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Accompanying the

Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

concerning type-approval requirements for the general safety of motor vehicles

Impact Assessment

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1. PROBLEM DEFINITION

In order to meet the European Union's safety and environmental objectives, there is a continual need to update the various regulations that apply to new vehicle construction. However, there is an equal need to limit the regulatory burden on industry, and to simplify existing legislation wherever possible. New technologies are now available which can dramatically improve vehicle safety (such as vehicle stability control) or reduce CO2 emissions (such as low rolling-resistance tyres)

European Community Directives concerning the type-approval of motor vehicle components and systems have been progressively introduced since 1970, under the framework of Community Directive 70/156/EEC. Over the last 35 years, the nature of the regime has evolved from being a system designed to allow free trade of vehicle components between Member States, to a system based on compulsory whole-vehicle type-approval (WVTA) for most categories of vehicle. WVTA requires a series of approvals to the component or system Directives, or equivalent standards which are produced by the United Nations Economic Commission for Europe (UNECE). These Directives and Regulations have been updated over the years to reflect technical progress, so that there are now around 50 base Directives and over 100 amending Directives covering this subject area. This duality of EC Directives and UNECE Regulations is confusing, unnecessary and wasteful of resources.

Advances in vehicle technology in the areas of braking, vehicle stability, sensing systems and tyre technology offer the potential for significant progress in these areas. Some advanced systems, such as vehicle stability control and tyre pressure monitoring systems, are already being offered by vehicle manufacturers. One area of particular importance concerns vehicle tyres. Tyres are critical to the safety performance of a vehicle since they represent the only contact between the vehicle and the road. They are also partially responsible for the level of traffic noise, and they can have a considerable impact on the fuel consumption of a vehicle, and hence its CO_2 emissions.

The purpose of this Impact Assessment is to examine the various issues concerning the current type-approval regime for vehicle safety, particularly the areas that can be simplified and the areas where additional measures may be appropriate in order to meet safety and environmental objectives.

Hence the Impact Assessment is structured so that the three main elements of the proposal are considered separately, i.e.

1) Simplification aspects

2) Advanced Safety Systems

3) Tyres

1.1. Simplification

The original vehicle type-approval framework Directive, 70/156/EEC has now been recast as 2007/46/EC to reflect the evolution of the vehicle type-approval procedure in recent years. In addition, the requirements covering vehicle emissions have been updated and consolidated into new Council and Parliament Regulations which are directly applicable in Member States. However, many of the original safety-related Directives are around 35 years old, and although some have been updated a number of times, the result is that there are many unconsolidated amendments which are complicated to interpret and, due to the effort involved in producing amendments, do not always represent the most recent state of technology. It is likely that in the future this situation will worsen.

In 2006 the CARS 21 group[1] recommended that 38 EC Directives should be replaced by equivalent UNECE Regulations in order to simplify the regulatory regime. UNECE Regulations are widely accepted in countries inside and outside the EU, and the EU is itself a contracting party to many of these Regulations. Therefore there is little point in the EU retaining and constantly updating its own Directives, unless there are particular aspects which are not covered, or are insufficiently covered, by UNECE Regulations. Therefore it is proposed that the requirements set out in these directives will be carried over by this Regulation and its implementing measures to this Regulation and will be replaced, where appropriate, with references to the corresponding regulations of the United Nations Economic Commission for Europe

The proposal will affect vehicle and component manufacturers, national administrations and test authorities. All should benefit to varying extents from the greater clarity of the legislation, and national administrations will benefit from reduced workload transposing Directives into national regulations.

