practice in eliminating odometer fraud, with a success rate of 97 % for sales of cars registered in Belgium. Its main feature provides for penalties for odometer fraud in national law and obliges the seller of a second-hand car to present a Car-Pass certificate that includes previous odometer reading records to a buyer. The centralised system is fed by **regular mileage readings data** provided by periodic technical inspections centres (PTIs) and different automotive **aftermarket stakeholders** (garages, tyre companies, periodic inspections centres). The PTIs also issue the certificate.

The Car-Pass system has successfully diminished the rate of odometer fraud on the domestic market, from an estimated 60 000 to 100 000 vehicles in 2006 to around 1 197 vehicles in 2016, bringing the percentage down to 0.16 % of all of all Car-Pass certificates within ten years.[46] Supporters of the Belgian system underline that even though a complete technical elimination of odometer fraud is not feasible, the Car-Pass is the best possible alternative at present.[47]

A study carried out for Car-Pass in 2010 states that although the system almost completely eliminated odometer fraud on the national market, manipulation was still estimated to be present in between 10 % and 18 % of second-hand cars imported to Belgium in 2008. However, since 2016 the Belgian system is connected to the Dutch system by means of a EUCARIS data exchange platform, feeding each state with information about imported cars from one market to another.[48] Belgium and the Netherlands are pioneers of data exchange on mileage of cross-border traded cars between EU countries.[49] Moreover, from 2018 onwards Slovakia will also exchange information with the Netherlands. Poland has just upgraded its mileage registry, which features new information on cars registered in France, Belgium, the Netherlands, Italy and Sweden, as well as in the United States of America and Canada.

4.2. Non-public solutions to the problem

Private initiatives try to fill the gap of low consumer confidence in the second-hand car market caused by mileage fraud, especially in cars traded across borders. CarFax is a North American company that is active in some EU Member States, notably Sweden, Spain and Slovenia. The company provides European buyers with second-hand American and Canadian cars, with a possibility to track vehicles' mileage history (and other relevant information). Carfax has 30 years of experience in the business and its European branch collects data from 20 countries,

[45] See e.g.: European Commission, Consumer market study..., op.cit and European Parliament resolution of 10 December 2013 on CARS 2020: towards a strong, competitive and sustainable European car industry (2013/2062(INI)).
[46] PWC Belgium, The impact of Car-Pass on the second-hand market in Belgium, July 2016.
[47] Car-Pass, Impact study of mileage fraud with used cars ..., op. cit.
[48] EUCARIS – European Car and driving license Information System – is a data exchange platform, not a database, 'that connects the Vehicle and Driving Licence Registration Authorities in Europe. EUCARIS is developed by and for governmental authorities and supports a.o. the fight against car theft and registration fraud' (https://www.eucaris.net).
[49] For more details on the cooperation between Belgium and the Netherlands see Car-Pass Annual Report 2016.

combining it in one extensive database, which allows the company to hold information on more than 150 million cars in Europe.[50]

Nevertheless, it is difficult to imagine that private initiatives would completely take over the role of public entities and develop a harmonised system of data exchange on car mileage history among the EU Member States.

4.3. Weaknesses of EU instruments

Furthermore, **existing EU tools still contain certain gaps**, which make odometer fraud in second-hand cars sold across borders both easy and widely available. To mention just a few flaws, the EU Roadworthiness Package adopted in 2014 does not envisage a broadening of the scope of odometer checks conducted at various aftermarket stakeholders, in addition to the checks done at obligatory PTIs. This approach proved to be key to the success of national initiatives, such as Car-Pass in Belgium. Moreover, no EU-level data exchange solution for odometer readings between the Member States has been adopted. This leaves the potentially crucial dataset of car histories inaccessible to European consumers and car sellers, and confirms their lack of confidence in the second-hand car market.

Although odometer manipulation is punishable in 26 European countries (25 EU Member States plus Norway)[51] and Directive 2014/45/EU will make it a punishable offence liable to a penalty across the EU as from 20 May 2018, it is still difficult to determine who is responsible for the practice (the second-hand car dealer from the exporting country, the dealer from the importing country, the new owner, or perhaps the owner from the exporting country?). The manipulation itself does not leave a trace, and it is very difficult to catch somebody red-handed.

Drawing on the external expert study in Annex 1, this EAVA identifies **five main weaknesses in the existing EU legal system** leading to high levels of odometer fraud in cross-border second-hand car trade in the EU:

i. No EU-level system of exchange of information on car odometer readings between the Member States;
ii. No increase in minimum frequency of odometer reading recording in the EU;
iii. No harmonisation of information collected in national mileage registries;
iv. No widespread practice of installing tamper-proof odometers in manufactured cars;
v. No tamper-proof odometer replacement planned for cars already in use (retrofitting).

First weakness

Currently, each Member State tries to fight odometer fraud in imported second-hand cars in its own way. Often it is bound to fail, as the only solution to the problem would be access to the mileage registry of another Member State. As explained above, the current EU legislation only envisages that the Commission will examine 'the most appropriate way to link the existing national systems with a view to exchanges of information on (...) odometer readings between

[50] Information on the Carfax website indicates that it has a database with more than 14 billion records collected from 35 000 partners and sources.
[51] ECC-Net, Cross border car purchases..., op.cit.

the competent authorities (...)'.[52] This does not seem to be an appropriate answer to an EU internal market failure – that of odometer fraud in cross-border used car trade. This situation is exacerbated by the lack of a system which would allow easy and accessible mileage information exchange between the Member States.

EU law envisages the establishment of a roadworthiness certificate by the Member States, which should accompany a car throughout its lifetime and contain information, inter alia, on the odometer record recorded at the last PTI. This will surely encourage the creation of national mileage registries. However, as proven in practice, the mere existence of registries and certificates will not facilitate detection of odometer tampering, as it is assumed in Directive 2014/45/EU. Without an adequately functioning EU-level exchange of mileage information, this practice will continue in cross-border trade of used cars.

Second weakness

Systems which are proven to effectively diminish odometer fraud at national level (the Belgian and Dutch examples) are based on issuance of certificates, which contain car mileage history. The success of Car-Pass in Belgium is also due to an extended number of obligatory odometer checks and recordings. These are often carried out at the obligatory PTI. Aftermarket actors such as garages, fast-fitters, tyre centres, franchised and non-franchised dealers are obliged by law to cooperate with the central data collecting system and send information on the odometer reading of a vehicle when they undergo service or repair.[53] This solution seems to be beneficial both for newly registered cars and for older cars, which are naturally prone to require more frequent service and maintenance.

Despite this evidential best practice example, the latest EU legislation sets a minimum requirement of obligatory registration of car mileage only during the PTI.[54] It is left up to Member States to determine if they deem it necessary to introduce obligatory odometer mileage checks more frequently.

The EU legislative acts oblige Member States to effectuate such a mileage check within four years following the first registration of the vehicle. The majority of EU countries require checks towards the end of this period, within three or four years (see Table 5 in Annex 1). Only Latvia requires the check within the second year. The directive in force also established a criterion of number of kilometres driven for the first PTI: in case a car has reached a mileage of 160 000 km before the deadline of the first PTI, it should undergo a mileage check.

This provision might clearly increase the incentive for dishonest car owners to roll their odometers back in order to avoid an early roadworthiness inspection. Such a supposition can be confirmed by the Fédération Internationale d'Automobile (FIA), which points out that the

[52] Directive 2014/45/EU.
[53] PWC, *The impact of Car-Pass on the second-hand market in Belgium*, July 2016.
[54] Directive 2014/45/EU.

majority of odometer fraud in cars registered for the first time takes place even before the first PTI.[55]

Third weakness

Member States gather odometer data in a different format depending on a system they have implemented. Harmonisation of data collection would not only have the advantage of better serving the citizens who want to import a used car from another Member State, allowing them to discover its history, it would also provide a more robust EU-wide set of statistics on real kilometres driven.

As the annexed research paper underlines, although mileage reporting information is not considered sensitive personal data, it can become problematic in some countries with strict data protection legislation (notably in Germany). As the considered transactions are international, an agreement on which information to collect and to make available to another country's authorities should be established between the Member States.

Fourth and fifth weaknesses

As previously mentioned in this study, manipulation of an odometer device is an easy and quick to perform, which incentivises the fraudulent practice of rolling back a car's mileage.

The newest development in the EU to halt this negative trend is Regulation (EU) 2017/1151 on Worldwide harmonised Light-duty vehicles Test Procedures, which entered into force in September 2017, and obliges car manufacturers to prove they have secured odometer devices in newly produced cars.

Nevertheless, up to now, improved security measures for odometer readings were only used in certain car makes and were not widespread (e.g. Tesla gathers odometer records remotely through the 'event data recorder'/a car's 'black box', together with many other data about a car's usage[56]). Even if new cars begin to be equipped with more reliable technology, it will take (as assumed in the research paper in Annex 1) between 15 to 20 years to see results. This is due to the lifespan of cars. Data regarding the average age of passenger cars in the EU in the last decade reveals that the fleet is getting older, as Europeans tend to hold on to their vehicles longer (see Figure 3 in Annex 1). Therefore, as indicated in the commissioned research paper, installing more secured odometer devices in new vehicles only will not solve the persisting problem of easy tampering in the existing car fleet.

4.4. European Parliament's position

The European Parliament has repeatedly stressed its position in favour of **fighting odometer manipulation** and of making the EU second-hand car market more transparent and safe. In the CARS 2020 resolution of 2013, it called on the Commission for mileage recording at each

[55] Fédération Internationale de l'Automobile, Comments on informal document GRSG-108-38 on Regulation No. 39 (Speedometer), United Nations Economic Commission for Europe (UNECE), 109th Working Party on General Safety Provisions (GRSG), 29 September-2 October 2015 and FIA, Protection against mileage fraud - A world in motion, informal document for the UNECE meeting - 106th GRSG, 5-9 May 2014.
[56] T.Cowen, A.Tabarrok, *The End of Asymmetric Information*, Cato Unbound, April 6, 2015.

roadworthiness test.[57] Similarly, during the legislative work on the roadworthiness directive between 2012 and 2014, the Parliament called on the Commission to 'examine the most efficient and effective way to **establish an electronic vehicle information platform**, by taking advantage of existing and already implemented IT solutions with regard to international data exchange so as to minimise costs and avoid duplication'.[58] The Parliament proposed that this Commission examination 'shall consider the most appropriate way to **link the existing national systems** with a view to **exchanging information on** data related to roadworthiness testing and **odometer readings** between the competent authorities of Member States responsible for testing, registration and vehicle approval, the testing centres, the test equipment manufacturers, and the vehicle manufacturers'. This recital has been inscribed in the directive text.

5. Possible EU response to current weaknesses

5.1. EU right to act

EU road **transport has an evident cross-border dimension**. EU treaties set out provisions for a common transport policy, which should be pursued at EU-level due to its clearly transnational goals and challenges. It is difficult to imagine that these goals could be achieved and tackled by Member States separately. That is why they are being dealt with at EU-level or through coordination between the EU and Member States.

Moreover, **Article 91** of the Treaty on the Functioning of the European Union (TFEU) stipulates that the EU legislators (the European Parliament and the Council) shall, among other things, act on measures to **improve transport safety**.[59] This is the legal basis for the Roadworthiness Package of three directives adopted in 2014. It includes legislation related to the **technical state of vehicles**, registration documents and roadside technical inspections, all of which envisage odometer reading control and registration.

Moreover, **Article 114 TFEU** sets out that the Council shall act on the establishment and functioning of the **internal market**, which empowers the Commission to propose harmonisation measures 'concerning health, safety, environmental protection and consumer protection (…) taking account in particular of any new development based on scientific facts'.[60] The EU type approval legislation, including the above-mentioned European Commission Regulation 2017/1151, is based on these grounds.

[57] European Parliament resolution of 10 December 2013 on CARS 2020: towards a strong, competitive and sustainable European car industry (2013/2062(INI)).
[58] Amendments adopted by the European Parliament on 2 July 2013 on the proposal for a regulation of the European Parliament and of the Council on periodic roadworthiness tests for motor vehicles and their trailers and repealing Directive 2009/40/EC (COM(2012)0380 – C7-0186/2012 – 2012/0184(COD)) (1) (Ordinary legislative procedure: first reading).
[59] Official Journal of the European Union, Consolidated version of the Treaty on the Functioning of the European Union, C326/49, 26 October 2012.
[60] Official Journal of the European Union, Consolidated Versions of the Treaty on European Union and of the Treaty establishing the European Community (2002), 2002/C 325/01.

Despite the existence of separate national vehicle registration offices, there is a need for exchange of information on cars within the EU single market. This is already the case within platforms such as the European Car and driving license Information System (EUCARIS) or the European Register of Road Transport Undertakings (ERRU). EUCARIS was set up to mutually exchange data on vehicles, mainly to identify stolen cars and prevent their legal registration in another Member State. The legal basis was a **multilateral treaty** signed by the members of the platform. EUCARIS functionalities were widened with time and now the platform serves, among other things, to exchange information on the vehicle owner/holder's insurance and personal data. This is possible, on the EU legal basis of **EU Council Decisions 2008/JHA/615 and 616** on the stepping up of cross-border cooperation, particularly in combating terrorism and cross-border crime. As mentioned above, Belgium and the Netherlands are front-runners in using EUCARIS as a car mileage exchange platform, and for this purpose they have signed a **bilateral agreement** on the matter.[61]

As the problem of odometer fraud cannot be narrowed down to only the transport issue and road safety dimension, the **EU internal market legislation protecting consumer rights** should be also applicable, notably the 'Unfair Commercial Practices Directive' (Directive 2005/29/EC).[62] As indicated in the European Commission's consumer market study on the second-hand car market, Articles 6 and 7 are of particular relevance in the case of odometer fraud.[63] They prohibit 'traders from providing false information on the main characteristics of the product and stating that the main characteristics of a product should be provided by the trader'. The study assesses that 'subject to a case-by-case assessment, accuracy of the mileage of a second-hand car could also be considered as part of the main characteristics of this product'.

5.2. Policy options and their impact

In order to address the five areas of weaknesses of the EU legal systems listed above, a set of measures for EU legislative action could be developed. Drawing upon the findings of the external expert study, this EAVA outlines the most relevant options: [64]

Policy Option 1

This policy option envisages development by the EU Member States of a mileage registration system like the Belgian Car-Pass, allowing access to mileage information in cross-border transactions – either through a mileage certificate accompanying a car sold abroad – **Variant 1** – or through a mileage information exchange system between the Member States – **Variant 2**.

This policy option could help overcome the **first** (no EU-level system of exchange of mileage information), **second** (no increase in minimum frequency of odometer reading recording) and **third** (no harmonisation of information collected in national mileage registry) **weaknesses**.

[61] Car Pass, Annual Report 2016.

[62] Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices in the internal market and amending Council Directive 84/450/EEC, Directives 97/7/EC, 98/27/EC and 2002/65/EC of the European Parliament and of the Council and Regulation (EC) No 2006/2004 of the European Parliament and of the Council.

[63] European Commission, Consumer market study..., op.cit

[64] Further alternative options are to be found in the commissioned expert research paper (Annex 1).

The Car-Pass like solution adopted in Member States separately would address the issue of registering car mileages regularly throughout the car's lifespan (second weakness) including at maintenance and repairs, not only at the obligatory PTI intervals. Adding to this policy option, Variant 1 or Variant 2 could ensure that during a cross-border sale, data on mileage is accessible, solving the problem of mileage data accessibility (first weakness). Moreover, Scenario 2, which envisages exchange of mileage information through an EU-level platform like EUCARIS, would imply that the problem of no harmonisation of information collected in national mileage registries (third weakness) would be addressed. In order to be able to effectively exchange information, Member States would have to agree on a common harmonised format for the data, as is already the case for other information exchanges on the EUCARIS platform.

Table 2 – Policy Option 1 with its two variants allowing access to car mileage information in cross-border trade

Policy Option 1: creation of a Car-Pass-like system in all EU countries with a cross-border information exchange	
Variant 1:	
Scope	A standardised certificate for any cross-border car sale is established at the EU-level
Cost/year	€107.9 million
Variant 2:	
Scope	EU-level mileage information exchange system binding all national – systems – EUCARIS-like
Cost/year	€96.9 million
Benefits Option 1	✓ 97 % odometer fraud elimination ✓ €8.51 billion (€9.04 billion in the case where emissions are included) under the Variant 5 (medium-medium odometer fraud scenario)

Source: EPRS, based on Annex 1.

The cost of implementation of **Option 1**, without any of the two variants, would be **€91.7 million per year** (Table 13 in Annex 1). The cost is calculated based on the operating costs of the Belgian Car-Pass system (excluding user cost) and adapted to each EU Member State; depending on the size of their intra-EU trade in second-hand cars (data for 2014). If an EU-wide harmonised certificate is selected as a variant added to the Option 1 (Car-Pass like) system, in order to ensure mileage information on cars purchased abroad (**Variant 1**), the cost would be **€107.9 million** (Table 2). This would include the cost of issuing the certificate borne by the user. If to the Car-Pass like solution only an EU-level information exchange system is added (**Variant 2**), the cost increases by €5.2 million, rising to **€96.9 million yearly**. This calculation is based on the cost of use of the EUCARIS platform.

Benefits of the application of Option 1 are assumed to be the same as on the Belgian market, where a **97 % odometer fraud elimination** rate was achieved (see Figure 5 in the commissioned research paper in the Annex 1), thanks to the Car-Pass system. In the most

probable Variant 5 – the medium-medium scenario adopted in the annexed research paper – (a medium rate of tampering and mileage roll-back of around 60 000 vkms per case), the overall **benefit for EU Member States would be €8.51 billion per year** (in the case where emissions are included, the benefit would be around €9.04 billion). As explained in the research paper in Annex 1, the biggest benefits from eliminating odometer fraud are observed in EU-12 countries, because they started with the highest fraud rate.

Policy Option 2

This policy option envisages an increase in the protection of odometer devices in passenger cars, so that unauthorised manipulation would be rendered difficult and costly. This option implies that car manufacturers ensure a technical upgrade in odometer devices.

This policy option could help overcome the **fourth and fifth weaknesses**. Installing tamper-proof odometers in all newly manufactured cars is considered under **Variant 1**. As this would not solve the problem of odometer tampering in the already existing car fleet, a **Variant 2** scenario of retrofitting tamper-proof odometers is considered together with the Variant 1 solution of fitting them in all newly-registered cars.

Table 3 – Policy Option 2 with its two variants introducing tamper-proof odometer technology

Policy Option 2: installation of tamper-proof odometers	
Variant 1:	
Scope	Installing tamper-proof odometers in all newly-manufactured cars
Cost/year	€12.2 million (in 2014)
Variant 2:	
Scope	Installing tamper-proof odometers in all newly-manufactured cars and retrofitting them in the EU car fleet currently in use
Cost/year	€19.64 billion (in 2015)
Benefits Option 2	€6.1 billion

Source: EPRS, based on Annex 1.

As shown in Table 3 above, the cost of **Variant 1** would be **€12.2 million** (cost for 2014, as based on data for new car registrations that year). It is calculated on the basis of an estimation by Fédération Internationale d'Automobile (FIA), that one tamper-proof odometer could cost one euro per unit. The cost of **Variant 2** would be much higher and could amount to **€19.64 billion** EU-wide (if the replacement took place in 2015). It is calculated at an assumed cost of €80 per replaced unit, which includes both the device and the labour cost (see Table 15 in Annex 1), based on the number of cars on the EU market in 2015. This estimate is based on the literature review indicated in the commissioned research paper by Professor Borkowski (Annex 1).

The benefits of Option 2 would mainly depend on the potential rate of tampered-with odometers remaining after the installation of new, better-protected devices. The

commissioned research paper (Annex 1) assumes that the new technology will reduce odometer fraud by 70 %. This would yield **benefits of €6.1 billion** (€6.5 billion including emissions) in the most probable **medium-medium scenario**, as Variant 5 of the research paper assumes a medium rate of tampering and mileage roll-back of around 60 000 vkms per case (see Table 16 in Annex 1). An average benefit across all nine scenarios considered could reach €6.7 billion (and €7.1 billion including emissions).

5.3. Comparative assessment of policy options

Results of the cost-benefit analysis

For the above-mentioned policy options, favourable cost-benefit ratios (CBR) were obtained except for the low fraud scenarios in the Policy Option 2 in Variant 2, which includes an additional retrofitting option of tamper-proof odometers in the whole existing EU car fleet (Table 20 in Annex 1).

As shown in Table 4, for the most probable scenario of medium odometer fraud rate (Variant 5 in the annexed research paper), the Option 2 in Variant 1 had the best results (0.002), but Option 1 is also very favourable (0.013 for Variant 1, and an even better score of 0.011 for Variant 2). The worst scoring Option 2 in Variant 2 is at 3.202 in this scenario.

Table 4 – Cost-benefit ratio of considered policy options under most probable fraud scenario*

Policy option	Policy Option 1 – Variant 1: including operational and certification cost	Policy Option 1 – Variant 2: with EU-level information exchange system	Policy Option 2 – Variant 1: tamper-proof odometer only in newly- registered cars	Policy Option 2 – Variant 2: tamper-proof odometer retrofitting + in newly- registered cars
CBR under most probable fraud scenario	0.013	0.011	0.002	3.202

* This scenario (Variant 5 in the annexed research paper) assumes a medium rate of tampering and mileage roll-back of around 60 000 vkms per case and excludes the emissions component.

Source: EPRS, based on Annex 1.

The CBR results were better for scenarios that foresaw a higher fraud rate, which the annexed research paper assumes to be most relevant for EU-12 countries. This is very visible in Option 2 Variant 2, which in the least favourable scenario of low fraud scored 21.43, but in the highest fraud scenario scored 1.09. Nevertheless, when analysing the lowest and the highest fraud rate CBR results, Policy Option 1 (in both variants) and Option 2 (in Variant 1) scored positively.

It should be noted however that the commissioned research paper (Annex 1) concludes that the latter option of installing tamper-proof odometers only in newly-registered cars in the EU (Option 2 in Variant 1) should be disregarded as an advisable policy option. The reason given is that the renewal of the EU car fleet takes between 15 to 20 years, and would therefore take too long to eliminate the fraudulent odometer problem from the second-hand car market. Nevertheless, this EAVA considers that this option should not be eliminated altogether. Firstly, it scores excellent CBR results – the best out of all options under the medium fraud scenario. Secondly, this option should be considered in the broader context of joint introduction with Policy Option 1.

Assessment against European added value criteria

The above-mentioned potential policy options are assessed against European Added Value criteria of effectiveness, efficiency, and synergy.

For the purpose of this EAVA, **effectiveness** is measured in terms of ability to address EU market failure and legislative gaps at EU-level, which give a substantial leeway for fraud in the EU cross-border second-hand car market; **efficiency** is measured in terms of better results (greater benefits) achieved by acting at EU-level than at Member State level; **synergy** is measured in terms of elimination of fragmentation of measures in the EU.

- Policy Option 1

This policy option is clearly addressed at public authorities. Both its Variants 1 and 2 can be assessed as effective, as this option can tackle the odometer fraud problem, which to a large extent has not been addressed by Member State policies, at EU-level.[65]

Also, this policy option appears to ensure higher level of efficiency than Member States acting alone. As seen in the practice, the development of an information exchange system on odometer readings among Member States takes time and exists only between three countries to date. Policy Option 1 in Variant 2 (Car-Pass like system at EU-level with EU-level information exchange system) should be perceived as the most efficient policy option, because of its highest scoring CBR (among all options) in all fraud scenarios.

This policy option seems to fully fulfil the synergy criteria as it addresses the heart of the odometer fraud problem – the fragmentation of information on car mileage and its inaccessibility in cross-border second-hand car transactions. If measures allowing access to this information (either under Variant 1 or Variant 2) were to be introduced at EU-level, EU consumers' rights would surely be reinforced. Moreover, other actors present on the EU second-hand car market would also benefit from such a harmonisation of measures. To fully utilise the potential of taking action at EU-level, Policy Option 1 would also need to ensure that a common data format is established (as recommended in the annexed research paper).

[65] Except for three Member States which have begun to exchange mileage records across the borders on the basis of bilateral agreements: Belgium and the Netherlands, and Slovakia and the Netherlands.

One of the main potential barriers identified with this policy option are differences in Member States when it comes to treatment of mileage information. Both Variants of Policy Option 2 would have to address this issue by ensuring data protection and respect of the legislation in force, while enabling access to information to all stakeholders interested in car mileage records. In this context, it is worth mentioning that the December 2017 conclusions of the EU Transport Ministers regarding digitalisation of transport urged Member States, stakeholders and EU bodies to 'make more transport-related non-personal data and, where appropriate, anonymised data, including real-time data, openly available and re-useable in a non-discriminatory manner to all service providers and users in order to enable efficient traffic management, new digital services and business models'.[66]

- Policy Option 2

This policy option is addressed at public authorities as well as car manufacturers, who would be the direct subject of such intervention. The effectiveness of this policy option depends on whether a new and more secure device (tamper-proof odometer) is installed in cars present on or entering the EU market. Such regulatory intervention requesting car manufacturers to install a certain device in cars is possible at EU level as the EU internal market legislation harmonises type approval of vehicles.

The efficiency of this option would be greatest in Variant 2 (tamper-proof odometer retrofitting in current car fleet and in newly-registered cars). This would allow more effective elimination of the market failure of odometer fraud in cross-border car trade. However, Variant 2 appears to be less cost-efficient than Variant 1, as the CBR shows above.

Regarding increased synergies resulting from Option 2, very few effective technological solutions to tackle odometer fraud exist to date. Therefore, introducing such a solution would surely be positive for all second-hand car market stakeholders currently suffering negative effects from odometer fraud.

Benefits of this policy option clearly depend on the level of protection of odometer devices from illegal manipulation. No technology is hack-proof. Nevertheless, technology can develop quickly and provide new solutions to detected flaws. EU companies are already working on new technological solutions to solve the odometer fraud problem.[67]

Conclusion

Considering the cost-benefit analysis results and the above assessment against efficiency, effectiveness and synergy, both **Policy Option 1 with its Variant 1 and/or Variant 2, as well as Policy Option 2 in Variant 1 have a clear EU added value, albeit to a different extent**.

[66] Council, Draft Council conclusions on the digitalisation of transport, 15050/17.
[67] See for example: Bosch and TÜV collaborate to fight odometer fraud.

6. European added value

Odometer fraud in second-hand cars sold across the borders in the EU is a transnational challenge faced by all Member States. Numerous weaknesses persist in the EU internal market which make it difficult to trade second-hand cars without being exposed to the problem of odometer fraud. These weaknesses could be limited or eliminated if they were addressed by regulatory action at EU level according to some or all of the proposed policy options outlined above.

Most importantly, Policy Option 1 – introduction of a Car-Pass like system at EU level with either a certificate which follows a car (Variant 1) and/or EU-level mileage information exchange system (Variant 2) – is estimated to allow a **reduction in odometer fraud in second-hand cars sold cross-border in the EU of 97 %** (see Figure 5 in the annexed research paper). This option could also close the economic loss identified of at least **€1.3 billion** (under a conservative scenario of low fraud rate) and is likely to be closer to **€8.77 billion a year** (middle fraud rate scenario) in the EU. EU car owners who bear the consequences of accelerated depreciation of cars with manipulated odometers mainly sustain this cost through increased spending on maintenance and repair. This option would enable the regular tracking of mileage driven by a car during its lifespan and render this information accessible not only on the national market but also in the event that the car is sold cross-border. A common data format would need to be developed for this purpose. It would provide harmonised statistics on the EU cross-border second-hand car trade and render them comparable. Better monitoring of kilometres driven could also have a positive impact on monitoring of vehicle emissions. This would allow an assessment of the real environmental impact of a vehicle's emissions (if they are calculated based on real kilometres driven). If adopted, this policy option is estimated to provide an **EU-wide benefit of €8.51 billion per year** under the medium odometer fraud scenario (see Table 14 in the annexed research paper).

Policy Option 2 in Variant 1 – fitting the tamper-proof device in newly-registered vehicles only – should not be disregarded, despite the fact that 15 to 20 years could pass before yielding any benefits. The implementation cost is relatively low (€12.2 million), compared to the **€6.1 billion EU-wide benefit** it could yield (benefit for reference year 2014, see Table 16 in the annexed research). This policy option would address the problem by making the manipulation of odometers more difficult, a problem which has widespread consequences and leads to the aforementioned economic costs, borne mainly by EU consumers.

Importantly, the above-mentioned policy options and their variants do not have to be exclusive. If implemented jointly, they would surely provide even greater European added value.

Annex 1

Study on the added value of further EU level measures addressing odometer manipulation in motor vehicles traded across the EU: economic analysis

Research paper by
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Abstract:

This research tackles the problem of odometer fraud in the European Union cross-border car trade. Accordingly to uncovered evidence, the level of fraud in second-hand car cross-border transactions is two or in some cases even more than three times higher than in internal national automotive markets. In order to measure the effects of the application of different policy options aimed at the reduction of odometer fraud in intra-EU used car markets, the paper first estimates the main used car flows in the EU. It comes as no surprise that the majority of transactions can be observed between EU-15 and EU-12 countries. Having established the major used car flows in Europe, the study calculates the scale of odometer fraud. Odometer fraud level is a product of how frequently odometers are rolled back and how many vehicle-kilometres (vkms) are erased on average. The odometer tampering rates for EU countries are then proposed based on existing evidence. As a result, nine variants of possible odometer fraud are calculated across European countries. Subsequently the monetary value of the 1 vkm tampered is established and overall economic loss due to odometer fraud calculated. The research proposes three options involving countermeasures allowing for fraud elimination. The costs associated with all three options are estimated and compared with previously established benefits for each variant. The final results are the cost/benefit ratios estimated for each odometer fraud scale variant and each intervention option. This allows for the comparison of options and concludes that the best policy option to eradicate odometer fraud in the cross-border trade of used cars within Europe would be the establishment of a mechanism for continuous odometer checks and accompanying certification in all EU Member States.

AUTHOR
This study has been written by **Prof. Przemysław Borkowski** of the University of Gdańsk, at the request of the European Added Value Unit of the Directorate for Impact Assessment and European Added Value, within the Directorate General for Parliamentary Research Services (DG EPRS) of the General Secretariat of the European Parliament.

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List of abbreviations and acronyms

ACE	European Automobile Manufacturers' Association
CBR	Cost/Benefit Ratio
DG MOVE	Directorate General for Mobility and Transport
EC	European Commission
EP	European Parliament
ERRU	European Register of Road Transport Undertakings
EU	European Union
EUCARIS	EUropean CAR and driving licence Information System
HSM	Hardware Secure Module
MS	Member States
OECD	Organisation for Economic Co-operation and Development
SHE	Secure Hardware Extension
UN	United Nations
VIP	Vehicle Information Platform
Vkm	vehicle – kilometers

EU country codes:

BE	Belgium				
BG	Bulgaria	IT	Italy	PT	Portugal
CZ	Czech Republic	CY	Cyprus	RO	Romania
DK	Denmark	LV	Latvia	SI	Slovenia
DE	Germany	LT	Lithuania	SK	Slovakia
EE	Estonia	LU	Luxembourg	FI	Finland
IE	Ireland	HU	Hungary	SE	Sweden
EL	Greece	MT	Malta	UK	United Kingdom
ES	Spain	NL	Netherlands		
FR	France	AT	Austria		
HR	Croatia	PL	Poland		

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Executive summary

Whenever a vehicle[68] is sold the total mileage as recorded by the odometer is documented. In the case the odometer reading is known by the seller to be incorrect for any reason, the seller is required to share this knowledge with the buyer. Failing to do so constitutes odometer fraud. Similarly, it constitutes odometer fraud if the odometer has been tampered with the goal of pretending that the total mileage is lower than in reality.

Odometer fraud is an illegal act of changing or altering the odometer reading and reporting an altered reading as a valid one. It results from odometer tampering, also referred to as odometer rollback, "clocking", or odometer manipulation. Manipulating an odometer does not necessarily constitute a crime under the legal systems of the European Union Member States.

For instance, odometer manipulation required during repair of a broken odometer cannot be considered an odometer fraud. The purpose of odometer manipulation, and whether the manipulation is being reported, might constitute the difference between a legal and an illegal action. What is of paramount importance is the fact that odometer manipulation is almost always (odometers break rarely) performed as odometer fraud, which is an action oriented at hiding the real odometer reading in order to profit from it.

The profit comes from the lower reported mileage and the resulting higher sale price on the vehicle. Odometer fraud occurs in both national and cross-border second-hand car markets. While the scale of odometer fraud in both instances is substantial, as various evidence suggests, it is cross-border transactions in which odometer fraud is more frequent. This is a direct result of differences between countries in Europe. Language and legal setups as well as bureaucratic barriers in various national administrations prevent buyers from one country from effectively seeking information about the past histories of the cars in another country. While checks about the past history of a vehicle on the national market are already difficult, some practical steps (i.e. the need to translate documents, to understand how foreign reporting systems work, and finally not knowing whom to ask) make checking the car's mileage across borders almost impossible.

Is odometer fraud a problem across the EU? A web check for the term "odometer tampering" returns hundreds of hits in several European languages, many with direct links to "specialists" offering such "services" for less than 100 euros. The second-hand car market in Europe scores low in the consumer confidence research, it ranks last out of all 13 goods markets assessed (EC, 2016). In the study conducted for the European Commission entitled "*European second-hand car market analysis",* when checked against a variety of issues linked with car purchases, consumer-respondent confidence was the lowest with regard to verifying the accuracy of car mileage (only 40 % very confident) and the reliability of either the car's mechanical condition or history (only 45 % very confident) (Mehlhart et al., 2011).

[68] The terms *vehicle* and *car* are used throughout this research in the meaning of a personal car unless otherwise stated.

Against this background, this research outlines potential measures to be taken at the EU level in order to combat odometer fraud in cross-border used car transactions. The study takes an in-depth look at three different intervention options:

- Option 1 – establishing a mechanism for continuous odometer checks and accompanying certification in all EU Member States.
- Option 2 – introducing technical solutions in order to make odometers tamper-proof on both national and EU level.
- Option 3 – increasing control and enforcement of penalties for odometer tampering.

The study compares the costs and benefits resulting from all three options' and measures' added value at the EU level.

The first step to acquire the necessary cost/benefit ratios (CBR) for the above-mentioned options is to calculate the potential benefits of each intervention and the costs associated with each option. The benefits are derived from the reduction in odometer fraud levels.

The depreciation rates and maintenance costs of vehicles are ensured with the elimination of odometer tampering. Currently, with a substantial share of traded cars having tampered odometers, the depreciation premium is intercepted by the dishonest seller. The mechanism is based on the difference in the price of high and low mileage vehicles from a given production year. If mileage is rolled back, this means that depreciation incurred "on paper" differs from actual depreciation. The buyer will at some point bear the cost due to more frequent repairs or the earlier need to repair key and often expensive components. Also, the running costs of a car with a higher mileage are greater than one with a lower mileage (e.g., due to different consumption levels of engine oil and fuel, lowered power efficiency of the engine etc.). Consumer surveys suggest that depending on the car make, the running costs of a ten-year-old car in comparison to a three-year-old one could be between two and twelve times higher (Consumer Reports, 2017).

With regard to emissions, the relation with odometer fraud depends on the method used to calculate emissions. This has broader ramifications. For instance, in various emission control schemes which utilise vkm (vehicle-kilometres) to measure emissions, the way in which those vkms are recorded affects the odometer fraud cost calculation.

The EU *Update of the Handbook on External Costs of Transport* (Korzhenevych et al., 2014) advocates for measuring emissions per vkm. Wherever emissions are tackled based on the number of vkms measured from official odometer readings (e.g., during periodic technical checks), society has been exposed to the cost of emissions which have occured, but a certain number of vkms are missing from the records, due to fewer vkms being read from tampered odometers. For each vkm that has been driven, emissions have been released into the environment. With odometer rollback, those emissions were not accounted for. On the other hand, in those cases where vkms are recorded from real road counts, there are no "missing vkms" and the emissions component in the total odometer fraud value has no relevance.

The first step in determining the potential benefits resulting from reduced odometer fraud is to establish the scale of the phenomenon in EU cross-border transactions. While odometer fraud is not limited simply to cross-border deals, but is also present in internal or national markets of the Member States, this study focuses on cross-border transactions only. This is an important consideration regarding the calculation of the cost/benefit ratio, because any mechanism preventing odometer fraud will certainly have a positive effect on both cross-border and national transactions.

Firstly, the obtained cost/benefit ratios could be more favourable if the impacts on national markets were considered. Secondly, the study deals exclusively with passenger cars (PC). PC are predominantly purchased for private use, while in other car categories the purpose is primarily business. Companies usually have much better tools to check a car's past history than individuals. Furthermore, passenger car fleets in the EU are much larger than fleets of other vehicles (Eurostat, 2017).

The variable depicting odometer fraud is critical for the whole calculation as all subsequent estimates build upon it. The underlying data necessary to measure it regard the flow of vehicles traded within the EU. The data on vehicle flows has been collected from Eurostat and the European Automobile Manufacturers' Association (ACEA) databases supported by the calculations performed by the authors of the "*European second-hand car market analysis*" (Mehlhart et al., 2011). This data has been complemented by additional sources (such as national road administrations and other reports) and estimates to fill in data gaps. The remaining data necessary to establish the scale of odometer fraud was estimated for all EU Member States but they could only be applied to 19 countries. These are countries for which information regarding this crucial variable - vehicle flows - was successfully gathered for a long time series. For some countries the time-series gathered are shorter.

Data quality is a major obstacle throughout the whole study, indeed the data on cross-border trade in used cars is not fully reliable and often fragmented, or not reported at all in publicly available sources. Nevertheless, it was possible to produce underlying data for at least a number of data points for as many as 25 Member States for the time span between 2006 and 2014 (or 2015 in some cases).

Having established the size of odometer fraud, the unit price for one vkm missing from an odometer reading was calculated for all EU Member States. There are nine variants based on the estimated scale of tampering and kilometres rolled back per individual vehicle. The end result is nine scenarios showing country and EU-wide costs of odometer tampering.

For each of the three above mentioned intervention options, the cost of associated action is calculated as well as the success rate (success rate is understood as the percentage reduction of odometer tampering due to the employment of a particular measure). This is followed by the calculation of the cost/benefit ratio (CBR) for each variant.

Barriers to applicability and the intangible merits of each intervention option are then discussed based on these estimates, the conclusion being that the best result (most

favourable cost/benefit ratio) in quantitative analysis is associated with intervention under Option 1, i.e., the establishment of a mechanism for continuous odometer checks and accompanying certification in all EU Member States.

Chapter 1 Second-hand cross-border car markets in the European Union

Key findings

- The second–hand cross-border car market in the European Union is active predominantly in the west-east direction (used cars flow from the EU-15 to the EU-12).
- While the whole EU car park gets older, it is the EU-12 car fleet which ages at a much higher pace.
- Most of the second-hand cars imported to the EU-12 are older than five years.

I - Background

1.1 Second-hand car markets

In the past decades in the European Union second-hand cars originating from cross-border trade market constituted as much as two-thirds of all car purchases in the case of the EU-12 countries as well as for some EU-15 countries (Mehlhart et al., 2011; Burnewicz, 2005). At the same time it was seemingly a non-factor in case of other EU-15 countries (Mehlhart et al., 2011).[69] The countries with high import rates are predominantly located in Central Eastern Europe and the Balkans and belong to the New Member States (NMS).[70] As the "*European second-hand car market analysis*" outlines, imports of cars exceeding 60 % of total vehicles traded were attributed to BG, CY, CZ, EL, LV, MT, PL, RO and SK. For most of the EU-15 countries, imports were below 15 % of all cars traded (AT, ES, FR, IT, PT, SE and UK) (Mehlhart et al., 2011).

Those numbers have remained steady or have slightly increased during the last decade. Germany, with its high share of exports and increasing imports, is a special case. According to a Belgian study dealing with odometer fraud prepared by Car-Pass, imports of second-hand cars in Germany reached 16 % in 2010 in business–to–business transactions only (Car-Pass, 2010). If consumer-to-consumer transactions were to be included, this number would increase.

[69] EU-15 are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, the United Kingdom. By EU-12 this research means: Bulgaria, Croatia, Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia.

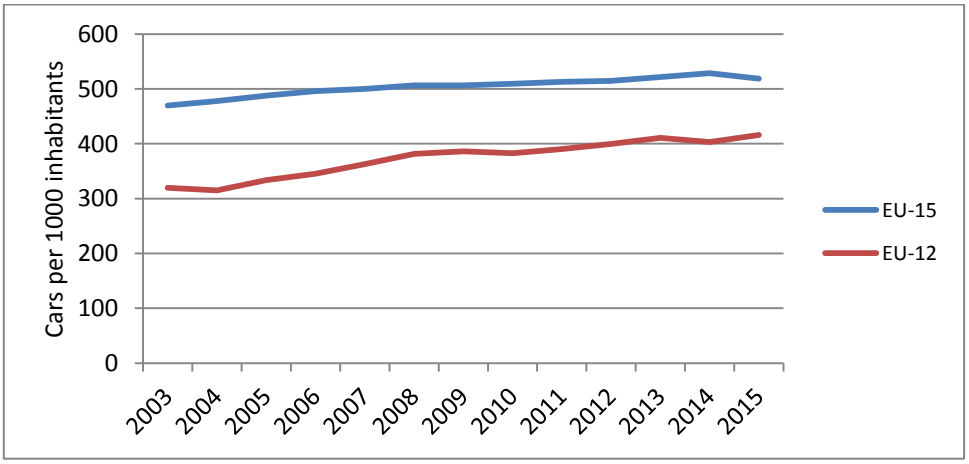
[70] The term New Member States (NMS) is used with reference to countries which joined the European Union starting from the 2004 enlargement. NMS as a term is used more in the historical context, while currently EU-12 is a more adequate designation. This division will be observed throughout the current report, using NMS in the historical context whenever referring to some inherent problems resulting from those states' socialist economy past, are referred to and the EU-12, when discussing current developments.