1.2. Advanced Safety Features

Advances in vehicle design, including the provision of seat belts and airbags and improvements in crashworthiness, have led to considerable casualty reductions in recent years. However, future increases in road traffic will make it difficult to meet future casualty reduction targets unless more advanced accident avoidance technologies can be introduced. Although market forces are already encouraging the introduction of new technologies in some vehicles, it is possible that legislation will be required to speed their introduction. In general, advanced features are initially introduced as options on high-specification cars, and eventually filter down to cars at the low-budget end of the market. However, the situation varies considerably between one Member State and another, and it is possible that, due to cost reasons and the fact that some buyers do not consider safety as a high priority when making a purchasing decision, some 'entry-level' models will never be equipped with a feature unless it is compulsory. There may therefore be justification to introduce mandatory requirements for advanced vehicle safety systems, where such requirements are technically and economically feasible and can be justified in terms of projected casualty savings. Annex I shows the potential savings in deaths and serious injuries that can be obtained by various safety technologies. As can be seen, a high proportion of these savings can be achieved by means of the measures envisaged in this document, and discussed in the following sections. The measures in Annex I not specifically covered by this proposal are either covered under other framework legislation or covered under this proposal via UNECE legislation. For example, Pedestrian Protection is covered by a separate proposal which was adopted by the Commission in 2007. ABS braking on motorcycles would be covered under the separate

[1] Competitive Automotive Regulatory System for the 21st Century.

motorcycle framework Directive. Daytime running lights, conspicuity markings and seat belt reminder systems are being covered by amendments to the relevant UNECE Regulations which would be referenced under implementing regulations under this proposal.

Where possible, the detailed technical specifications of advanced safety systems will be based on UNECE Regulations or other international standards. The first systems likely to be covered are Electronic Stability Control (ESC), Advanced Emergency Braking (AEB) and Lane Departure Warning systems (LDW) described in 1.2.1 to 1.2.3. Tyre Pressure Monitoring Systems can also be described as advanced safety systems but they are discussed under the tyres section (1.3.3). Other systems might be included at a later date. The beneficiaries would be the road users in general. The costs would fall initially to vehicle manufacturers, but would be likely to be passed on to vehicle buyers.

1.2.1. Electronic Stability Control

Electronic stability control (ESC) systems act on the braking or power systems of a vehicle to assist the driver in maintaining control of the vehicle in a critical situation (caused, for example, by poor road conditions or excessive speed during cornering). ESC usually acts by sensing wheel slip in individual wheels and reducing power or applying braking to one or more wheels to regain stability. ESC can reduce accidents by more than 20 percent in normal conditions and more than 30 percent in wet or icy conditions. It has been available on some cars for around 10 years, and costs have been reducing due to improved technology and increased volumes. The market penetration of ESC in cars varies greatly between Member States. Recent figures[2] suggest that, on average, 43 percent of cars in the 'supermini' class are offered with ESC as standard in Denmark compared with only 3 percent in Malta. In the case of small family cars, 83 percent are offered with ESC as standard in Denmark compared with only 35 percent in Ireland.

For heavy commercial vehicles, there is less customer demand, possibly for cost reasons and possibly because drivers of heavy vehicles are considered to be less vulnerable in an accident and less likely to benefit from ESC (although some of the main beneficiaries may be the occupants of smaller vehicles who are less likely to be struck by a large vehicle equipped with ESC). Thus in these cases the market mechanism alone may not be sufficient to bring about improvements in safety.

Separate technical standards for light and heavy vehicle ESC have been under development within the UNECE. Decisions need to be made on how these new standards will be applied in the European Union.

1.2.2. Advanced Emergency Braking Systems (AEBS)

Some vehicles are already fitted with systems which employ sensors to monitor the proximity of the vehicle in front and detect situations where the relative speed and distance between the two vehicles suggest that a collision is imminent. In such a situation, emergency braking can be automatically applied and the effects of the collision are either mitigated or avoided altogether. The capability of such systems could be

2 Figures from the 'choose ESC website http://www.chooseesc.eu/download/press/EuroNCAP%208_May%20ESC%20Brochure.pdf

expanded in the future to cover other types of accident (for example, pedestrian accidents or even head-on collisions). Preliminary studies suggest that such systems could ultimately save around 5000 fatalities and 50,000 serious injuries per year across the EU. It is likely that due to the technical challenges involved, these systems will only be ready for installation on the whole range of new vehicles in a few years time. However, it is already possible to provide estimates of the likely costs and benefits of such systems.