1.2 Reasons for purchasing a second-car

The reasons for purchasing a second-hand car are varied. The buyers are either those for whom a second-hand car is their first car or those who require a replacement car. The former revert to the second-hand market due to financial constraints while the latter offer a range of reasons; from lower price as compared to buying a brand new vehicle, to a need to act quickly in order to replace their previous vehicle due to breakdown, or because it was too small, or too costly to maintain. Price consideration seems crucial behind all decisions (ECC-net, 2015). It has already been pointed out in market studies that in consumer interviews almost two thirds (64 %) of consumer respondents mentioned price as the predominant factor in their purchase decisions. Other important factors were car mileage (35 %), car brand / manufacturer (27 %), the car's mechanical condition (26 %) and the car's age (26 %) (EC, 2014). The picture is clear, the second-hand car market thrives because the prices of the cars offered are significantly lower than in the new car market.

The volume of cross-border transactions increases because of a relative difference in wealth between citizens of different Member States. EU-15 societies maintain a wealth advantage over EU-12 societies and supply second-hand cars bought predominantly by customers from the EU-12. The cause of this process is the increasing wealth of New Member States societies. The process started with the change of the economic system from socialist to market-oriented, but gained pace upon accession of those countries to the European Union. Increasing wealth (but still considerably below that of EU-15) met insufficient supply of own second-hand cars. Since the EU-15 has a surplus of used cars and the EU-12 have started to catch up (also on the motorisation rate) after the enlargement (see Figure 1), the natural market economy consequence was a flow of used cars from EU-15 to EU-12.

Figure 1: Motorisation rate 2003-2015, EU-15 vs EU-12



Source: Eurostat, 2017.

II - Objectives

The objective of this section is to establish the size of the second-hand car market in cross-border trade within the European Union. Within Europe second-hand car markets are not

limited to national markets. There is a significant flow of used cars between Member States. The main flows in previous decade have occurred from the EU-15 countries to the automotive markets of the EU-12 Member States. The import of used cars exceeds the number of domestic new registrations in almost all of the Eastern EU countries (Eurostat, 2017 and ACEA, 2010-17).

The largest exporting countries are Germany, Italy, the Netherlands and Belgium. France is also a strong exporter, especially towards the Romanian market. Germany is the largest exporter of used cars, likely responsible for two-thirds of all used car exports and the main supplier to Central Eastern European (CEE) countries. The largest importing countries are Poland, followed by Romania and Germany. Measuring the size of those flows is critical for evaluating the odometer fraud problem. It is also interesting to look at the used car circulation in the EU-15, those flows are much lower in number but still contribute to the odometer problem at the national level.

The size of the second-hand car market and especially the information about destination markets (import volumes) is a critical variable necessary to measure the scale of economic loss resulting from odometer fraud. Therefore, the value of economic loss could be calculated only for the countries for which car flows are known.

III - Methodology

The data on the size of the second-hand car markets in the European Union is not directly available from Eurostat nor from other transport statistics of the United Nations (UN), nor from the Organisation for Economic Co-operation and Development (OECD). The data on cross-border second-hand car purchases is even less available. The initial source of data for the purpose of this study is therefore to be found in a report on second-hand car market study (Venherle and Vergeer, 2016). This study was complemented with some additions and changes whenever contradictory or additional data sets were available. To some extent, the size of the used car cross-border transactions can be also extrapolated from the statistics provided by Eurostat and ACEA.

The difference between Eurostat data and ACEA data represents (theoretically as per their respective data collection criteria) the difference between total registrations and new car registrations. ACEA reports only new car registrations, while Eurostat data supposedly reports all registrations. It is assumed that the difference results exclusively from the cross-border trade of used cars. A similar assumption was proposed by the authors of "*Data gathering and analysis to improve the understanding of 2nd hand car and LDV markets and implications for the cost effectiveness and social equity of LDV CO2 regulations*" (Venherle and Vergeer, 2016).

Having said that, considerable data deficiencies in both ACEA and Eurostat databases had to be addressed during the calculation process. The datasets have gaps or are contradictory in some areas. In those cases, in-depth search in national sources was performed in order to confirm data reliability or fill in missing data.

IV - Findings

4.1 Data source

The initial scale of cross-border trade in used cars for the majority of EU-12 Central and Eastern European Countries (CEE) has been adapted from the "*Second-hand car market analysis…"* (Melhart et al. 2011) and the *"Data gathering…."* study (Venherle and Vergeer, 2016)**.** This applies to the **Czech Republic, Latvia, Lithuania, Estonia, Poland and Hungary**. This data is available from the year 2006 until 2014 or 2015 and is considered reliable by the original source. Data for Poland comes from the Polish Automobile Association (PZMot) and from the Ministry of Infrastructure. For the purpose of the current study, they were further cross-checked with an assessment of the transport sector development in Poland (Burnewicz, 2010).

Romanian data reportedly originally came from the driving licence and vehicle registration authority - the DRPCIV (Directia Regim Permise de Conducere si Inmatriculare a Vehiculelor) (DRPCIV, 2015). In the case of the Czech Republic, the authors of the *Second-hand car market analysis* acquired data from the car registry run by the Ministry of Transport (Centrální registr vozidel Ministerstva dopravy ČR). Hungarian data was acquired from a data provider - DATAHOUSE (Datahouse, 2015).

Data from the **Baltic states** was reportedly acquired from a set of national providers. The *Second hand car market analysis* claims these data sources to be reliable. The case of the EU–15 is different. While the above-mentioned report provides direct estimates for Finland and Sweden, it does not mention the other EU-15 countries. For those countries, estimates from Eurostat and ACEA databases were compared for the purpose of the current study.

For **Belgium, Greece, Spain, Portugal and Slovakia**, estimates are based on the difference between Eurostat's official data on registrations, and the ACEA database of new registrations only. The difference should produce registrations of used cars from outside those countries. The same approach has not been possible for the remainder of Europe due to data problems.

4.2 Data limitations

Firstly, **Austria and Luxembourg** report the same data to Eurostat and ACEA regardless of theoretical methodology differences between the databases. If the above-mentioned computation method was to be applied to France, the resulting numbers would be a negative figure which obviously cannot be representative of the actual situation. It would mean that total registrations (for new and old cars combined) are less than the total of new car registrations.

Similar considerations apply to **Slovenia, the UK and Germany**. In the case of the UK, partial data could be obtained from annual University of Buckingham reports (University of Buckingham, 2014), but they only provide changes from year to year and not absolute numbers. The UK is altogether a special case due to its cross-border intra-EU car trade heavily weighted towards Ireland. Further, the UK is also a special case because its imports are heavily influenced by vehicles of non-EU origin. In fact, 30 952 cars were imported in 2008, but only 8 852 were from other EU countries.

Irish data obtained from the Society of the Irish Motor Industry (SIMI) shows that most of the imported cars came from the UK (Power, 2016). But the SIMI data only provides the total number of imported used cars across all categories. Therefore, it is clear that the calculation of passenger cars share was based on the assumption that the imports follow the ratio of personal cars (PC) to other vehicles in the fleet. In order to acquire the above, ratios for the years 2006-2014, originating from the ANFAC/ACEA report (ACEA, 2014), were calculated (each year, they oscillate around 85 %) and were applied to the SIMI total figures.

For **Germany** the calculation was even more complicated. While the UK data is not critical for the purpose of this study (due to the hermetic nature of the UK car market caused by the differing construction of vehicles), German data is essential, because Germany is a major player both in the export and import markets of used cars. Therefore, in order to acquire the figures on the German market it was necessary to look into national and regional (land) statistics. From internal statistics provided by Kraftfahrtbundesamt (KBA) - German Federal Motor Transport Authority - (KBA, 2017) the change in vehicle ownership can be deducted. This number represents both internal and external purchases of cars. Nevertheless, the *Car-Pass study* estimated imported cars to Germany to be at the level of 311 340 in 2009 (Car-Pass, 2010).

Unfortunately, those are only business-to-business (B2B) or business-to-consumer (B2C) transactions. In order to add consumer–to-consumer (C2C) transactions one would need to estimate the probable number of those transactions, because they are not correctly reported in abovementioned official statistics due to their private character. The sum should be smaller than that of B2B transactions because the EU-15 second-hand car market is highly dominated by professional car dealers and C2C transactions are much less frequent than in the CEE countries.

An estimate of the number of private advertisements vs dealer advertisements would be about 26 % for private advertisements on car-selling websites (Auto-m portal, 2017; Carsontheweb portal, 2017; Autoexpoportal, 2017). A consumer behaviour study accompanying Car-Pass study states that out of the sample of 433 interviewed consumers, private points of sale constitute 36 % of all such places in Germany (Car-Pass, 2010). This number includes the friends and family categories and allocates a 22 % share to independent private traders.

Based on above information, it is reasonable to claim that C2C transactions should average 25 % of B2B transactions. Thus, with high degree of plausibility, the total estimated share of cross-border registrations would be at about 20 %. This number was applied to the total German registration changes taken from KBA (KBA, 2017).

4.3 Alternative method to establish total imports of vehicles

Another available method of tackling total imports of vehicles is using United Nations (UN) trade statistics. The estimate could be based on item 8 703 ‘motor cars and other motor vehicles principally designed for the transport of persons’ (Comtrade, 2017). This item is not

overly precise because it incorporates all vehicles including train cars. Moreover, a cross-check with the German KBA estimate shows that UN figures are four times higher, while a cross-check with Polish data results in a figure one-third lower than the estimate made by the *Second-hand analysis* or Polish internal reports (Burnewicz, 2010). Given the high level of aggregation, Comtrade data does not seem to be sufficiently precise and therefore was not used in this research.

Data acquired from national authorities (e.g. Denmark, the Netherlands) is partially available and has to be partially extrapolated. For instance, **Danish** data coming directly from Danish customs (SKAT) is given for both PCs and Light-Commercial-Vehicles (LCVs) (Mehlhart et al., 2011). There is one year in which there is an overlap with the Eurostat/ACEA based estimate and the figures are similar: 35 000 provided by SKAT and 34 178 from the estimate. Since SKAT shows both PCs and LCVs in one item, it is further assumed that the difference consists in LCVs. Only SKAT data is available for the remaining years. The percentage of PCs in the total number from 2008 is therefore applied to obtain a rough estimate of PCs in PC+LCV imports for the remaining years.

Unfortunately, this could have been done only in the case of time-series up until the year 2011. No data beyond 2011 is reported in Denmark. No data for **Cyprus** nor **Malta** could be obtained from publicly available sources. However, the car imports from Cyprus and Malta are not large enough as to significantly distort any EU-wide considerations. Croatian data is relevant from 2013 only because of its recent alignment to EU standards.

4.4 Conclusions on collection of data

To sum up, it was possible to collect data on:

- almost all EU-12 countries representing the majority of cross-border importing countries
- some key EU-15 markets including the German market which is the biggest EU market.

All estimated values of cross-border trade transactions of used passenger cars within the EU for the year 2014 are given in Table 1. For these estimates, the most complete sources were available and were therefore used as a basis for subsequent cost/benefits calculations. The remaining data and calculations for time series ranging from 2006 to 2015 are presented in the Annex I.

Table 1: Estimated cross-trade in used cars in the European Union in 2014

Country	No of intra-EU imported cars	Country	No of intra-EU imported cars
BE	4 772	LT	163 553
BG	22 421	LU**	10 924
CZ	120 408	HU	96 733
DK	34 178*	MT	n/a
DE	465 532	NL	86 000
EE	26 118	AT	n/a
IR	43 842	PL	748 863
EL	13 223	PT	56 462
ES	34 817	RO	219 929
FR	113 485**	SI	n/a
HR	34 560	SK	146 299
IT	6 686***	FI	19 045
CY	n/a	SE	16 972
LV	50 112	UK	30 952****

Notes: * 2011 data available, **2010 data available, *** 2013 data available, **** 2008 data available.
Source: Own elaboration.

Chapter 2 Odometer fraud in cross-border car transactions within the European Union

Key findings

- Odometer fraud in cross-border second-hand car transactions is between 2 and 3.5 times higher than odometer fraud in internal market transactions across the European Union.
- There is a significant difference between EU-15 and EU-12 odometer fraud rates. They are higher for cross-border imports to the EU-12 than to the EU-15.
- Economic loss resulting from odometer fraud in the EU is estimated as a range depending on the scenario, the most probable variant being 8.76 billion euro.

I - Background

While cross-border second-hand car transactions constitute a substantial part of the total EU used car market, the important question is to what degree those transactions are fraudulent. Trade in cross-border assets always creates additional risks for the buyer resulting from the unfamiliarity with the seller's country regulations and customs. The existing differences in national car markets create opportunities for second-hand car flows across borders. At the same time, buyers attracted by car price do not pay sufficient attention to other factors such as the car's technical condition or legal status. These issues put foreign buyers at a disadvantage. They rarely know the institutional setups of the source market of the imported car or the protocol for seeking information about the car's past. The language differences may further complicate the situation. Due to the existence of all the above-mentioned obstacles in researching vehicle history, odometer tampering is expected to be a factor in cross border transactions to a higher degree than in national transactions.

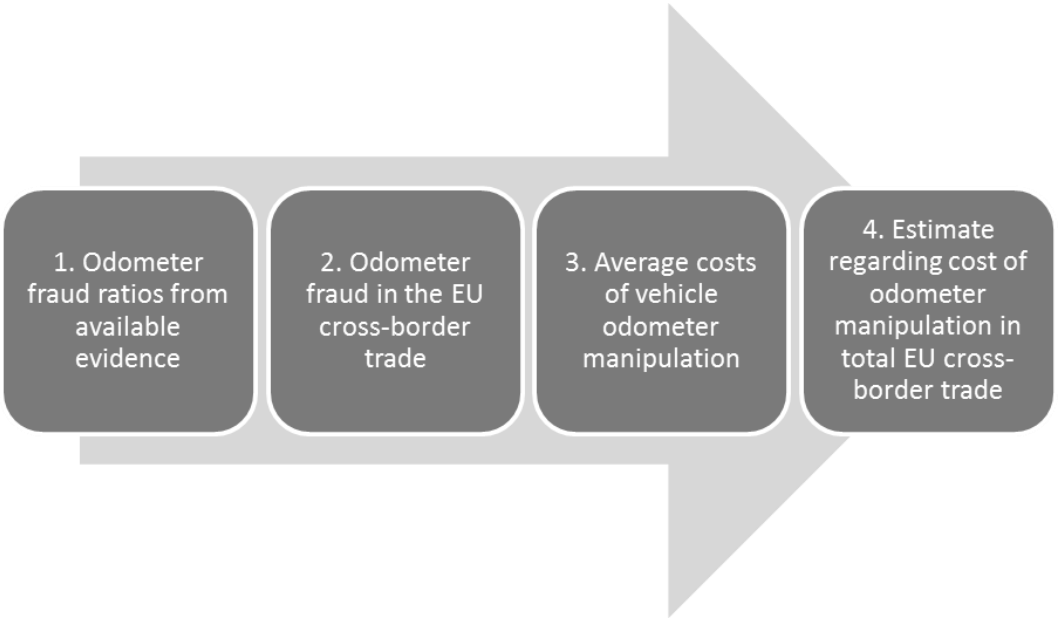
II - Objectives

This section will calculate the value of odometer fraud in cross-border transactions in the second-hand car market of the European Union.

III - Methodology

The methodological approach is first to establish odometer fraud ratios applicable to particular import markets within the EU. Second, to calculate the magnitude of odometer fraud, and third to monetise the economic loss due to the existence of the odometer fraud. The methodological framework for this task is given in Figure 2.

Figure 2: Methodological approach for the estimation of economic loss from odometer manipulation in cross-border used car transactions



Source: Own elaboration.

3.1 Odometer fraud ratios

Firstly, odometer fraud ratios are collected from available evidence. The evidence and expert opinions available (see subsequent discussion) indicate that the scale of odometer fraud in cross-border transactions is higher than in internal market transactions, a pattern visible across all countries where odometer fraud was identified. Reports from cross-border odometer fraud cases, opinions and studies allow for the application of odometer manipulation ratios to trade figures specific for particular countries or groups of countries. If we consider the trade patterns in the European second-hand car markets, several car markets behave similarly.

There are similarities between car markets in Poland and Romania, with large quantities of relatively older cars imported.[71] The Baltic states feature similar conditions applicable to the functioning of car markets. The German market is the largest in terms of exports, but the German scrap-scheme affects import characteristics. The UK and Ireland markets are interrelated to a high degree due to technical differences in car design as compared to the rest of the European Union and both countries demonstrate a significant level of imports from outside the EU.

3.2 Existing patterns in cross-border second-hand car trade

The evidence above confirms that certain patterns exist in cross-border second-hand car trade. Firstly, similar odometer manipulation ratios are applicable in certain countries, e.g., the indicator for CZ, RO and PL is reportedly similar, and thus it could be assumed that it might

[71] Patterns for long time series (2006-2015) are collated in the Annex.

fall within same range for other EU-12 countries. Secondly, cross-border car trade is very only active between selected countries; thus, there is no need to check all possible pairs of trade partners in the EU, but only those where an actual high volume of trading takes place. Subsequently, the scale of odometer fraud in the EU cross-border trade can be estimated by applying ratios from step 1 to total intra-EU car trade volumes obtained in Table 1.

Thirdly, the average costs of vehicle odometer manipulation can be calculated based on additional depreciation incurred, but not reported due to odometer rollback, cost of repairs and maintenance of vehicles and optionally environmental damages.

Partial data on average repair costs for selected car brands in specific countries was collected from relevant sources, as were depreciation rates for selected national markets. The German rate will be used as a reference and owing to the collected information on the average price differences (the cost-difference factor for major car brands across European car markets) between countries, depreciation and maintenance rates for the other EU countries can be recalculated. The German rate is the optimal starting point due to its reliability[72] and because it is German-based used cars that feed into the dominant used cars trade flows within the EU.

3.3 How we calculate

The whole calculation basis is provided in the formula:

$CO_j = TV_j \times OFR_j \times UC_j$

Where:

- ✓ CO_j – cost of odometer manipulation in cross-border imports of country j,
- ✓ TVj – total number of cars imported to country j from other EU countries,
- ✓ OFRj – odometer fraud rate specific for the second-hand car market of country j,
- ✓ UCj – unit cost of odometer fraud (eurocents per 1 vkm) for country j, and
- ✓ j=BE, BG, CZ, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, PT, RO, SI, SK, FI, SE, UK.

The cost of odometer fraud incurred is built on three cost components:

$UC_j=D_j+M_j+(E_j)$

Where:

- ✓ Dj represents the additional depreciation cost of odometer-tampered vehicles per 1 vkm for country j,
- ✓ Mj is the additional maintenance cost due to odometer tampering per 1 vkm for country j,

[72] The COMPETE project, whose cost reports underpin the current research, was able to provide a full cost structure allowing for the retrival of the maintenance cost component for Germany and the UK only (Maibach et al., 2006).

- ✓ Ej is the additional environmental damages unaccounted for and due to odometer rollback per 1 vkm for country j (optional component).

3.4 Environmental damages

Environmental damages represented by unaccounted emissions are an optional part of the estimate depending on the way that total vkms are calculated for a given application. In the application where vkms are calculated from periodical odometer readings, the emissions component should be added, because those readings do not reflect total vkms incurred. In the applications where vkms are calculated from manual or automated counts of traffic or traffic surveys there are no "missing" vkms and, consequently, no unaccounted emissions. In those cases, the emissions component should be omitted from the equation. Eurostat points out that due to the fact that vkms reports are not compulsory, the methods to collect data in different Member States are not uniform. Vkms are calculated from odometer readings in Belgium, Ireland, and Norway while other countries may use different sources and estimation techniques (traffic surveys, mobility surveys, road counts etc. – and a combination thereof).

Finally, estimates on the cost of odometer manipulation in total EU cross-border trade is calculated by applying the average odometer-fraud cost per vkm to the number of vkms missing due to the odometer manipulation.

IV - Findings

Three initial scenarios were considered for odometer fraud rates: **low, medium and high fraud rate variants**. The fraud rates were elaborated on the basis of the following considerations:

- Wherever fraud rates were directly available from reliable case studies/reports they were accepted.
- Wherever data for a particular country is unavailable, the fraud rate is assumed to be in an order of magnitude of the one applicable to the country of similar car imports characteristic and similar market setup (e.g., LT and LV, PL and RO).
- Whenever individual case studies offer a measured fraud rate, this was counterchecked with the estimate. In addition, all estimates were cross-checked wherever overlapping evidence was discovered.

4.1 Low fraud rate scenario

For the low fraud rate scenario, fraud rates are used as reported in the EU-wide consumer market study (EC, 2014). It is a very conservative approach because the study reports only the uncovered cases of fraud. In other words, fraud rates in this study are based on the percentage of people actually reporting fraud. Certainly not all cases of fraud were discovered nor reported by the respondents. Nevertheless, it is adopted in order to establish a lower boundary of the possible fraud range. Further, a conservative assumption serves to avoid inflated fraud rates from some of the quoted case studies. It keeps in check the medium and high fraud rate scenarios, which are rooted in the low fraud rate scenario's initial figures.

4.2 Medium fraud rate scenario

In the medium fraud rate scenario, evidence from the previously discussed case studies is compared to the evidence form (EC, 2014). This allows the establishment of patterns for groups of countries on the basis of similarities in national car market characteristics. Most importantly, it is recognised that a 2 to 3.5 higher rate of fraud in cross-border traded vehicles exists in the EU-12 countries as compared to the EU-15.

4.3 High fraud rate scenario

In the case of the high fraud rate scenario, evidence from the above discussed case studies is confronted with the dependence observed within the EU-15 (based on, e.g., Car-Pass, 2010). The result is that the high fraud rate scenario is twice the size of the medium fraud rate scenario. In the EU-12 high fraud rate scenario, evidence from dealers' reports is used but deflated in order to reduce potential dealer bias.

The rates adopted for the EU countries for all three scenarios: low, medium and high fraud rate, are presented in Table 2.

Table 2: Fraud rates in cross-border passenger car trade in the EU

Country/Scenario	Low fraud	Moderate fraud	High fraud
BE	3 %	10 %	18 %
BG	20 %	40 %	80 %
CZ	8 %	37 %	74 %
DK	6 %	10 %	15 %
DE	2 %	22.30 %	40 %
EE	8 %	35 %	70 %
IE	1 %	5 %	13 %
EL	9 %	20 %	40 %
ES	10 %	20 %	40 %
FR	2 %	20 %	43.30 %
HR	6 %	20 %	40 %
IT	7 %	20 %	40 %
LV	9 %	40 %	80 %
LT	9 %	40 %	80 %
LU	2 %	20 %	40 %
HU	13 %	26 %	52 %
MT	3 %	7 %	10 %
NL	3 %	30 %	40 %
AT	2 %	22.30 %	40 %
PL	15 %	40 %	80 %
PT	4 %	12 %	30 %
RO	16 %	40 %	80 %
SI	10 %	20 %	40 %
SK	10 %	20 %	40 %
FI	3 %	7 %	14 %
SE	3 %	7 %	14 %
UK	3 %	5 %	12.50 %

Note: CY is excluded from this analysis because no fraud rates for CY were available.

Source: Own estimates.

4.4 Considerations on collected data

The low fraud rate scenario uses data from the EU consumer report (EC, 2014). These figures are most certainly lower than real odometer fraud ratios. Firstly, they are obtained from customers reporting cases of fraud, which requires prior recognition on the part of the customer that the actual fraud has happened. It is unlikely that all fraud instances were discovered and reported by customers. Secondly, the abovementioned report applies to domestic transactions. One may assume that the number of dishonest sellers in home markets is lower than in international transactions.

The traceability of a car's past history is much easier in a national market, not only because local buyers understand local conditions better and have at least a basic knowledge of vehicle records systems, but also because they have easier access to legal instruments when compared with foreign buyers in the case a fraud case is uncovered. Nevertheless, these ratios can be considered the lower end of odometer fraud range, it is certain that the rate is not lower than that.

The same report mentions an interesting difference between the EU-15 and EU-12. For the former, the average fraud rate is reported at 4 %, while for the latter it is reported at 14 %. This huge discrepancy is confirmed by other available (although incidental) reports from across the EU. The medium fraud rate scenario is based upon reports collected from across Europe providing odometer fraud ratios (see Table 3).

Table 3: Evidence of odometer fraud

Report	Geographic coverage	Odometer fraud rate reported	Notes
Car-Pass	Belgium	8.6 % (a) 0.24 % (b) 10 %-18 % (c)	(a) Pre Car-Pass, (b) Car-Pass operational (internal market), (c) imported cars (with Car-Pass operational)
Automotive professionals	Belgium, France, Germany, Luxembourg, Netherlands	30 %-40 %	Imported cars. Car-Pass interviews with automotive professionals, estimate
ADAC/DEKRA	Munich, Germany	22.3 %	Based on Munich Police raid of suspicious car dealers, internal market
DGCCRF	France	43.3 %	Internal market
Field research – telephone interviews	Poland	70 %-90 %	Imported cars, small sample
Nationale Autopass/RDW	Netherlands	30 %	Imported cars, estimate
OTF	UK	5 %-12.5 %	Internal market, estimate
50artel.ie	Ireland/UK	10 %	Imported cars, estimate
CARFAX	Sweden	3.1 %-7 %	Internal market
AAA Auto Group	Poland-Germany	90 %	Imports to Poland from Germany, estimate
Non-EU evidence for reference purposes			

Report	Geographic coverage	Odometer fraud rate reported	Notes
Illinois Attorney Generals Consumer Protection Division	Illinois, US	49.8 %	Internal market, field research
Pennsylvania Office of Attorney General	US	5.09 %	Internal market. Only leased cars of 2 companies tracked
NHTSA	Pennsylvania, US	20 %	Internal market, field research

Source: Own elaboration based on sources as discussed.

4.5 The case of Germany

The German internal rate of 22 % is reported by the German Automobile Club Association – ADAC (ADAC, 2014). This figure actually stems from the famous Munich Police raid against dishonest car dealers and derives from the number of odometer manipulated cars found during this action. It has several deficiencies: firstly, it comes from a single action conducted by the Munich Police. Since then, the special unit dealing with odometer fraud has been dissolved and no additional hard evidence has been collected. Secondly, it applies to both domestic and imported cars found in the dealer shops but without clear indication of the composition of the sample. The assumption that the internal fraud rate is lower than the external rate cannot be verified on the basis of this evidence.

4.6 The case of France

French evidence from the French competition, consumer protection and anti-fraud authority (DGCCRF) report (Car-Pass, 2010) shows a 43 % rate of odometer tampered cars. Again this data was obtained by real actions and is not an estimate, thus it is considered representative, although not collected in a systematic way. The *Car-Pass study* considers that interviews with stakeholders in the French market prove that a 30 %-40 % ratio should be accepted. The evidence from the two major car markets in the EU varies considerably. While French data seems inflated, German data may underscore the real number of cases.

4.7 Futher details on referred rates

The car dealers' figure of 30-40 % (Car-Pass, 2010) seems to be the most reliable, because it comes from the people who know the market best. On the other hand, car-dealers might tend to overestimate the odometer fraud phenomenon and the figure could be a product of word of mouth rather than hard evidence. It is worth noting that industry opinion unanimously recognises that cross-border transactions are characterised by higher fraud rates than domestic ones. For the above reasons a conservative rate of about 20 % is adopted for the medium impact scenario in the EU-15 markets; while a 40 % rate is adopted for the high fraud scenario in cross-border car trade unless direct evidence points to a different rate.

The range of 20-40 % is further supported by evidence from the Dutch Nationale Autopas and the Rijksdienst Wegverkeer Nederland (RDW), which estimated that 30 % of all imported cars were manipulated (Car-Pass, 2010). In the Swedish market, there are specific CARFAX – a vehicle history reports provider – estimates of odometer tampering. The ranges are from 3.1 % to 7 % (Carfax, 2017), but applicable to domestic transactions only. In the EU-15 countries – for which evidence for internal and imported car markets was available – we often observe that the multiplier from domestic to imported car manipulation oscillates around 2.

Thus, Swedish fraud rates on international car deals can be assumed to be around 7 and 14 % for the medium and high fraud rate scenarios respectively. This fraud rate is in line with the specific feature of the Scandinavian car market, considering a lower share of imported vehicles in the total number of vehicles when compared with Germany or France.

4.8 The case of Belgium

In the case of Belgium, while the existence of the Car-Pass vehicle mileage registration and certification system has eliminated the majority of domestic fraud, the fraud ratio for internationally traded vehicles remains at a higher level, yet it is lower than in Germany or France. The reason could be that the very existence of the Car-Pass system means that odometer readings are performed and recorded on a very frequent basis. Dishonest sellers might be afraid to trade to Belgian customers, being aware that there is a chance for a later discovery of some irregularities during technical checks and readings of the car's on-board instruments (mileage is often recorded into other car systems, not only in the odometer). Following the Car-Pass's cautious estimate of imported cars fraud rates (Car-Pass, 2010), one could assume that in the Belgian market, about 10 % of cars imported have odometers tampered in the medium fraud rate scenario, and 18% in the high fraud rate scenario.

4.9 The case of the UK and Ireland

The UK and Ireland are special cases. The prevailing trade patterns show that the majority of imported cars flow either between them or come from non-EU locations. Although in recent years, we have been observing an increase in exports from the UK to CEE (as result of immigration from CEE countries to the UK), it is not mirrored by imports from continental Europe to the UK/Ireland. This is caused predominantly by the differences in car construction. The odometer fraud ratios for the UK and Ireland imports were reported by Cartell at 10 % (Cartell, 2017). The UK Office of Fair Trading (OFT) carried out a study in 2010 which yielded odometer tampering rates between 5 % and 12.5 % (OFT, 2010).

4.10 Evidence from outside the European Union

For reference purposes, it is also interesting to look for evidence outside the EU. A 1985 study by the US Illinois Attorney Generals Consumer Protection Division tracked 5 000 randomly chosen vehicles sold in a one year period by a large lease car company. 49.8 %of the sample were odometer tampered cars (Synder, 1985). Another study, conducted in 1992 by the Pennsylvania Office of Attorney General, also tracked vehicles sold by two major leasing companies. A 10 % sample was selected out of almost 50 000 vehicles sold all over the US. The study found that 5.07 % of the leased vehicles resold had been subject to an odometer rollback, with an average of 53 123 miles (Kelly, 1992).

The only estimate of odometer rollbacks from a non-lease segment of the market is rather old and concerns Pennsylvania vehicles sold on auction which produced a rollback rate of 20 % (Kelly, 1982). More recent analysis for US National Highway Traffic Safety Administration (NHTSA) determines the overall probability of odometer fraud at 3.47 % (NHTSA, 2002). While considering the US market as supportive evidence, one has to consider that in the US transactions happen between customers using the same language and under a similar legal framework. Although some institutional setups differ from state to state, the barriers

customers face to check the previous record of a car are not of the type and scale of those encountered by a European customer.

V - Specificities of the EU market

5.1 Predominant trade patterns

EU-12 citizens face different challenges for odometer fraud calculations. Firstly, the predominant trade patterns in car markets in the EU is a west-east flow of used cars. Moreover, the share of old and very old cars in total imports to the EU-12 is much higher than in the EU-15 (Table 4).

Table 4: Average age of the EU passenger car fleets in 2015

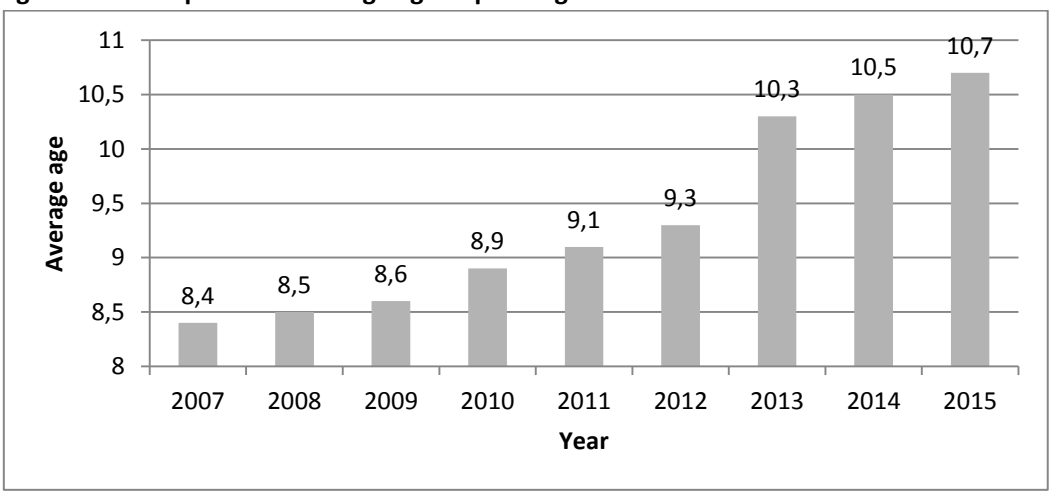
EU country	Average age	Country	Average age
Austria	8.9	Spain	11.4
Belgium	7.7	Sweden	9.6
Denmark	8.5	Czech Republic	14.5
Finland	12.7	Estonia	15.1
France	9	Hungary	14.5
Germany	8.9	Latvia	16.3
UK	8.5	Lithuania	16.7
Greece	13.5	Poland	17.2
Ireland	9	Slovakia	13.4
Italy	10.7	Slovenia	11.2
Netherlands	9.5	Romania	15.3
Portugal	12.6	Luxembourg	6.2

Source: ACEA, 2014.

In general, the vehicle fleets in Europe tend to become older but the process is much more rapid in the EU-12, as a direct result of importing older cars more frequently. The average age of cars in the EU has not increased only due to the fact of enlargement and the addition of relatively older car parks of NMS to EU totals.

After all, the enlargement took place in 2004 and the rapid increase in average vehicle age is visible only from 2007, yet it accelerates from 2013 (Figure 3). A comparison of Figure 3 and Table 4 reveals that this process can only be explained by a high volume of old cars being traded from the EU-15 to the EU-12. As a consequence, odometer fraud in the EU-12 is more closely associated with older cars, while in the EU-15 it applies to relatively young cars.

Figure 3: Development of average age of passenger car fleet in the EU 2007-2015



Source: ACEA, 2014.

This situation has worsened because technical inspections (thus a need to register mileage) for brand new cars was compulsory in Europe only after several years of usage (Table 5).

Table 5: Technical inspection sequence in some European countries*

Country	Inspection due in year	Country	Inspection due in year
Austria	3-2-1-1-	Lithuania	3-2-2-2-
Belgium	4-1-1-1-	Luxembourg	3.5-1-1-
Bulgaria	3-2-2-2-	Netherlands	petrol/electric 4-2-2-1-1, diesel/other 3-1-1-1
Estonia	3-2-2-2-	Norway	4-2-2-2-
Finland	3-2-1-1-	Poland	3-2-1-1-
Germany	3-2-2-2-	Slovakia	4 years
Gibraltar	4-2-2-2-	Slovenia	4-2-2-1-
Hungary	4-2-2-2-	Spain	4-2-2-2-1-
Iceland	4-2-2-1-	Sweden	4-2-1-1-
Ireland	4-2-2-2-	Switzerland	4-3-2-2-
Italy	4-2-2-2-	United Kingdom	3-1-1-1-
Latvia	2-1-1-1-		

*Country data available as per EReg research.

Source: Ereg, 2014.

This situation is not going to change in the future with the adoption of Article 5 of the Directive 2014/45/EU (EP, 2014), which sets the time for the first technical check after purchase at four years. During the last decades, the relatively long timespan between purchase and the first compulsory technical check with accompanying odometer reading produced a temptation to roll back the odometer shortly before a visit to designated control stations. In a relatively young car environment of the EU-15, it is more likely that the original user tampers the odometer just before the first mandatory technical inspection.

Thus, less miles are rolled back in comparison to older cars. In the EU-12, with the majority of trade deals involving older vehicles, there is no room for finesse in tampering attempts. For instance, in Poland it is believed that a car with mileage of more than 200 000 km cannot be sold, thus, older cars traded have almost always mileage approaching this figure but never above it - regardless of their age. This pattern was confirmed in this research by the measurement of the average vehicle-kms per car in different vehicle age groups.

Ideally, the distribution of vehicle-kms per car should be consistent across all car age groups. If the calculation shows a distortion in any age group, e.g., in the case of the EU-12 if older cars suddenly start to report much fewer vkms than average, then it is clear that odometer readings were distorted at some point in time. This assumption might not hold in individual cases where a purchase of a second car to a household took place, because this might change car use patterns in the household.

But during the analysed time span, the average number of vehicles in a household changed very little in the EU-15, with only small increases of 1 % - 2 % in the group of households owning more than one car. A major increase in total number of vehicles occurred in the EU-12, but this was predominantly observed in the group of households which did not previously own a car and was accompanied by a statistically visible increase in total vkms (ACEA, 2014; ACEA, 2017).

5.2 Household transport demant

The underlying assumption is that the average trip length should not change substantially along with the age of a car because household transport demand is not elastic. There are some arguments against this assumption: e.g. if the car is older it is likely to break and thus users will be more inclined to reduce usage. This factor cannot, however, offset the basic needs of the user. Demand for daily transport activities, such as trips to/from work/shops/schools remains, and this demand is not responsive to the age of the car.

The choice of transport mode is influenced more by several other factors, such as individual characteristics and lifestyle, the type of journey, the perceived service performance of each transport mode and price differential (Beirao and Cabral, 2007). Additional proof is provided by the observed increase in the total use of personal cars in the EU measured by the number of vkms reported by Eurostat during the last decade, which is accompanied by a simultaneous increase in the average car age. Although cars in households age, they are used more frequently.

Users accustomed to car travel do not shift more to public transport in order to lessen the mechanical burden on the aging vehicle. To the contrary, users might prefer to maximise the use of the car before it is scrapped. Furthermore, any increase in the total stock of vehicles without an observed change in travel behaviour (increasing share of public transport trips in total trips per household) should be positively correlated with an increase in the number of vkms. If not, there is a gap which cannot be explained other than with vehicle odometer manipulation.

5.3 More details about the calculations

The proportionality ratio allows to estimate "missing" vkms. The ratio has been calculated with the assumption that the Belgian market is an odometer-fraud-free market (reference point). In order to apply the above mentioned method to each country, the stock of vehicles of different age groups had to be multiplied by the average vkm rate. The former data was acquired from the Eurostat database and other supportive datasets (Eurostat, 2017; ACEA, 2010-17). Then the car fleet was sub-divided in age groups:

- Cars less than 2 years old.
- Cars between 2 and 5 years old.
- Cars between 5 and 10 years old.
- Cars older than 10 years.

In addition to Eurostat data, other basic datasets were used to calculate the share of cars aged 20 or more years. The average vkms per car was calculated from total vkms and the total number of vehicles. Information regarding total vkms was partially available from both Eurostat (Eurostat, 2017) and from ACEA (ACEA, 2010-17 and ACEA, 2014). Both sets had many gaps which were filled in thanks to other relevant data sources (Mobilit, 2014; UNECE, 2015; Icaro, 2017; CBS, 2017). Yet, due to data deficiencies, final estimates could only be performed for several selected Member States. Nevertheless, a pattern is visible. The calculation was performed for the time period 2006 - 2014, when the rapid increase of the average car age took place in the EU.

Table 6 presents the results of this estimate as a ratio and shows the difference in the proportion of vkms per number of cars and per car age group.

Table 6: Missing vkms in different age groups for the selected EU countries

Country/age group	up to 2 years	2-5 years	5-10 years	10 years and older
Belgium	0	0	0	0
Germany	0.004622	-0.02916	0.000978	0.023557
Estonia	0.008539	-0.04209	0.071114	-0.03757
Ireland	0.030646	-0.09799	0.004028	n/a
France	-0.13276	-0.11142	0.026669	0.217511
Croatia	0.005539	-0.02244	0.03857	-0.01704
Lithuania	0.006475	-0.02009	0.098324	-0.08471
Sweden	-0.02538	-0.07364	-0.02587	0.124897
UK	0.003129	-0.03144	-0.02069	0.048757

Source: Own estimates.