1.2.3. Lane Departure Warning Systems (LDW)

Lane Departure Warning (LDW) Systems assist drivers in keeping their lanes by warning drivers when their vehicle is in danger of leaving the lane unintentionally (mainly due to lack of driver attention). Current systems use either an audible beep or a "rumble strips" noise, which mimics the sound made when the tyre runs over a lane divider or road edge marking.

A supplement to the LDW system is the lane change assistant (LCA) system. This assists drivers intending to change lanes. The lane change assistant monitors the adjacent lanes and warns the driver if another vehicle is likely to come within colliding distance during the lane change. This occurs for example, if the other vehicle is located in the LCA equipped vehicle's blind spot. Presently the system would warn the driver of such a problem with e.g. a red flashing side mirror. Later on, a system with feedback in the steering wheel could be introduced. The lane change assistant needs predictive sensors to scan the surrounding vehicles. The sensors might possibly be integrated with the sensors used on a AEBS system.

1.3. Tyres

The current type-approval Directive on vehicle tyres (92/23/EEC) covers specifications relating to the approval of new tyres as components, and requirements for the equipment of new vehicles with suitable tyres. The requirements are mostly related to tyre safety, but the Directive was amended in 2001 (2001/43/EEC) to cover additional requirements to limit tyre rolling noise emissions. The initial noise limit values agreed in 2001 were subject to a review, to assess whether it was possible to introduce tighter noise emission values without compromising other essential aspects of tyre design. This review has now been completed, and new noise limit values have been recommended.

In addition, as part of the Commission's CO_2 reduction strategy, tyres have been identified as potential sources for improvements in vehicle fuel economy (and hence reductions in CO_2 emissions). In particular, the use of low rolling-resistance tyres can significantly reduce fuel consumption, and the use of tyre pressure monitoring systems (TPMS) can ensure that tyres remain inflated to the optimum pressure to maximise fuel economy. TPMS can also offer safety benefits by providing the driver with a warning of any significant deflation in one or more of the vehicle tyres.

Studies have shown that it is possible to improve the noise and fuel economy performance of tyres without necessarily affecting their safety. However, safety is paramount and it is essential that existing safety standards are not compromised. Since it is recognised that it could be possible for manufactures to meet, say, more stringent rolling resistance requirements by designing a tyre which has poor grip performance (particularly in the wet), it is considered that new car tyres should also be subject to wet grip performance requirements to ensure that this aspect is not overlooked in the pursuit of more energy-efficient, quieter tyres. Consequently there are four areas where it is considered necessary to introduce new performance requirements for tyres:

- tighter noise emission requirements,

-new rolling resistance requirements,

-the introduction of TPMS to vehicles, and

- new wet-grip requirements.

It is intended to treat the above measures as a package, since they are inter-related. However, since it is possible that different regulatory solutions may be appropriate for different elements of the package, the different elements are considered separately within this Impact Assessment.

Further details of the four elements of the package are given below.

1.3.1. Rolling Noise Emissions.

Road-traffic is perceived by the population to be the biggest source of noise pollution. Above a vehicle speed of 40 to 50 km/h, rolling noise is the dominant component of road traffic noise. It is already widely recognized that the noise exposure is a serious limiting factor for people's quality of life, but recent research has highlighted the harmful effects noise exposure may have on people's health. In addition, impaired sleep may also have effects on work efficiency and learning efficiency at schools. Reducing the level of tyre/road noise thus represents an effective approach for protecting the population from noise. An integrated approach, involving the use of low-noise road surfaces and low-noise tyres is seen as being best means of achieving this. The Directorate General for the Environment has been involved, together with other stakeholders, in work to investigate the use of low-noise road surfaces. The Directorate General for Enterprise and Industry has the responsibility for tyre performance standards. This section concentrates on the contribution of the vehicle tyre to lowering tyre-road noise emissions.