This result should be interpreted in the following way: if the ratio is negative, it means that cars of a given age group made on average fewer vkms than they would do in a model situation, in comparison to vehicles from other groups. The higher the ratio, the stronger the effect. The estimate from Table 6, with negative ratios representing missing vkms in older car groups for the EU-12 sample and younger cars for the EU-15 sample, supports the idea that in the EU-15 odometer tampering is more frequent in relatively younger cars while in the EU-12 countries missing mileage is something visible mostly in the 5-10 years and older than 10 years car groups, i.e., among car groups which represent the majority of imports to the EU-12. The

above patterns suggest that the scale of odometer fraud in cross-border transactions in the EU-12 might be much higher than in the EU-15, primarily due to the fact that older vehicles are sold to those countries. This is also visible in the internal fraud rates acquired through consumer consultation as reported in the already mentioned EU-wide consumer market study (EC, 2014). Notably, those rates are 3.5 higher in case of the EU-12.

VI - Conclusion

In conclusion, it might be claimed that what constitutes a low fraud rate scenario for the EU-12 is actually within the range of the medium fraud rate scenario for the EU-15. The existing evidence on cross-border fraud rates for the EU-12 is even more fragmented than for the EU-15. No systematic research has ever been performed into this issue. The only method ensuring good quality of data would be an empirical check on a significant number of traded cars. This action would require a substantial institutional involvement on the part of government.

6.1 Results of stakeholders consultation
However, for the purpose of this study, a consultation with about 30 stakeholders in the car market in Poland revealed that the odometer manipulation could range between 70 % and 90 % of all imported cars. Dealers who are active in the market officially claim similar numbers. Although incidental, this evidence is very relevant. [73]

Interviews with used car importers and dealers, performed for the purpose of this study, provides further insights into the mechanism of odometer fraud. Some traders claim that the practice of odometer rollbacks is well known to many buyers who understand that cars offered have a distorted mileage history and yet accept it, caring only for what is officially written into the vehicle documents. One of the interviewed dealers even suggested that certain customers request that dealers manipulate the odometer reading. It can be explained by the fact that those old cars are often being bought for a short duration (about 2-3 years), and then buyers want to resell them and do not want to tamper with odometers themselves, because they fear legal consequences. Traders from Poland also revealed that German car sellers build informal relations with Polish car dealers and actual odometer tampering happens in one of the many car shops on the border - at the transfer. Thus the responsibility for the fraud is dispersed and difficult to trace because the tampering process happened in between.

In fact, the German dealer can claim that the car left his shop without a tampered odometer, while the receiving Polish dealer can claim that the car was accepted with an odometer reading as it is. The Czech MEP Tomas Zdechovsky claims in an interview that according to the Czech Republic Transport Ministry, the number of odometer tampered cars in the internal market reaches 37 % (Euractiv, 2017). A systematic study based on econometric modelling confirms that odometer tampering is widespread in the Czech Republic (although the

[73] See for instance opinions expressed through various news venues, e.g., Związek Dealerów Samochodowych (the Polish Car Dealers Association) (ZDS, 2017) or the AA Auto Group (AA Auto Group, 2017) claim the odometer fraud rate reaches 90 %,

methodology applied did not allow for calculating the exact figures in this study) (Montag, 2017).

Summing up all the empirical evidence above and reported evidence, the odometer fraud rates for imported vehicles in the EU-12 countries are accepted to be at around 35 %-40 % for the medium fraud rate scenario, and 80 % for the high fraud rate scenario.

The exception is Estonia, which has a much better regulatory setup than most of the other EU-12 countries, while the average corruption index is also more favourable there. Henceforth it is reasonable to expect lowered fraud rates in the field of odometer manipulation.

6.2 Scale of odometer manipulation

The scale of odometer manipulation is measured in vkms missing from official registers. For the three scenarios (low, medium and high fraud rate), the product of total cross-border transactions and odometer fraud ratios adopted per country and per scenario is calculated to produce the number of cases with odometer fraud. The last piece of evidence needed is the average number of vkms manipulated. This evidence is scarce, there is hardly any statistical data on kilometres disappearing from odometer readings. This is not surprising considering that odometer tampering is uncovered incidentally and no systematic action by national authorities aimed at first recording and later preventing it has been conducted. Across the EU, there are few reports based on anything more substantial than single cases (Figure 4).

Figure 4: Selection of studies on average rollback

- ✓ An ADAC test from 2005 found the average rollback to be of 33 000 km (Car-Pass, 2010).
- ✓ An UK study produced average rollback of 67 612 miles (108 811 km) (OFT, 2010).
- ✓ The annual Car-Pass reports mention figures between 60 000 and 90 000 km (Car-Pass, 2009-2016).
- ✓ The already quoted French DGCCRF case mentions an average of 91 000 km.

Source: Car-Pass, 2010, OFT, 2010, Car-Pass, 2009-2016.

Given the range of results, for the purpose of this study three scenarios are considered:

1) Low manipulation scenario based on 30 000 km average rollback.

2) Medium manipulation scenario based on 60 000 km average rollback.

3) High manipulation scenario based on 90 000 km average rollback.

Those conservative (especially from the EU-12 perspective) estimates are adopted for the purpose of monetary loss calculation in the absence of solid evidence except for incidental reports. The incidental evidence available points that in many cases, the fraudster might be tempted to roll back even more than a hundred thousand km, yet plausibility is the limiting factor. For instance in Poland, a car cannot be sold if the mileage is more than 200 000 km. It is clear that for each national market there is a certain boundary of plausibility in fraud.

For fraud to be viable to the customer, the number of vkms per given age has to fall within some range. It is unlikely that, on average, manipulation will exceed 100 000 vkms, although incidentally there are cases reported when hundreds of thousands of vkms were rolled back.

Finally, nine variants combining three fraud rates with three sizes of rollbacks are prepared for calculation as indicated in Table 7.

Table 7: Variants of odometer fraud

Fraud rate/Manipulation scale	Low – 30 000 vkms	Medium – 60 000 vkms	High – 90 000 vkms
Low	Low-Low (Variant 1)	Medium-Low (Variant 4)	High-Low (Variant 7)
Medium	Low-Medium (Variant 2)	Medium-Medium (Variant 5)	High-Medium (Variant 8)
High	Low-High (Variant 3)	Medium-High (Variant 6)	High-High (Variant 9)

Source: Own elaboration.

6.3 Damages resulting from odometer manipulation

The total damage from odometer fraud is a result of three elements, notably the:

- Unaccounted depreciation.
- Higher maintenance cost.
- Damage to the environment (optional component).

Unaccounted depreciation results from a car's nominal (trade) value being higher than its actual market value. One of the key determinants of car price is its incurred mileage. Cars from the same production year with a higher mileage cost less than cars with less mileage. Odometer fraud creates a situation where part of the existing depreciation is not reflected in the value of the traded car.

Higher maintenance costs result from a higher frequency of repairs needed on a car with more mileage, due to the wear of mechanical components of the vehicle. Additional environmental damages are represented by the emissions unaccounted for. Vehicle-kms missing from the odometer record have already been driven and associated emissions have taken place. In order to account for those costs, the cost of one vehicle-km of missing mileage has to be established.

To calculate depreciation and maintenance costs, the *Car-Pass study* adopted a cost in eurocents per vkm dependent on the car type. For small domestically traded cars, it was set at 2.7 eurocents per missing vkm for depreciation and 1 eurocent per vkm for maintenance. The figures for medium size cars were set at 4.1 and 2.5 eurocents and for executive cars 6 and 3 eurocents correspondingly.

The same study assumed the following amounts in the case of foreign cars (imported to the Belgian market): small cars 2 and 0.6 eurocents, medium-sized cars: 4.2 and 1.8 eurocents, executive cars 8 and 2.3 eurocents, respectively (Car-Pass, 2010). Those figures collected from dealers seem to be very high if compared to national data on maintenance and depreciation costs. The DG TREN study (Maibach et al., 2006) comparing depreciation and maintenance costs in selected EU markets and US offers different insight (Table 8).

Table 8: Selected personal car use related costs (in eurocents)

Country/Cost	Depreciation	Maintenance, repairs and tires
Germany	0.16	0.05
UK	0.136	0.058
USA (comparison)	0.133	0.032

Source: Maibach et al., 2006.

For the purpose of this study, German rates were selected as the basis for the estimation of the cost of 1 vehicle-km missing from odometer records. This is mainly due to the fact that the way German data is collected confirms its reliability, but also because Germany is the most important exporter of used cars for the majority of cross-border transactions.

In order to maintain the cost difference factor present in European markets, and account for a certain discrepancies in cars and spare prices among Member State, this initial figure is adjusted by the price difference ratio applicable to EU national markets. The ratio was calculated for each market on the basis of the difference in automotive market prices of major producers in the EU. The price differential reflects the costs of material and personnel.

It is worth noticing that the obtained figure (recalculated from the price difference index) for the UK is the same as reported in Table 8, which confirms that the selected method is correct and applicable to all other cases with missing direct data on depreciation costs. The average calculated cost-difference ratios are given in Table 9. Ratio calculation is based on the price difference with regard to sales of products of major manufacturers present on the European automotive market: GM, Renault, Hyundai, Ford, VW, Fiat and Mercedes. The luxury cars and specialised cars (e.g. pick-ups) were excluded from the analysis.

Table 9: Price difference among EU automotive markets in relation to Germany

Country	Price difference to German market	Country	Price difference to German market
UK	-0.163615162	HR	-0.01962
CZ	-0.160197444	NL	0.038646
BG	-0.184950457	IE	0.061759
PL	-0.170864565	FR	0.006839
SK	-0.162808265	AT	-0.0194
LV	-0.066118387	LU	0.12868
BE	-0.093909835	HU	-0.06882
ES	-0.094792445	DE	Baseline
SE	-0.074243734	PT	0.162854
IT	-0.083330896	FI	0.297738
EE	-0.110846041	DK	0.581684
GR	-0.083814565		

Notes: The price differential is calculated only for countries for which sufficient data was collected. In subsequent estimates some substitutions are accepted based on average market price levels similarities: data for LT is not available, LV rate is adopted, data for RO is not available, BG rate is adopted, data for SI is not available, HR rate is adopted).
Source: Own estimate based on Carspring, 2017.

The third item of total fraud costs – the environmental damages - is optional. Wherever environmental damage is not accounted for due to the way vkms are being recorded, it is valid to add an environmental damage component to the total odometer fraud cost estimate. For this purpose, environmental damage unit costs specific for national markets obtained from the "*Update of the Handbook on External Costs of Transport"* (Korzhenevych et al., 2014) can be applied.

While the Handbook provides, with very detailed disaggregation of marginal air pollution cost per vkm in regard to type of traffic and vehicle class, only country averages could be used for the purpose of this study. This is because there is no mirroring differentiation by the scale of odometer fraud in urban, suburban and rural traffic areas, nor data on specific numbers of fraudulent vkms in each car class and engine capacity category. One must remember that we are trying to measure illegal activity which is not exhaustively reported in any official statistics. Nevertheless, the country cost differences as established in the Handbook[74] provide a good basis to capture the environmental damage difference between EU countries in cost terms.

The total cost of the odometer fraud can be finally calculated as a combination of the previously established maintenance loss, depreciation loss and optionally environmental damage that was not accounted for. The value of odometer fraud in cross-border transactions is provided for selected EU countries (for which sufficient data was collected) in Table 10. The detailed values from the years 2006 to 2015 are available in the Annex I.

[74] The main document offers only an EU average cost rate. Country specific rates (as provided in this research) can be calculated from country Excel spreadsheets annexed to the Handbook, from EC (EC, 2017).

Table 10: Monetary value of odometer fraud per variants in the selected EU countries in 2014 (million euro)

Country/ Variant	1	2	3	4	5	6	7	8	9
Including depreciation and maintenance costs, excluding emissions									
BE	0.82	2.72	4.90	1.63	5.45	9.81	2.45	8.17	14.71
BG	23.03	46.05	92.10	46.05	92.10	184.20	69.08	138.15	276.31
CZ	50.96	235.71	471.42	101.93	471.42	942.83	152.89	707.13	1414.25
DK	20.43	34.06	51.09	40.87	68.11	102.17	61.30	102.17	153.26
DE	58.66	654.03	1173.14	117.31	1308.05	2346.28	175.97	1962.08	3519.42
EE	11.70	51.21	102.41	23.41	102.41	204.83	35.11	153.62	307.24
IR	2.93	14.66	36.66	5.87	29.33	73.32	8.80	43.99	109.97
EL	6.87	15.27	30.53	13.74	30.53	61.06	20.61	45.79	91.59
ES	19.86	39.71	79.42	39.71	79.42	158.84	59.57	119.13	238.27
FR	14.40	143.97	311.69	28.79	287.94	623.39	43.19	431.91	935.08
HR	12.81	42.69	85.38	25.62	85.38	170.76	38.42	128.07	256.15
IT	2.70	7.72	15.45	5.41	15.45	30.89	8.11	23.17	46.33
LV	26.54	117.93	235.87	53.07	235.87	471.73	79.61	353.80	707.60
LT	86.60	384.90	769.81	173.21	769.81	1539.61	259.81	1154.71	2309.42
LU	1.55	15.54	31.07	3.11	31.07	62.14	4.66	46.61	93.21
HU	73.77	147.54	295.09	147.54	295.09	590.18	221.32	442.63	885.26
NL	16.88	168.82	225.10	33.76	337.64	450.19	50.65	506.46	675.29
PL	592.46	1579.89	3159.79	1184.92	3159.79	6319.57	1777.38	4739.68	9479.36
PT	16.55	49.64	124.09	33.09	99.27	248.18	49.64	148.91	372.28
RO	180.69	451.72	903.44	361.37	903.44	1806.87	542.06	1355.15	2710.31
SK	77.16	154.33	308.65	154.33	308.65	617.30	231.49	462.98	925.95
FI	4.67	10.90	21.80	9.34	21.80	43.60	14.01	32.70	65.40
SE	3.07	6.93	13.86	6.14	13.86	27.72	9.21	20.79	41.57
UK	4.89	8.16	20.39	9.79	16.31	40.77	14.68	24.46	61.16
Total	1310.00	4384.09	8563.12	2620.00	8768.17	17126.25	3930.00	13152.26	25689.37
Including depreciation and maintenance costs, and including emissions									
BE	0.86	2.87	5.17	1.72	5.74	10.34	2.58	8.61	15.50
BG	24.49	48.98	97.95	48.98	97.95	195.90	73.46	146.93	293.85
CZ	54.46	251.87	503.73	108.92	503.73	1007.46	163.37	755.60	1511.19
DK	20.85	34.75	52.12	41.70	69.50	104.24	62.55	104.24	156.37
DE	62.28	694.39	1245.55	124.56	1388.78	2491.09	186.83	2083.17	3736.64
EE	12.09	52.89	105.77	24.18	105.77	211.54	36.26	158.66	317.31
IR	3.02	15.09	37.71	6.03	30.17	75.43	9.05	45.26	113.14
EL	7.06	15.70	31.39	14.13	31.39	62.79	21.19	47.09	94.18
ES	20.48	40.95	81.91	40.95	81.91	163.82	61.43	122.86	245.72
FR	15.12	151.20	327.34	30.24	302.39	654.67	45.36	453.58	982.01
HR	13.53	45.08	90.17	27.05	90.17	180.33	40.57	135.25	270.49
IT	2.83	8.08	16.16	5.66	16.16	32.32	8.48	24.24	48.48
LV	27.59	122.61	245.22	55.18	245.22	490.44	82.76	367.83	735.66
LT	90.63	402.79	805.58	181.26	805.58	1611.16	271.88	1208.37	2416.74
LU	1.65	16.48	32.95	3.30	32.95	65.91	4.94	49.43	98.86
HU	79.06	158.11	316.22	158.11	316.22	632.44	237.16	474.33	948.66
NL	17.66	176.55	235.40	35.31	353.10	470.80	52.97	529.65	706.20
PL	630.32	1680.84	3361.68	1260.63	3361.68	6723.36	1890.95	5042.52	10085.04
PT	16.86	50.58	126.44	33.72	101.15	252.88	50.58	151.73	379.31
RO	197.58	493.96	987.92	395.17	987.92	1975.84	592.75	1481.88	2963.76
SK	83.82	167.64	335.27	167.64	335.27	670.54	251.45	502.91	1005.82
FI	4.75	11.09	22.19	9.51	22.19	44.37	14.26	33.28	66.56

Country/ Variant	1	2	3	4	5	6	7	8	9
SE	3.16	7.15	14.29	6.33	14.29	28.58	9.49	21.44	42.87
UK	5.09	8.48	21.20	10.17	16.96	42.39	15.26	25.44	63.59
Total	1395.20	4658.09	9099.32	2790.41	9316.19	18198.63	4185.61	13974.28	27297.95

*Variants as per variants established in Table 7.

Source: Own estimates.

6.4 The likelihood of a particular variant

The Variant 1 representing low odometer fraud rate and low manipulation scale is a lower boundary variant. It is certain that odometer fraud is at least equal to the numbers represented here. For reference purposes, the adequate variant will be the medium-medium scenario (Variant 5). This variant is still conservative, but accounts for odometer fraud ratios which are likely happen in real life. Further, the used odometer manipulation rates represent the most probable scenario. For this combination of manipulation and fraud rates, economic loss is estimated to be at 8 768 billion euro across EU not accounting for the optional emissions component (if emissions are included it is 9 316 billion euro).

High fraud rate scenarios (Variants 3, 6, 9) should only be applied to the EU-12 countries with high import volumes from the EU-15. Those variants represent the highest prevalence of odometer fraud as reported by the evidence gathered, and might result in an overestimation if applied across all Member States.

Chapter 3 Policy options at the EU level for eliminating odometer fraud from the European Union cross-border car trade

Key findings

- There are three approaches to fight odometer fraud given the EU political and institutional setup:
  - Option 1 - establishment of national odometer reading registration and certification systems which would enable data exchange between countries,
  - Option 2 - improving the technical design of odometers which would make odometer manipulation technically difficult,
  - Option 3 - improving law enforcement by active control of car sale deals.
- While for each option there are some legal or practical barriers to overcome:
  - Option 1 presents the most favourable cost/benefit ratios
  - Option 2 is likely to eradicate odometer fraud in a more long-term scenario (a 15-20 year horizon).
  - Option 3 will require a significant strengthening of enforcement authoritie's staff.

I - Background

Considering the economic loss incurred by odometer fraud in cross-border used car trade, an intervention leading to the reduction of the phenomenon is necessary. The EU has already addressed the robustness of competition in internal car markets, touching upon the problem of odometer fraud in:

- Directive 2014/45/EU of the European Parliament and of the Council of 3 April 2014 on periodic roadworthiness tests for motor vehicles and their trailers, which addresses, inter alia, the problem of odometer fraud.
- Directive 2014/46/EU of the European Parliament and of the Council of 3 April 2014 amending Council Directive 1999/37/EC on registration documents for vehicles.
- Directive 2014/47/EU of the European Parliament and of the Council of 3 April 2014 on the technical roadside inspection of the roadworthiness of commercial vehicles circulating in the Union and repealing Directive 2000/30/EC.
- European Commission Regulation (EU) 2017/1151 of June 2017 on type-approval of motor vehicles and on access to vehicle repair and maintenance information.

1.1 The Directive 2014/45/EU

The Directive 2014/45/EU which will only be in effect from 20 May 2018:

- requires that national authorities ensure that the odometer reading is registered during each periodical technical inspection and that it is recorded in a roadworthiness certificate (Article 8(5));
- defines odometer fraud as a punishable offence (Article 8(6)), and
- ensures that the results of the roadworthiness test are notified, or made available electronically to inspecting authorities as soon as possible (Article 8(7)).

1.2 The Directives 2014/46/EU and 2014/47/EU

Directive 2014/46/EU adds the principle of mutual recognition of validity of roadworthiness tests by the Member States (with implied acceptance of odometer reading recorded in the roadworthiness certificate). Directive 2014/47/EU includes a provision stipulating a check involving visual inspection and/or use of an electronic interface to verify whether the odometer has been "obviously manipulated (fraud) to reduce or misrepresent the vehicle's distance record" or not.

1.3 The European Commission Regulation (EU) 2017/1151

Recent European Commission Regulation (EU) 2017/1151 is a step forward because it requires manufacturers to secure odometer reading from tampering (Article 5(3) f, Annex I (2.33).

Nevertheless, the provisions of the abovementioned legal acts are not sufficient to address the cross-border odometer fraud for a number of reasons.

1. Ensuring that odometers readings are collected during technical inspections of the vehicles cannot by itself guarantee the elimination of odometer fraud.
2. The readings need to be recorded, made available on request and performed more frequently than what currently results from technical check intervals.
3. The provision for anti-tampering devices in newly manufactured vehicles is a step forward, but it does not address the problem for cars already produced.
4. Finally, the cross-border nature of odometer fraud calls for intra-EU actions.

Setting up separate national anti-odometer fraud systems in selected Member States only, does not eliminate – as the Belgian and Dutch examples prove – fraud from the cross-border used car trade.

1.4 Options at EU level

Based on the above listed considerations, action at the EU level could include:

- Minimal requirement criteria for anti-odometer fraud measures so that they are similar across all Member States, allowing for comparisons and would ensure unified reporting, and would facilitate their use by customers.
- Definition of broad parameters for national mileage registers, including clarification on how data is to be stored.
- Establishment of a common data format for national registers.

- A process to ensure that odometer related information can be validated by buyers using an easy access point, e.g. internet interface.

The European Parliament has already pointed out that more decisive action was needed, urging the European Commission "to take measures, in cooperation with the Member States, to ensure as well a high level of consumer protection, transparency and safety in the second-hand car market, and to work towards a gradual phasing out of polluting and less safe vehicles; commends its recommendation in the roadworthiness testing regulation to require mileage recording at each test; considers that initiatives such as the 'Car Pass' scheme in Belgium could be encouraged by a European Standard; notes that re-registration procedures for vehicle transfers must also discourage cross border mileage fraud"(EP, 2013).

The European Consumer Centres Network (ECC-Net) report (ECC-Net, 2015) points out that regardless of the fact that odometer tampering is prohibited in 26 European countries, only 10 offer consumers a mechanism allowing them to verify a vehicle's mileage before purchase. In eight cases, the consumer is directed to national mileage registers. Only the Belgian and Dutch system, accentuate the need for the issuance of a mileage certificate at the time of transaction. Incidentally, those two countries have working mileage recording systems which have proven to be efficient in reducing odometer fraud.

The Association of European Vehicle and Driver Registration Authorities (EReg) topic group has also worked on the problem pointing out that any solution should (EReg, 2014a):

- Avoid cost or excessive administrative burden for consumers, the administration and the automotive industry.
- Deal with data protection needs.
- Be able to exchange, between Member States, the mileage history of a vehicle.

In addition, EReg has already suggested that the EUCARIS[75] platform is the most appropriate tool for the exchange of mileage data.

II - Objectives

This section will evaluate the economic impact of different policy options at the EU level in order to effectively reduce odometer fraud.

The three options being analysed are:

- Option 1 – The creation of compatible national odometer reading registration systems mirroring solutions implemented by Belgian Car-Pass but allowing for cross-border information exchange.
- Option 2 – Improve technical design of odometers in order to make odometer manipulation technically difficult.

[75] EUCARIS is the EUropean CAR and driving license Information System, an exchange mechanism that connects the Vehicle and Driving Licence Registration Authorities in Europe developed in order to share vehicle and driving licence information and other transport related data.

- Option 3 – Better enforcement of law, including increased controls of car dealers / sellers.

It should be noted that Option 1 and Option 2 are among the policy instruments recommended in the recent analysis for the European Parliament regarding the measures preventing odometer tampering (TRT, 2017). Each option costs are calculated and compared to the expected benefits.

III - Methodology

The methodological approach differs across all three options.

3.1 Option 1

Option 1 requires a calculation of the costs necessary to create a Car-Pass like system in other EU countries. The total cost includes the cost of initial investment and yearly maintenance, plus operational costs incurred by system operators.

- Option 1 A addresses the variant in which this is achieved through the issuance of a certificate accompanying the traded car.
- Option 1 B covers separate national systems operating costs only. On top of those, the cost of ensuring cross-border information exchange has to be added.
- Option 1 C checks the costs of connecting all national subsystems under one pan-European electronic data exchange scheme.

The expected benefits are calculated based on the reduction of odometer fraud rates achieved in Belgium after Car-Pass had been introduced.

3.2 Option 2

Option 2 determines the cost of the additional anti-tampering protection measures on odometers.

- Option 2 A estimates the costs in case these additional anti-tampering protection measures are applied to new cars only.
- Option 2 B considers measures included in Option 2A and the necessary replacement of odometers in cars already in the market. This is a one-time operation, however it would involve a high number of vehicles with consequent impacts on costs and on the organisation of the entire process.

Benefits resulting from technical solutions are dependent on their robustness. If technical solutions are very difficult to crack, then almost full elimination of the tampering could be achieved. However, the problem with technical solutions is that every technical advance in the protection of odometers can in time be countered by an advance in the cracking abilities of fraudsters. The probability of this happening is rather high. If we look at the electronic goods market; computer programs are cracked often hours after their official release. Even if the protection is hard to crack, the question is how long will it remain uncrackable? And should it be cracked, should another EU-wide replacement of odometers be called for? Thus, the question of longevity of the obtained benefits could be raised.

3.3 Option 3

In Option 3, the cost of the additional inspections by the police and other control authorities, plus the cost of law enforcement, is considered. As a reference scenario, the US actions in this regard are assessed. The benefits from increased control is certainly less obvious than in Option 1, as some degree of tampering will remain depending on the effectiveness of enforcement bodies and penalties for odometer tampering. Again, the assumption of the tampering rate reduction is deducted from US evidence.

3.4 Research limitations

While making policy recommendations one has to also remember about research limitations. Option 1 is much better rooted in the available data and it was possible to cross-check some patterns adopted in Option 1 with estimates from different points of view. Option 3 is based on mirroring the enforcement case developed in the US. However, the enforcement level observed in the US case, which was used as a blue print for development of the EU case study, has never been of the scale proposed for the EU second-hand car market. In summary, the results obtained under Option 1 are more reliable than the results obtained under Option 3.

Option 3 represents a fitting estimate of the expected costs of intervention but uses extrapolation in order to measure benefits resulting from tighter control of the car market. Option 1 is based on more complete data. Finally, intangible issues should be considered while making recommendations. Measures researched under Option 1 are the only ones that were tested on a large scale and with sufficient time series considered. Those are also the only measures which were actually practically tested in the European environment.

IV - Findings

For each of the identified options, this section presents the costs, the benefits and the existing barriers to the proposed measures.

1. Option 1 – mileage registration system

Costs of Option 1

The cost of a Car-Pass like system includes the **initial investment in system development and its maintenance**. The Car-Pass study (Car-Pass, 2010) is not entirely clear, because it claims that the initial investment would be 1 million euro and subsequent yearly maintenance and investments would be of 3 million euro. However, in another section of the document it is claimed that the 3 million euro figure would include 1 million euro of initial investment.

The Car-Pass study also offers an insight into the perceived cost of similar systems for Germany, France, Luxembourg and the Netherlands. The yearly costs in those calculations are linked to the number of reporting car dealers. While this approach has a lot of merit, it must be said that no system is being operated costless. Moreover, considering only costs for connecting dealer facilities excludes other car workshops which should be included, if checks are to be frequent enough to prevent odometer manipulation.

The total number of workshops across the Member States is very difficult to assess due to insufficient reporting, and it is even more difficult in some EU-12 countries, which have liberal corporate laws under which companies could register with many fields of business interest, while actually later performing only a limited number of economic activities. Relying solely on the number of car sellers cannot be considered a reliable method outside the EU-15 and is also questionable for the EU-15 if recording is to be frequent. Car-Pass figures confronted with data on car park density (ACEA, 2014) allow for calculation of the average cost of the system per one vehicle (Table 11).

Table 11: Average cost of the system per one vehicle

Country	Cost in eurocent
Belgium	0.44
Germany	0.37
France	0.23
Netherlands	0.37
Luxembourg	0.35

Source: Own estimates.

For the purpose of this study, the 0.37 eurocent per vehicle cost in Germany is adopted as a reference figure. The reasons why the German market is critical for the purpose of this study have been mentioned in previous sections.

In the Car-Pass Belgian case, it is assumed that running costs cover automated reading. Under this provision, 3 million euro of running costs per year cover all automated readings. Car-Pass experience tells us that approx. 90 % of all readings are automated and 10 % are processed from faxes or online applications which need further manual recording by the staff. This is estimated to take 30 seconds per reading. The average number of readings per vehicle per year in Belgium is 2.35. Importantly, this number does not mirror purchases. For the system to be reliable it requires readings to be taken more frequently than simply at the time of transaction. The hourly work wage is considered to be 25 euro based on the Belgian example.

The total cost calculation is based on the following relations:

$TSC_j = OAC_j + OMC_j$

Where:

- ✓ TSC_j - total sytem operating costs for country j,
- ✓ OAC_j – total costs of automated readings for country j,
- ✓ OMC_j – total cost of manual readings for country j, and
- ✓ $OMCj = N_j \times V_j \times W_j \times 2$

Where:

- ✓ N_j is the average number of readings per year per vehicle for country j,

- ✓ V_j is the number of vehicles in j country's fleet,
- ✓ W_j is the hourly wage in country j in euro.

The same assumptions used for the Belgian case are used for the EU-wide estimate. (i.e. 90 % automated recording, 10% manual recording, and 30 seconds processing time). There is no basis to believe that other national systems mirroring the Belgian one would work differently.

Similarly, the number of readings per vehicle is assumed at the Belgian level because there is no evidence to the contrary. It is 2.35 readings times the hourly wage and times two because Car-Pass system assumes an additional check of manually introduced figures. The check requires a similar workload as the initial recording.

The **hourly wage** given by Car-Pass is different than average Belgian wage from Eurostat. The Car-Pass surely knows the costs of issuing a Car-Pass document in Belgium, but for other countries where such a system does not exist, the average hourly wage cost will be applied instead. The cost of the certificate incurred by the customer is not included in the above calculation basis. In Belgium it is currently 7.2 euro (2017) (Car-Pass, 2017) and was 6.35 euro (2010) per certificate. The total certification cost is calculated as unit price (6.35 euro adopted) times the number of cross-border transactions (it is assumed that the certificate will be compulsory for each cross-border purchase). The estimate of all costs of Car-Pass like system for the other EU countries is given in Table 12.

Table 12: Cost of Car-Pass like system for the EU countries in the year 2014 - Option 1 A (euro thousand)

Country	System cost	Country	System cost
BE	2 086	LV	568
BG	1 259	LT	1 505
CZ	2 575	LU	215
DK	1 108	HU	1 779
DE	19 672	NL	3 634
EE	412	PL	12 278
IR	1 051	PT	2 112
EL	1 979	RO	3 232
ES	8 386	SK	1 678
FR	12 834	FI	1 307
HR	771	SE	1 817
IT	13 766	UK	11 918

Note: Costs are calculated for EU countries for which underlying data on cross-border trade was available (see Table 1).
Source: Own estimates.

Another element for discussion is the **cost of the certificate**.

Firstly, there are significant price differences between Member States. The certificate price might vary and be subject to administrative cost, personnel costs and other country-specifics

costs. The instinctive thought is that the certificate price should be lower in the EU-12 than in the EU-15. However, the predominant car trade flows in Europe are from the EU-15 toward the EU-12. While discussing the import certificate, the price will be levied by the certification institution from the car's country of origin.

The Belgian certificate currently costs 7.2 euro and cost 6.35 euro in 2010. These figures look reasonable for other high income EU countries as well as for some EU-12 countries. For the purpose of this study, the certificate price across the EU is considered to be 6.35 euro. Also, for data-related reasons – the knowledge of the main exporters to specific markets is not as detailed as the knowledge about importers. It is the former which is necessary to recognise the certificate's origin. The use of the 6.35 (past) euro instead of 7.2 euro (current) value is dictated by the need to account for a lower price of the certificate in lower-income countries from the EU-15. It is also possible to set a constant Europe-wide price for the certificate, an action which could be agreed at the EU level. But this would be politically more difficult to agree upon as it would require involvement of EU financing.

The original Car-Pass like system is supposedly self-financing. The estimate provided in Table 12 represents both system operators running costs and private user certificate costs yielding **107.9 million euro** at EU-level. In the Belgian setup certificates fees finance the operating costs of the system. If we deduct the certificate purchase costs (private user costs) from the total costs, the operating only costs will appear as in Table 13, yielding together **91.7 million euro** at EU-level.

Table 13: Operating cost of Car-Pass like system excluding user costs - Option 1 B (euro thousand)

Country	System cost	Country	System cost
BE	2 056	LV	250
BG	1 117	LT	467
CZ	1 811	LU	146
DK	891	HU	1 164
DE	16 715	NL	3 088
EE	247	PL	7 523
IR	772	PT	1 753
EL	1 895	RO	1 836
ES	8 165	SK	749
FR	12 114	FI	1 186
HR	552	SE	1 709
IT	13 724	UK	11 721

Note: Costs are calculated for EU countries for which underlying data on cross-border trade was available (see Table 1).
Source: Own estimates.

In addition, one must remember that the system will also serve domestic transactions which are excluded from this calculation and should be treated as an additional unaccounted-for benefit. The system cannot be built for the cross-border functionality only, the total costs

represent the costs of a system capable of dealing with internal as well as cross-border odometer fraud.

The national systems, working separately but in a coordinated way, seem to offer sufficient internal efficiency to combat odometer fraud. However, in order to eliminate odometer fraud from cross-border transactions, the information collected through national systems has to follow the car. Some data exchange has to be ensured, which is not inherent in the national systems operating independently. One solution could be a certificate as discussed under Option 1A, another would be the creation of an additional information exchange system on top of the national systems binding those systems into one (Option 1C).

The Feasibility study on the Vehicle Information Platform (VIP) (Poele et al., 2014) provides an interesting analysis of the costs and benefits of different options for ensuring car-related data exchange on European level.

The four evaluated solutions are:

- Solution 1: All use cases are implemented in EUCARIS only.
- Solution 2: All use cases are implemented in the European Register of Road Transport Undertakings (ERRU) only.
- Solution 3: All use cases are implemented in ERRU and connectivity with EUCARIS is maintained.
- Solution 4: New system implementing VIP-Member States.

The costs for all four variants are given in number of person-months representing necessary workload to achieve objectives and according to Poele et al., 2014 are:

- Solution 1 – 1 593.
- Solution 2 – 1 770.
- Solution 3 – 1 660.
- Solution 4 – 1 693.

Considering the EReg claims that the EUCARIS platform is the most suitable to connect odometer registers and also because taking into account the fact that an existing infrastructure of EUCARIS can be reused. Based on that, it is assumed that the lowest cost variant from the four above solutions will be applied for the purpose of the current research. Translating those workloads into monetary values and applying wage costs as discussed previously within this research yields a total **additional cost of 5.2 million euro**. This is an additional cost on top of the cost calculated under Option 1 B (91.7 million euro) and yields Option 1 C - **96.9 million euro**.

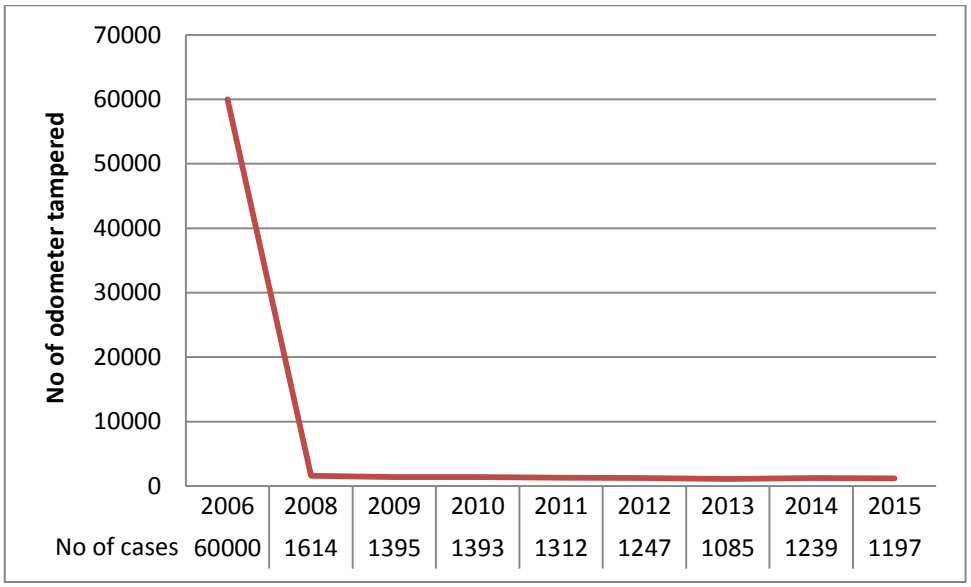
Comparing all three sub-options of Option 1, the **cost values** would be for:

- Option 1A – **107.9 million euro**,
- Option 1B – **91.7 million euro**, and
- Option 1C – **96.9 million euro**.

Benefits of Option 1

Benefits in Option 1 are assumed to be of the magnitude of what was achieved in the blue-print case of Car-Pass in Belgium. It is worth noticing that the Belgian system almost instantly eliminated the majority of fraud and since then the number of uncovered cases of odometer tampering are constant and low (Figure 5).

Figure 5: Efficiency of Belgian Car-Pass system



Source: PWC, 2016.

For the purpose of this study there is no reason to assume a different success rate for the rest of the EU countries. The **reduction in odometer fraud** observed in Belgium is of the magnitude of **97 %**. Variants of benefits resulting from the adoption of Option 1 are given in Table 14. In the case the emissions component is not considered (as per the methodology discussion in Chapter 2) the first part of the table applies. In the case emissions are part of the calculation, the second part of the table is applicable.

Benefits per year for EU Member States total under the most probable Variant 5 – **8.51 billion euro** (in the case emissions are included, it would be around 9.04 billion euro). The majority of benefits come from the EU-12, where the reduction in odometer fraud would be the most radical.

Table 14: Benefits under Option 1 for reference year 2014 (million euro)

Country/ Variant*	1	2	3	4	5	6	7	8	9
Without emissions component									
BE	0.79	2.64	4.76	1.59	5.28	9.51	2.38	7.93	14.27
BG	22.33	44.67	89.34	44.67	89.34	178.68	67.00	134.01	268.02
CZ	49.44	228.64	457.27	98.87	457.27	914.55	148.31	685.91	1371.82
DK	19.82	33.04	49.55	39.64	66.07	99.11	59.46	99.11	148.66
DE	56.90	634.41	1137.95	113.79	1268.81	2275.89	170.69	1903.22	3413.84
EE	11.35	49.67	99.34	22.71	99.34	198.68	34.06	149.01	298.02
IR	2.84	14.22	35.56	5.69	28.45	71.12	8.53	42.67	106.67
EL	6.66	14.81	29.61	13.33	29.61	59.23	19.99	44.42	88.84
ES	19.26	38.52	77.04	38.52	77.04	154.08	57.78	115.56	231.12
FR	13.96	139.65	302.34	27.93	279.30	604.68	41.89	418.95	907.03
HR	12.42	41.41	82.82	24.85	82.82	165.64	37.27	124.23	248.46
IT	2.62	7.49	14.98	5.24	14.98	29.96	7.87	22.47	44.94
LV	25.74	114.39	228.79	51.48	228.79	457.58	77.22	343.18	686.37
LT	84.00	373.36	746.71	168.01	746.71	1493.42	252.01	1120.07	2240.13
LU	1.51	15.07	30.14	3.01	30.14	60.28	4.52	45.21	90.42
HU	71.56	143.12	286.24	143.12	286.24	572.47	214.68	429.35	858.71
NL	16.38	163.76	218.34	32.75	327.51	436.68	49.13	491.27	655.03
PL	574.69	1532.50	3064.99	1149.37	3064.99	6129.99	1724.06	4597.49	9194.98
PT	16.05	48.15	120.37	32.10	96.30	240.74	48.15	144.44	361.11
RO	175.27	438.17	876.33	350.53	876.33	1752.66	525.80	1314.50	2629.00
SK	74.85	149.70	299.39	149.70	299.39	598.78	224.54	449.09	898.17
FI	4.53	10.57	21.15	9.06	21.15	42.29	13.59	31.72	63.44
SE	2.98	6.72	13.44	5.95	13.44	26.88	8.93	20.16	40.33
UK	4.75	7.91	19.78	9.49	15.82	39.55	14.24	23.73	59.33
Total**	1 270.7	4 252.56	8 306.23	2 541.4	8 505.13	16 612.46	3 812.1	12 757.7	24 918.69
Total EU-15	169.05	1 136.95	2 075	338.1	2 273.9	4 150.00	507.15	3 410.85	6 225.01
Total EU-12	1 101.65	3 115.61	6 231.23	2 203.3	6 231.32	12 462.45	3 304.95	9 346.84	18 693.68
Including emissions component									
BE	0.84	2.79	5.01	1.67	5.57	10.03	2.51	8.36	15.04
BG	23.75	47.51	95.01	47.51	95.01	190.02	71.26	142.52	285.04
CZ	52.82	244.31	488.62	105.65	488.62	977.24	158.47	732.93	1465.86
DK	20.22	33.71	50.56	40.45	67.41	101.12	60.67	101.12	151.68
DE	60.41	673.56	1208.18	120.82	1347.12	2416.36	181.23	2020.68	3624.54
EE	11.73	51.30	102.60	23.45	102.60	205.20	35.18	153.90	307.79
IR	2.93	14.63	36.58	5.85	29.27	73.16	8.78	43.90	109.75
EL	6.85	15.23	30.45	13.70	30.45	60.90	20.56	45.68	91.36

Country/ Variant*	1	2	3	4	5	6	7	8	9
ES	19.86	39.73	79.45	39.73	79.45	158.90	59.59	119.18	238.35
FR	14.67	146.66	317.52	29.33	293.32	635.03	44.00	439.98	952.55
HR	13.12	43.73	87.46	26.24	87.46	174.92	39.36	131.19	262.38
IT	2.74	7.84	15.67	5.49	15.67	31.35	8.23	23.51	47.02
LV	26.76	118.93	237.86	53.52	237.86	475.73	80.28	356.80	713.59
LT	87.91	390.71	781.41	175.82	781.41	1562.82	263.73	1172.12	2344.24
LU	1.60	15.98	31.96	3.20	31.96	63.93	4.79	47.95	95.89
HU	76.68	153.37	306.73	153.37	306.73	613.46	230.05	460.10	920.20
NL	17.13	171.25	228.34	34.25	342.51	456.68	51.38	513.76	685.01
PL	611.41	1630.42	3260.83	1222.81	3260.83	6521.66	1834.22	4891.25	9782.49
PT	16.35	49.06	122.64	32.71	98.12	245.29	49.06	147.17	367.93
RO	191.66	479.14	958.28	383.31	958.28	1916.57	574.97	1437.42	2874.85
SK	81.30	162.61	325.21	162.61	325.21	650.43	243.91	487.82	975.64
FI	4.61	10.76	21.52	9.22	21.52	43.04	13.83	32.28	64.56
SE	3.07	6.93	13.86	6.14	13.86	27.72	9.21	20.79	41.58
UK	4.93	8.22	20.56	9.87	16.45	41.12	14.80	24.67	61.68
Total	1 353.35	4 518.35	8 826.34	2 706.69	9 036.7	17 652.67	4 060.04	13 555.05	26 479.01
Total EU-15	176.21	1 196.34	2 182.32	352.42	2 392.68	4 364.63	528.63	3 589.02	6 546.94
Total EU-12	1 177.14	3 322.01	6 644.02	2 354.28	6 644.02	13 288.04	3 531.41	9 966.03	19 932.07

*Variants as per variants established in Table 7, **excluding MT, SI, CY, AT for which underlying data was not available.
Source: Own estimates.