The currently applicable limit values laid down in Directive 2001/43/EC (amending Council Directive 92/23/EEC relating to tyres for motor vehicles and their trailers and to their fitting) are given in table 1(a)-(c) below. The limit values are based on various categories and widths of tyre. Class C1 tyres are generally used for cars, class C2 generally for light commercial vehicles and C3 generally for heavy commercial vehicles. Within class C1, there are several width categories. Since wider tyres will normally produce more noise than narrow tyres, the 2001 Directive allows higher noise limits for the wider categories of tyre. As can be seen, some of the future values are dependant on studies to be carried out to ensure that these more stringent noise values do not compromise tyre performance in other areas. This study (by FEHRL, the Forum of European National Highway Research Authorities) has now been completed[3] and will be referred to in this document as the FEHRL report.

3 FEHRL Study S12.408210 on tyre/road noise (see http://ec.europa.eu/enterprise/automotive/projects/report_tyre_road_noise1.pdf).

The specific proposals set out in the FEHRL report to amend the above limit values are discussed in section 3. However, one of the main conclusions of the FEHRL study is that many tyres currently on the market could easily meet tighter limit values than currently exist (without any obvious trade-offs in other areas). This may be partly because tyre manufacturers are anticipating the lower limit values (as foreseen by the 'indicative' values in columns B and C of table 1). Hence even if there is no change to the Directive, the situation will probably continue to improve. However, if limit values remain at the pre-2007 levels, there will be little incentive to improve tyre noise performance and design optimisation in other areas (for example, wet grip) may actually lead to tyre designs that barely meet the current requirements. This, in conjunction with increasing overall traffic levels, and the increased use of wider, noisier, tyres, could lead to an increase in the traffic noise problem if no action is taken.

The beneficiaries from additional action to improve tyre/road noise standards would be the general public, particularly those living near busy roads. The costs required to meet tighter noise standards would initially fall to tyre and vehicle manufacturers, but would ultimately fall to vehicle users. There is a significant externality problem here, i.e., the people who buy tyres are not necessarily the people who benefit from lower traffic noise. Even in the case where buyers of tyres would benefit from lower traffic noise, a particular buyer would probably consider that his/her own purchasing decision would have little effect on his/her quality of life (unlike the situation concerning tyre safety, where the purchaser is likely to be a direct beneficiary).

Table 1a Noise limit values prescribed in 2001/43/EC (C1 car tyres)

		Limit values in dB(A)		
Tyre Class	Nominal section width (mm)	A	B (¹)	C (¹) (²)
C1a	≤ 145	72 (*)	71 (*)	70
C1b	> 145 ≤ 165	73 (*)	72 (*)	71
C1c	> 165 ≤ 185	74 (*)	73 (*)	72
C1d	> 185 ≤ 215	75 (**)	74 (**)	74
C1e	> 215	76 (***)	75 (***)	75

(*) Limit values in column A shall apply until 30 June 2007;
Limit values in column B shall apply as from 1 July 2007.
(**) Limit values in column A shall apply until 30 June 2008;
Limit values in column B shall apply as from 1 July 2008.
(***) Limit values in column A shall apply until 30 June 2009;
Limit values in column B shall apply as from 1 July 2009.
(¹) Indicative figures only. Definitive figures will depend on amendment of the Directive following the report required in Article 3(2) of Directive 2001/43/EC.
(²) Limit values for column C will result from the amendment of the Directive following the report required in Article 3(2) of Directive 2001/43/EC.

Note: Additional allowances are given for reinforced tyres (1 dB(A)) and special tyres (2 dB (A))

Table 1b. Noise limit values prescribed in 2001/43/EC (C2 light commercial tyres)

Category of use	Limit value expressed in dB(A)
Normal	75
Snow	77
Special	78

Table 1c. Noise limit values prescribed in 2001/43/EC (C3 heavy commercial tyres)

Category of use	Limit value expressed in dB(A)
Normal	76
Snow	78
Special	79

1.3.2. Tyre Rolling Resistance

Rolling resistance is the resistance to motion that occurs when an object (e.g. a wheel or tyre) rolls. It is caused mainly by the deformation of the wheel or tyre or the deformation of the contact surface (e.g., the road) and thus it depends very much on the material of the wheel or tyre and the type of road surface. For example, rubber will give a higher rolling friction than steel and sand will give much higher rolling friction than concrete. In the case of rubber vehicle tyres, rubber acts as a visco-elastic material that deforms and returns to its original shape periodically. The term 'hysteresis loss' is often used in literature to describe the energy lost as heat during the repeated deformation of a tyre.