Barriers to the measures proposed under Option 1

The governments of the EU are increasingly relying on e-services in the area of data collection. This should naturally reinforce the drive to automate the reporting of odometer data. Yet, with all processed data, the question of personal data and sensitive data arises. The personal data definition is broad in the EU legal framework under Article 2 of the Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data. “Personal data” shall mean any information relating to an identified or identifiable natural person (EP, 1995).[76]

In other words, any data which allows for singling out a specific person might be considered personal and under legal protection. The natural pan-European platform for odometer data exchange will most likely be built upon a system of vehicle registration information exchange and/or a system gathering information from the technical checks of vehicles. In most cases, it would include not only the vehicle specifications but also the car owner’s name, falling into the category of personal data. But even vehicle information with no direct link to a person is often considered as sensitive information which requires a more careful exchange.

[76] The legal basis for *personal data* definition will change in May 2018 with the entry into force of the Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data but the definition remains the same.

Odometer reading data should not fall under the sensitive personal data category as the latter, according to the definition of Directive 95/46/EC (Article 9), includes only "personal data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership, and the processing of genetic data, biometric data for the purpose of uniquely identifying a natural person, data concerning health or data concerning a natural person's sex life or sexual orientation". But the EReg consultation (EReg, 2014) reveals that in some countries even simple external reporting of mileage data could be problematic due to the legal setup or public opposition, including in Germany.

Furthermore, in any cross-border exchange of odometer related data, information other than the odometer reading has to be passed on to make the odometer reading meaningful. For instance, the vehicle identification number (VIN) is considered as sensitive information by 53 % of the Member States (Poele et al., 2014). The cross-border nature of transactions will require passing vehicle data to external entities. National systems are often a more easily acceptable option to the public. But national systems are separate. The prevention of cross-border odometer fraud requires realistic measures to report vehicle data to other country authorities, while ensuring protection of personal data and sensitive information.

However, the entire complex and questionable data exchange system could be replaced with legislation on the issuance of a compulsory, standardised certificate for any cross-border car sale. Then the certificate would follow the car. It would require certain data disclosure which might be subject to a heated debate about privacy. After all, the certificate will inform the buyer about the driving customs of the seller (number of vkms driven per year can be derived from it). Some would argue that sellers whose mileage indicates that they travel often might thus become more vulnerable to thievery. But the certificate could be very simplistic with only basic information connecting the odometer reading to the car in question, a solution which should address most of the privacy concerns.

2. Option 2 - technical solution

Costs of Option 2

An alternative to the Car-Pass like system is an odometer which cannot be tampered with due to special technical protection. Odometers nowadays are electronic devices. Mileage is often also recorded in other electronic components of the vehicle. However, because of the need to ensure interoperability, often systems are accessible from the computer connected to the car's central information processing unit. If we assume that the single objective is odometer protection, then the additional cost of producing tamper-proof odometers must be considered.

An available estimate of the additional cost of an anti-tamper odometer is 1 euro per unit (FIA, 2014). This seems to be a reasonably cheap solution to install new odometers in all newly manufactured cars (Option 2A). Moreover, the cost will be associated with future purchases and absorbed in full by either manufacturers or buyers. However, this move will not eliminate the problem with older vehicles. Odometers must be replaced in all cars already in use. The

cost (Option 2B) of this operation ranges from as low as 50 euro per unit, to as much as 400 euro per unit. For the purpose of this study, the cost is assumed to be 80 euro, including the cost of parts and the necessary workload. This is a rough estimate taken from the websites on spare parts and car repair shops' working hour prices (Peachparts, 2017; Odometergears, 2017; Autobahnlogic, 2017)[77].

Replacement is very car make-dependent and could require less or more time. The cost of parts will range from as little as 30 euro to as much as 180 euro. This is, however, a one-time investment. Table 15 shows the cost of a one-time odometer replacement in the EU if conducted in 2015 (the last year that full data on the composition of vehicle fleet in EU countries is available).

Table 15: Cost of odometer replacement in the EU (unit: euro million)

Country	Option 2 A: Tamper -proof odometers in **new vehicles**	Option 2 B: Replacement of odometers in **existing fleet of vehicles**
BE	0.483	444.44
BG	0.021	241.11
CZ	0.192	386.67
DK	0.189	186.76
DE	3.037	3 552.24
EE	0.021	52.24
IR	0.096	161.47
EL	0.071	408.87
ES	0.855	1 762.36
FR	1.796	2 602.48
HR	0.034	117.92
IT	1.361	2 966.46
LV	0.012	52.62
LT	0.014	96.45
LU	0.050	29.83
HU	0.067	248.62
NL	0.388	655.44
PL	0.325	1 600.31
PT	0.143	375.97
RO	0.070	392.64
SK	0.072	155.93
FI	0.106	253.82
SE	0.304	366.78
UK	2.476	2 530.99
Total	12.185	1 9642.40

Source: Own estimates.

Given the staggering required operation cost of Option 2B - **19.64 billion euro EU-wide**, the easier approach would be to wait until old vehicles are scrapped. However, this would mean that a significant proportion of odometer fraud will be accepted for the next 15-20 years until

vehicles without anti-tampering devices are finally removed from the market. In addition, simply replacing the odometer might not be so easy in cars produced more recently, which tend to store mileage information in several electronic components at least. Whether those could be easily reprogrammed (software only problem) or not and would they require a replacement (hardware problem), depends on a particular car make and is therefore an additional unknown.

The replacement cost is the only substantial cost under Option 2. What remains is the cost of an anti-tampering device in new odometers. The calculation of this component is made on the basis of new registrations (data from ACEA) times the cost of 1 euro. Considering new car registrations in the EU in the reference year 2014 - Option 2A -, this expenditure will only total **12.2 million euro**. The calculation assumes that only the odometer unit needs to be protected, and other car units which also store mileage information are left without anti-tampering devices. This would be acceptable if one assumes that the anti-tampering solution will protect the odometer and that no other units would need to be protected. And if odometer protection can be cracked, so can potential protections in other car elements.

The International automobile federation (FIA) points out (FIA, 2014b) that since the United Nations Economic Commission for Europe (UNECE) Regulation 18 on anti-theft of motor vehicles, systems such as Secure Hardware Extension (SHE) or Hardware Secure Module (HSM) are fitted in vehicles. They contain cryptographic keys that block unauthorised access, which shows that vehicle manufacturers already have the necessary tools to implement protection into the odometer unit. Similar systems are applied in order to secure credit cards. SHE and HSM components can be used in odometer protection saving on costs of protection implementation. Similarly, software which provides protection in anti-theft devices is already installed in the car. It is a simple technical task to reengineer it and apply it to odometers.

Benefits of Option 2

The benefits of Option 2 are not fully traceable. If the anti-tampering system is unbreakable the odometer fraud is fully eliminated. If it is broken only incidentally it would be safe to assume a 90 % odometer elimination rate. Otherwise, it is only a matter of additional cost for the fraudster. This cost will probably be very low. While initial effort to break the system will be likely time and resource consuming for the fraudster, once the system is cracked, the cracked protection will be easily removed. There is plenty of evidence from software markets where electronic protection can be removed almost costless in copies and the only effort for crackers comes from the initial “investment” (rather in time than in money).

Another viable evidence is that observed from credit card fraud. Modern credit card chips use a similar technology to technology advocated for use in the protection of odometer units. However, statistics comparing cards stolen vs cards later cracked are not available and cannot be used as reference data. Some countries have deployed a technology standard based on the chip protection of the credit card, enjoying a 70 % decrease in counterfeit fraud (e.g., the U.K between the years 2005 and 2013) (Barclays, 2015). Based on that data, it is assumed that there could be an optimistic 70 % reduction in odometer fraud for Option 2. The expected benefits corresponding to this assumption are shown in Table 16.

The **average** across all variants yields **benefits of 6.7 billion euro** (excluding emissions) or 7.1 billion euro (including emissions). For the **most probable variant**, Variant 5, the **benefits are 6.1 billion euro** (no emissions included) and 6.5 billion euro (emissions included).

Table 16: Benefits under Option 2 for reference year 2014 (million euro)

Country/Variant*	1	2	3	4	5	6	7	8	9
Excluding emissions component									
BE	0.57	1.91	3.43	1.14	3.81	6.87	1.72	5.72	10.30
BG	16.12	32.24	64.47	32.24	64.47	128.94	48.35	96.71	193.41
CZ	35.68	165.00	329.99	71.35	329.99	659.98	107.02	494.99	989.98
DK	14.30	23.84	35.76	28.61	47.68	71.52	42.91	71.52	107.28
DE	41.06	457.82	821.20	82.12	915.64	1642.40	123.18	1373.45	2463.60
EE	8.19	35.85	71.69	16.39	71.69	143.38	24.58	107.53	215.07
IR	2.05	10.26	25.66	4.11	20.53	51.32	6.16	30.79	76.98
EL	4.81	10.69	21.37	9.62	21.37	42.74	14.43	32.06	64.11
ES	13.90	27.80	55.60	27.80	55.60	111.19	41.70	83.39	166.79
FR	10.08	100.78	218.19	20.16	201.56	436.37	30.23	302.34	654.56
HR	8.97	29.88	59.77	17.93	59.77	119.54	26.90	89.65	179.30
IT	1.89	5.41	10.81	3.78	10.81	21.62	5.68	16.22	32.43
LV	18.57	82.55	165.11	37.15	165.11	330.21	55.72	247.66	495.32
LT	60.62	269.43	538.86	121.24	538.86	1 077.73	181.87	808.30	1616.59
LU	1.09	10.88	21.75	2.18	21.75	43.50	3.26	32.62	65.25
HU	51.64	103.28	206.56	103.28	206.56	413.12	154.92	309.84	619.68
NL	11.82	118.18	157.57	23.64	236.35	315.13	35.45	354.53	472.70
PL	414.72	1 105.93	2 211.85	829.44	2 211.85	4 423.70	1 244.17	3 317.78	6 635.55
PT	11.58	34.75	86.86	23.16	69.49	173.73	34.75	104.24	260.59
RO	126.48	316.20	632.41	252.96	632.41	1 264.81	379.44	948.61	1 897.21
SK	54.01	108.03	216.06	108.03	216.06	432.11	162.04	324.08	648.17
FI	3.27	7.63	15.26	6.54	15.26	30.52	9.81	22.89	45.78
SE	2.15	4.85	9.70	4.30	9.70	19.40	6.44	14.55	29.10
UK	3.43	5.71	14.27	6.85	11.42	28.54	10.28	17.13	42.81
Total**	917.00	3 068.86	5 994.19	1 834.00	6 137.72	11 988.37	2 751.00	9 206.58	17 982.56
Total EU-15	122.00	820.48	1497.42	243.99	1 640.96	2 994.85	365.99	2 461.44	4 492.27
Total EU-12	795.01	2 248.38	4 496.76	1 590.01	4 496.76	8 993.52	2 385.01	6 745.14	13 490.29
Including emissions component									
BE	0.60	2.01	3.62	1.21	4.02	7.24	1.81	6.03	10.85
BG	17.14	34.28	68.57	34.28	68.57	137.13	51.42	102.85	205.70
CZ	38.12	176.31	352.61	76.24	352.61	705.22	114.36	528.92	1057.84
DK	14.59	24.32	36.49	29.19	48.65	72.97	43.78	72.97	109.46
DE	43.59	486.07	871.88	87.19	972.15	1 743.76	130.78	1 458.22	2 615.65
EE	8.46	37.02	74.04	16.92	74.04	148.08	25.39	111.06	222.12

Country/Variant*	1	2	3	4	5	6	7	8	9
IR	2.11	10.56	26.40	4.22	21.12	52.80	6.34	31.68	79.20
EL	4.95	10.99	21.98	9.89	21.98	43.95	14.83	32.96	65.93
ES	14.33	28.67	57.34	28.67	57.34	114.67	43.00	86.00	172.01
FR	10.58	105.84	229.14	21.17	211.67	458.27	31.75	317.51	687.41
HR	9.47	31.56	63.12	18.94	63.12	126.23	28.40	94.67	189.35
IT	1.98	5.66	11.31	3.96	11.31	22.62	5.94	16.97	33.93
LV	19.31	85.83	171.65	38.62	171.65	343.31	57.93	257.48	514.96
LT	63.44	281.95	563.91	126.88	563.91	1127.81	190.32	845.86	1691.72
LU	1.15	11.53	23.07	2.31	23.07	46.13	3.46	34.60	69.20
HU	55.34	110.68	221.35	110.68	221.35	442.71	166.02	332.03	664.06
NL	12.36	123.59	164.78	24.72	247.17	329.56	37.08	370.76	494.34
PL	441.22	1176.59	2353.18	882.44	2353.18	4706.35	1323.66	3529.77	7059.53
PT	11.80	35.40	88.51	23.60	70.81	177.01	35.40	106.21	265.52
RO	138.31	345.77	691.54	276.62	691.54	1383.09	414.93	1037.32	2074.63
SK	58.67	117.35	234.69	117.35	234.69	469.38	176.02	352.04	704.07
FI	3.33	7.77	15.53	6.66	15.53	31.06	9.98	23.30	46.59
SE	2.22	5.00	10.00	4.43	10.00	20.01	6.65	15.00	30.01
UK	3.56	5.94	14.84	7.12	11.87	29.67	10.68	17.81	44.51
Total (excluding CY, SI, AT, MT)	976.64	3 260.67	6 369.52	1 953.29	6 521.33	12 739.04	2 929.93	9 782.00	19 108.56
Total EU-15	127.16	863.34	1 574.87	254.32	1 726.68	3 149.73	381.48	2 590.01	4 724.60
Total EU-12	849.48	2 397.33	4 794.66	1 698.96	4 794.66	9 589.31	2 548.44	7 191.98	14 383.97

*Variants as per variants established in Table 7, **excluding MT, SI, CY, AT for which underlying data was not available.
Source: Own estimates.

Barriers to the measures proposed under Option 2

As with every technical solution, counters to the technology exist. The protection can be cracked and the odometer anti-tampering device made obsolete. One can argue that credit cards are protected by a similar mechanisms and although they can be cracked, we still continue to use the mechanisms. Similarly, car internal anti-theft systems are also protected. However an important consideration is being missed. If the owner of a credit card loses their card, any card-cracking action is being made without his knowledge and a prior act of theft had to occur.

The same applies to anti-theft systems. However, with odometer tampering, it is the owner who is actively seeking to tamper it. There is a time limit with a stolen credit card or car. Thieves and crackers need to break the protection in a limited timeframe. With odometer tampering, there is unlimited time to work on cracking the odometer.

Besides, as pointed out by an expert from the International Organization of Motor Vehicle Manufacturers (UNECE, 2015a) in position to the FIA proposal on protecting odometers with anti-tampering devices, reverting to ISO standards would bring private standards into industry, forcing it to authorise laboratories, buy standards and train people in using them.

The ISO systems which can be applied are primarily certified to electronic cash and might not work well in the automotive context.

Finally, the case of odometer breakdown has to be addressed. An honest user trying to replace this part will face critical barriers, the whole replacement will be costly and very time-consuming, because it is unlikely that technology will be passed on to any garage, rather that a visit to manufacturer's workshop will be compulsory.

3. Option 3 – improved enforcement

The third option assumes that the authorities will more actively enforce measures to address odometer fraud, including police raids on suspicious dealers and workshops, strict enforcement of odometer checks during periodical technical inspection, etc.

Costs of Option 3

The cost of these measures is based upon the costs incurred by the US road transport authorities in their campaign against odometer fraud. It has to be noted that US efforts were limited and did not achieve any breakthroughs. But the US programme allows for the allocation of the cost of active action, a cost which can then be extrapolated into an all-out active enforcement programme. The cost of US odometer fraud fight programme based on increased enforcement was: USD 154 thousand in 2014, USD 140 thousand in 2015, and USD 254 thousand in 2016 (NHTSA, 2016). Afterwards, those figures were considered largely inadequate.

From the year 2002, the average yearly expenditure for odometer fraud prevention was around a steady 150 thousand USD. The administrative unit of the National Highway Traffic Safety Administration (NHTSA) responsible for fighting odometer fraud comprised only eight people, who had to cover the whole territory of the US. The additional state oriented aid to fight odometer fraud was USD 150 thousand per annum. In other words, the measures were weak and the results correspondingly insufficient. Table 17 summarises the US road administration's effort to actively reduce odometer fraud.

The NHTSA's prime weapon to deter odometer fraud is its power to investigate cases and refer them to the Department of Justice (DOJ) for prosecution. The data in Table 16 shows the total number of cases investigated for the period between 1990 and 2001 and from the time the odometer fraud unit was established (1978). According to NSHTA, an average odometer fraud investigation takes about a year to complete. Those are complex operations with the number of vehicles involved per case appearing to increase from year to year. In the later years of its operation, NSHTA concentrated on bigger cases. For a case to be prosecuted by the DOJ it has to involve at least 100 vehicles or show a pattern of fraud by the defendant. The DOJ needs about two years to fully prosecute a case.

The table 17 shows that on average, 80 % of all cases are complete, which is a success. The problem lies with the limited resources channelled into the system and in the incidental

enforcement. The odometer fraud unit simply lacks manpower and the financial capacity to decisively influence odometer fraud rates.

Table 17: NHTSA effort to combat odometer fraud in US

Year	Investigations		Vehicles involved	Vehicles per case	Referred to Department of Justice	Percent referred	Number of Cases prosecuted	Defendants convicted
	Opened	Completed						
1990	69	38	320	88.4	21	55 %	13	16
1991	63	25	717	28.7	23	92 %	18	18
1992	36	22	1 563	71	20	91 %	12	17
1993	22	12	105	8.8	9	75 %	5	6
1994	37	39	2 274	58.3	34	87 %	23	23
1995	38	26	1 468	56.5	21	81 %	16	26
1996	26	14	852	60.9	9	64 %	9	16
1997	26	9	730	81.1	9	100 %	3	3
1998	33	14	1 006	71.9	9	64 %	7	7
1999	17	14	1 707	121.9	14	100 %	4	3
2000	20	17	1 831	107.7	14	82 %	1	1
2001	5	3	233	77.7	2	67 %	1	2
Total 90-01	392	233	12 806		185		112	138
Total 78-01	2 038	997	16 538		352		230	265

Source: NHTSA, 2002.

Based on Table 17, it could be calculated that the average cost per one investigation is USD 1 359 (using EUR/USD exchange rate of 1.18, it is 1 604 euro). The open question, as nobody has tested it, is how many cases per year such an agency should prosecute in order to make odometer tampering a high-risk profession. For the purpose of the cost/benefit calculation in the current research, a 20 % enforcement rate will be applied.

The cost of action for an EU-wide campaign under other thresholds is provided in Table 18. Assuming the number of car dealers and repair workshops in the EU is 380 000 (those represent companies associated in the European Council for Motor Trades and Repairs - CECRA) (CECRA, 2014) the cost for an EU-wide campaign with a 20 % control rate would be 12.2 million euro annually.

Table 18: The cost of direct action (million euro per year)

Percentage of investigations	Number of companies investigated	Total cost (euro)
10 %	38 000	6.1
20 %	76 000	12.2
Percentage of investigations	Number of companies investigated	Total cost (euro)
30 %	11 400	18.3
40 %	15 200	24.4
50 %	19 000	30.5

Source: Own estimates.

Benefits of Option 3

The direct benefits of Option 3 are very difficult to predict. The US enforcement efforts have never been carried out on a mass-scale. The reduction in odometer fraud should result from fear of efficient authorities' action. The number of cases prosecuted in the US is simply too low to observe any meaningful effect. For the purpose of this study, it is assumed that with enforcement campaign of a 20 % control rate, an 80 % reduction in fraud rate might be expected.

The benefits resulting from Option 3 under those assumptions are calculated in Table 19. They are estimated on the average across all variants at 7.6 billion euro (excluding emissions) or 8.1 billion euro (including emissions). For the most probable Variant 5 the figures are: 7 billion euro (emissions excluded) and 7.5 billion euro (emissions included).

Table 19: Benefits under Option 3 for reference year 2014 (million euro)

Country	1	2	3	4	5	6	7	8	9
Excluding emissions component									
BE	0.65	2.18	3.92	1.31	4.36	7.85	1.96	6.54	11.77
BG	18.42	36.84	73.68	36.84	73.68	147.36	55.26	110.52	221.05
CZ	40.77	188.57	377.13	81.54	377.13	754.27	122.31	565.70	1 131.40
DK	16.35	27.25	40.87	32.70	54.49	81.74	49.04	81.74	122.61
DE	46.93	523.22	938.51	93.85	1 046.44	1 877.03	140.78	1 569.66	2 815.54
EE	9.36	40.97	81.93	18.73	81.93	163.86	28.09	122.90	245.79
IR	2.35	11.73	29.33	4.69	23.46	58.65	7.04	35.19	87.98
EL	5.50	12.21	24.42	10.99	24.42	48.85	16.49	36.64	73.27
ES	15.88	31.77	63.54	31.77	63.54	127.08	47.65	95.31	190.61
FR	11.52	115.18	249.35	23.04	230.35	498.71	34.55	345.53	748.06
HR	10.25	34.15	68.31	20.49	68.31	136.61	30.74	102.46	204.92
IT	2.16	6.18	12.36	4.33	12.36	24.71	6.49	18.53	37.07
LV	21.23	94.35	188.69	42.46	188.69	377.39	63.68	283.04	566.08
LT	69.28	307.92	615.84	138.57	615.84	1 231.69	207.85	923.77	1 847.53
LU	1.24	12.43	24.86	2.49	24.86	49.71	3.73	37.29	74.57
HU	59.02	118.04	236.07	118.04	236.07	472.14	177.05	354.11	708.21
NL	13.51	135.06	180.08	27.01	270.11	360.15	40.52	405.17	540.23
PL	473.97	1 263.92	2 527.83	947.94	2527.83	5 055.66	1 421.90	3 791.75	7 583.49
PT	13.24	39.71	99.27	26.47	79.42	198.55	39.71	119.13	297.82
RO	144.55	361.37	722.75	289.10	722.75	1 445.50	433.65	1 084.12	2 168.25
SK	61.73	123.46	246.92	123.46	246.92	493.84	185.19	370.38	740.76
FI	3.74	8.72	17.44	7.47	17.44	34.88	11.21	26.16	52.32
SE	2.46	5.54	11.09	4.91	11.09	22.17	7.36	16.63	33.26
UK	3.91	6.52	16.31	7.83	13.05	32.62	11.74	19.57	48.93
Total	1 048.00	3 507.27	6 850.50	2 096.00	7 014.54	13 701.00	3 144.00	10 521.81	20 551.49

Country	1	2	3	4	5	6	7	8	9
Total EU-15	139.42	937.69	1 711.34	278.85	1 875.38	3 422.68	418.27	2 813.07	5 134.03
Total EU-12	908.58	2 569.58	5 139.16	1 817.15	5 139.16	10 278.31	2 725.73	7 708.73	15 417.47
Including emissions component									
BE	0.69	2.30	4.13	1.38	4.59	8.27	2.07	6.89	12.40
BG	19.59	39.18	78.36	39.18	78.36	156.72	58.77	117.54	235.08
CZ	43.57	201.49	402.99	87.13	402.99	805.97	130.70	604.48	1 208.96
DK	16.68	27.80	41.70	33.36	55.60	83.40	50.04	83.40	125.09
DE	49.82	555.51	996.44	99.64	1 111.03	1 992.87	149.47	1 666.54	2 989.31
EE	9.67	42.31	84.62	19.34	84.62	169.23	29.01	126.93	253.85
IR	2.41	12.07	30.17	4.83	24.14	60.34	7.24	36.21	90.51
EL	5.65	12.56	25.12	11.30	25.12	50.23	16.95	37.67	75.35
ES	16.38	32.76	65.53	32.76	65.53	131.05	49.15	98.29	196.58
FR	12.10	120.96	261.87	24.19	241.91	523.74	36.29	362.87	785.61
HR	10.82	36.07	72.13	21.64	72.13	144.26	32.46	108.20	216.40
IT	2.26	6.46	12.93	4.52	12.93	25.85	6.79	19.39	38.78
LV	22.07	98.09	196.18	44.14	196.18	392.35	66.21	294.26	588.53
LT	72.50	322.23	644.46	145.00	644.46	1288.93	217.51	966.70	1 933.39
LU	1.32	13.18	26.36	2.64	26.36	52.72	3.95	39.54	79.09
HU	63.24	126.49	252.98	126.49	252.98	505.95	189.73	379.46	758.92
NL	14.12	141.24	188.32	28.25	282.48	376.64	42.37	423.72	564.96
PL	504.25	1 344.67	2 689.34	1 008.50	2 689.34	5 378.69	1 512.76	4 034.02	8 068.03
PT	13.49	40.46	101.15	26.97	80.92	202.30	40.46	121.38	303.45
RO	158.07	395.17	790.34	316.13	790.34	1 580.67	474.20	1 185.50	2 371.01
SK	67.05	134.11	268.22	134.11	268.22	536.43	201.16	402.33	804.65
FI	3.80	8.88	17.75	7.61	17.75	35.50	11.41	26.62	53.25
SE	2.53	5.72	11.43	5.06	11.43	22.86	7.59	17.15	34.30
UK	4.07	6.78	16.96	8.14	13.57	33.91	12.21	20.35	50.87
Total	1 116.16	3 726.47	7 279.45	2 232.33	7 452.95	14 558.91	3 348.49	11 179.42	21 838.36
Total EU-15	145.33	986.67	1 799.85	290.65	1 973.34	3 599.69	435.98	2 960.01	5 399.54
Total EU-12	970.84	2 739.80	5 479.61	1 941.67	5 479.61	10 959.21	2 912.51	8 219.41	16 438.82

*Variants as per variants established in Table 7, **excluding MT, SI, CY, AT for which underlying data was not available.
Source: Own estimates.

Barriers to the measures proposed under Option 3

There is no enforcement activity which allows all car deals to be checked. Even if dealers will be subjected to regular checks, the consumer to consumer market will be left outside the scope of this action.

4. Cost/benefit ratios estimates

Cost/benefit ratios (CBR) are calculated under the following **assumptions**:

- Nine variants of odometer fraud were assumed (Chapter 2). The perceived benefits are calculated for each variant. There are nine benefit variations.
- The costs of intervention are calculated for each intervention option. Costs are independent of the odometer fraud rate scenario in question. Altogether, there are three cost variations.
- Benefits and costs are compared by producing 27 CBR depending on: a) odometer fraud scale adopted and b) the cost accompanying a particular intervention option.

Table 20 presents the CBR associated with employing three intervention options per scenario. The full estimates for all options are provided in the Annex. There is a difference in calculating costs and benefits with regard to countries represented in the database under Option 3, as compared to other options.

Table 20: Cost/benefit ratio of intervention

Option/Variant	1	2	3	4	5	6	7	8	9
Excluding emissions component									
Option 1A CBR including user costs	0.0849	0.0254	0.0130	0.0425	0.0127	0.0065	0.0283	0.0085	0.0043
Option 1B CBR excluding user costs	0.0721	0.0216	0.0110	0.0361	0.0108	0.0055	0.0240	0.0072	0.0037
Option 1C CBR with pan-European system	0.0762	0.0228	0.0117	0.0381	0.0114	0.0058	0.0254	0.0076	0.0039
Option 2A CBR only new registrations	0.0133	0.0040	0.0020	0.0066	0.0020	0.0010	0.0044	0.0013	0.0007
Option 2B CBR replacement+new odometers in newly registered cars cost	21.4336	6.4045	3.2789	10.7168	3.2023	1.6395	7.1445	2.1348	1.0930
Option 3 CBR intervention at 20% control	0.1163	0.0348	0.0178	0.0582	0.0174	0.0089	0.0388	0.0116	0.0059
Including emissions component									
Option 1A CBR including user costs	0.0798	0.0239	0.0122	0.0399	0.0119	0.0061	0.0266	0.0080	0.0041
Option 1B CBR excluding user costs	0.0677	0.0203	0.0104	0.0339	0.0101	0.0052	0.0226	0.0068	0.0035
Option 1C CBR with pan-European system	0.0715	0.0214	0.0110	0.0358	0.0107	0.0055	0.0238	0.0071	0.0037
Option 2A CBR only new registrations	0.0125	0.0037	0.0019	0.0062	0.0019	0.0010	0.0042	0.0012	0.0006
Option 2B CBR replacement+new odometers in newly registered cars cost	20.1247	6.0278	3.0857	10.0623	3.0139	1.5429	6.7082	2.0093	1.0286
Option 3 CBR intervention at 20% control	0.1092	0.0327	0.0167	0.0546	0.0164	0.0084	0.0364	0.0109	0.0056

* Variants as per variants established in Table 7.

Source: Own estimate.

For all other variants, including Option 2 A, where tamper-proof odometers were to be installed only in newly produced cars, favourable CBR were obtained. Ratios improve when moving from low fraud rate scenarios to high fraud rate scenarios.

Across the lowest assumed fraud rate scenarios (Variant 1), CBR for Option 1 is still favourable at 0.07/0.08 depending on the sub-variant, for Option 2 B it equals 21.43 and it is the worst of all calculated ratios (in the variant without replacing odometers in existing fleets - Option 2 A - it is excellent at 0.013), for Option 3 it is 0.12.

In the most likely medium fraud rate scenario (Variant 5) Option 1 scores between 0.011 and 0.013, Option 2 – 3.2 (or 0.002 with no-replacement variant), Option 3 – 0.017. The best effects are associated with the highest fraud rate scenarios (which are less probable, except for the EU-12).

If a high-high scenario (Variant 9) is applied across the EU, CBR for Option 1 is between 0.0037 and 0.0043, for Option 2 equals 1.09 (0.0007 for the no-replacement variant) and for Option 3 it is 0.0059.

Conclusions

Odometer fraud is one of the key problems reported by European customers active in the second-hand car markets of the EU. The inability to tackle and check an imported car's history makes it more tempting for fraudsters to tamper odometer in cars sold outside the country.

It is estimated that **odometer tampering in cross-border purchases could be between 2 and 3.5 as frequent as odometer tampering in national markets**.

The total **economic losses** due to odometer tampering in EU cross-border trade (for 2014) was estimated to yield an average across all analysed scenarios of about **9.5 billion euro, or 10.1 billion euro** if the environmental component is included. The figure adopted depends on the variant representing fraud rate in all cross-border scenarios and the amount of rolled back kilometres.

In the low-low scenario (lower boundary for all variant estimates) representing the lowest damages, the economic loss is still around 1.3 billion euro, which is a significant number under any circumstances. The low-low scenario is certainly very conservative. It would be more appropriate to refer to one of the middle range scenarios as representing the true loss.

The medium-medium scenario (medium rate of tampering and tampering an average of around 60 thousand vkms per case) produces **8.77 billion euro in losses (9.32 billion euro if emissions are factored in)**.

Obviously, considering the cost associated with the phenomenon, decisive action to eradicate odometer fraud is necessary.

- ✓ **Option 1** envisages a system for registering mileage at different points of a car life cycle. This system will allow for the mileage registration at the time of sale and also during car lifetime, for instance during technical checks, servicing or repairs.

- ✓ **Option 2** would improve protection of odometer electronic systems, making it impossible or at least very costly and difficult to crack those protections and manipulate mileage. This option is based on a technical solution.

- ✓ **Option 3** requires the strengthening of enforcement efforts – through frequent inspections of cars offered for sale.

Regarding Option 1
In the EU there are already national registers of odometer readings with certification capabilities (e.g., in Belgium and in the Netherlands). Both systems have proven to be very successful tools in combating odometer fraud. The problem with national systems is that they are country based and cannot prevent fraud in cross-border transactions of imported vehicles. While their internal capability to eliminate odometer tampering has been tested, the next step would be to have a similar system in place across all the EU countries accompanied by EU-

wide information exchange, either electronically or by means of a simple certificate accompanying each car subjected to sale. The **annual cost of the system,** if introduced Europe-wide, would **be between 91.7 million euro** (the sum of operating costs of national systems excluding the cost of certificate purchase by users) **and 107.9 million euro** (including the certificate cost). The addition of an electronic information exchange platform to the national systems will yield a total cost of **96.9 million euro** for the option which does not include the certificate costs for customers.

Regarding Option 2
The technical solution is tempting due to its operational simplicity. There are two variants considered under Option 2. The first involves only an introduction of tamper-proof odometers in all newly produced cars (Option 2 A). The second, additionally calls for replacement of all odometers with new, tamper-proof devices in the whole existing vehicle fleet (Option 2 B). It does not require setting up special institutions responsible for mileage recording.

The annual cost of production of odometers with tamper-proof design would not exceed **12.2 million euro** (as calculated for the reference year 2014). However, this cost does not include the necessary - if one wants to fully eliminate fraud - replacement of odometers in all vehicle fleets currently in use. Considering the fleet size as in the reference year 2014, this operation would result in a staggering expenditure of **19.6 billion euro**. The alternative is to let the older vehicles slowly die out through natural scrappage processes. It means accepting rather high mileage fraud rates for another 15-20 years. The main problem with the technical solution, apart from the replacement cost, is its questionable permanence. Any technical solution based on software can be cracked.

Regarding Option 3
This option requires intensified efforts in the area of enforcement. After all, odometer tampering is illegal. More frequent checks of cars offered for sale by authorities might serve as a deterrent. The key question with regard to this option concerns the necessary frequency of such checks. It is assumed that a 20 % check rate will eliminate almost all fraud from the dealer market and will seriously reduce fraud in person to person transactions. The perceived annual cost of this option was estimated at **12.2 million euro**.

Regarding the benefits
For all the nine fraud rate scenarios, identified benefits resulting from applying measures considered under Options 1, 2 and 3 were calculated and compared to the costs associated with those options. Depending on the scenario, the cost/benefit ratio **(CBR) is between 0.0007 and 21.43** (for more details see Table 20). In the most likely medium fraud rate scenario (Variant 5) Option 1 scores between 0.011 and 0.013, Option 2 – 3.2 (or 0.002 with no fleet-wide odometer replacement variant), Option 3 – 0.017. Overall, the best cost/benefit ratios are associated with Option 1 - registers with certification, closely followed by Option 3 – improved enforcement.

Even better ratios are associated with Option 2 without odometer replacement in existing fleets (Option 2 A) but this variant does not really solve the odometer problem for at least the

next 15-20 years, therefore it should not be considered as a valid policy to be pursued. All the above results improve slightly if the emissions component is included. This is a logical consequence of having additional effects of the reduction of unaccounted environmental costs. However, one has to remember that this component of the estimate is optional and important only as a tool for keeping environmental damage accounts reliable. Reducing odometer fraud per se will not reduce emissions, rather it will only make emission records correct.

Considering all the reasons mentioned in the previous sections, it is the conclusion of the current research that **Option 1 would be the optimal solution to the problem of odometer fraud to be pursued in the EU**. Option 1 offers three sub-options:

- ✓ Option 1 A: separate national systems but with information flow ensured through certification,
- ✓ Option 1 B: separate national systems without certification, and
- ✓ Option 1 C: national systems combined at the EU level by an encompassing electronic information system run by the EU institutions.

Further considerations on Option 1 and its sub-options

The Option 1 B of leaving only national systems in place is worth considering, because it represents minimum intervention and all the effort is left in the hands of national governments. This system would have Europe-wide efficiency if it would be build out of efficient national systems. If the national systems mirror Belgian or Dutch solutions, this efficiency (97 % odometer fraud reduction rate) is ensured. Efficient separate national systems could reduce internal market fraud and in effect also reduce fraud in the EU cross-border trade because the cars traded would originate from fraud less national markets. But there is also a question of traceability of a vehicle history and of consumer confidence.

Under Option 1 A, consisting of separate national registries, an EU level action should be considered to ensure their efficiency. It could be the establishment of an EU-wide certification procedure standard that would help to eliminate fraud from the cross-border EU car transactions, or at the lowest intervention level, the standardisation of the certificate form. Reliability and faster eradication of odometer fraud requires that information about odometer reading follows the car. This can be ensured either through introducing a compulsory certificate accompanying a car whenever and wherever it is being sold, issued by the national odometer reading register. Such a certificate could be standardized at the EU level and its validity could be easy to confirm (e.g. through the Internet webpage of the issuer).

The third possibility - Option 1 C - is the addition of electronic information exchange on top of national systems. This should be done as a functionality within the previously discussed EU-wide road information exchange system (for instance one such as proposed in the COMPETE project).

The problem with such an encompassing vehicle information platform (VIP) is the feasibility of its development. The feasibility assessment produced by the COMPETE project concludes that from the implementation point of view, the best option would have been the creation of

a new system. In addition, in this study, it is further assumed that the existing architecture of separate systems which are to be integrated will be fully operational and that Member States will be able to enforce the implementation of some missing key components. Resolving those issues might significantly delay tackling the odometer fraud problem.

For this reason, the current research advocates the use of - for the time being – national mileage registers with a certification option enabled and wait for development of an EU-wide VIP. It is not feasible to build a separate pan-European system for the sole purpose of odometer reading data exchange. If the EU-wide system as proposed under VIP assumptions is being developed for the exchange of different data, the odometer data functionality can be added to this system on the basis of the existing architecture.

However, if such a system is not pursued or is slow to develop, the national mileage registers would remain fully functional without it. Furthermore, with certificates issuance ensured, they perform all functions required from such a system in order to eliminate odometer fraud from cross-border trade. Yet, the lack of a pan-European system on top of national systems does not mean that action at the EU level should not be pursued. The EU role could be to set a standard for an odometer reading certificate so that it is the same across all countries. It would ensure similar reporting and ease of use by end users especially in cross-border transactions.

Furthermore, the broad parameters of national mileage registers could be defined at the EU level. This would improve their efficiency, precisely how data is being stored and ensure the use of a common data format in preparation for the introduction of a potential EU level VIP. An EU level legislation could also ensure that an odometer reading certificate could be easily validated by a buyer using an Internet interface (e.g., to define standardised page layout for the purpose of checking the validity of an issued certificate and ensure it is accessible in all the EU official languages).

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Annex to Annex 1 of the study on the added value of further EU level measures addressing odometer manipulation in motor vehicles traded across the EU: Economic analysis (Research paper by Prof. Przemysław Borkowski) – Estimates of odometer fraud and cost-benefits of intervention under different fraud scenarios and intervention options

Abstract:

This annex provides estimates for the research paper on the added value of further EU level measures addressing odometer manipulation in motor vehicles traded across the EU: economic analysis.

This annex is published separately and may be accessed on the European Parliament Think Tank website.

Second-hand cars traded across the EU have their odometer readings manipulated more frequently than those traded on national markets. Odometer fraud is difficult to track and leaves no trace. This incurs costs and creates challenges on the EU internal market. It can also impact EU road safety. Against this background, this European added value assessment identifies weaknesses in the existing EU legal system. Moreover, it outlines potential policy measures that could be taken at the EU level, and that could generate European added value through coordinated approaches and more harmonisation in this area.

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