Rolling resistance has a direct impact on the vehicle CO_2 emissions and fuel consumption. A study by TNO [4] (referred to throughout this document as the TNO study) estimates that use of low rolling resistance tyres (LRRT) could reduce fuel consumption by 3% for a given vehicle and thus save on average 0.09 tonnes of CO2 per year and vehicle.

There has been a gradual reduction in rolling resistance for tyres of comparable dimensions over recent years. This has partly been driven by the desire of car manufacturers to reduce the overall fuel consumption of new cars. However, development and use of LRRT needs to be encouraged and accelerated if they are to make a significant contribution to the CO_2 reduction strategy.

Apart from the global benefits made possible from the gradual replacement of traditional tyres by LRRT, the individual vehicle users can also benefit from lower fuel bills. However, there is likely to be a higher initial cost, largely reflecting the development costs incurred by the tyre manufacturer. Also, due to the fact that tyres with high speed ratings tend to have a higher rolling resistance than standard tyres, it is possible that more demanding rolling resistance requirements will restrict the choice of higher-performance tyres available on the market.

The use of customer information (for example, tyre labelling or information campaigns) may encourage the increased market penetration of LRRT. However, the tyre purchasing decision is likely to be based on a number of factors other than fuel economy; and in particular the purchase price is likely to be a significant factor particularly with an older car. Also, the purchaser may have little real choice if a particular car has a limited number of tyre types suitable for it, or if a particular tyre dealer or fitter only offers a limited range of products. Thus, although the market mechanism may have a role to play in encouraging LRRT, it may not be sufficient in itself.

1.3.3. Tyre Pressure Monitoring Systems

Maintaining proper tyre inflation is essential for both fuel efficiency and better tyre performance. Deflated tyres can cause up to 4% increase in fuel consumption while reducing tyre lifespan by 45% . Tyres can lose 3-6% of pressure per month, and this may not be noticed by the driver. Deflated tyres are also an important factor causing road accidents resulting in numerous fatalities and injuries throughout Europe. Despite the fact that tyre pressure is important for the operation of the vehicle car owners are not careful with the condition of their tyres. The TNO study quotes research which shows that 50% of all cars are driven on under-inflated tyres, and US estimates which indicate that under-inflation causes an increase in the average rolling resistance of about 8%.

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[4] Review and analysis of the reduction potential and costs of technological and other measures to reduce CO_2-emissions from passenger cars Final Report- TNO Contract nr. SI2.408212 , see http://ec.europa.eu/enterprise/automotive/projects/report_co2_reduction.pdf

A potential solution to this problem is the use of Tyre Pressure Monitoring Systems (TPMS). TPMS are systems that monitor tyre pressure and warn the driver in case a tyre has to be inflated. In certain cases TPMS also warn for tyre failures for safety reasons. Two different TPMS types are distinguished, indirect TPMS and direct TPMS. The indirect TPMS uses the antilock brake system (ABS) wheel speed sensor to measure the speed of the wheel. Pressure drops are detected by the increase in the ABS wheel speed that is caused by the reduction of the rolling wheel diameter. Direct TPMS have calibrated internal sensors that measure actual tyre pressure and transmit data to receivers.

Use of TPMS is relatively low in Europe. In the USA it is higher due to the TREAD Act which effectively mandates the use of TPMS on new cars. It is envisaged that similar legislation will be necessary in Europe in order to reap the full benefits of such a system. However, it could be argued that TPMS systems meeting the US standard may not be sufficiently accurate to detect the degree of under-inflation that can make a significant difference to fuel consumption and hence CO_2 emissions. This is discussed further in section 3.

Apart from the global benefits made possible by the increased use of TPMS systems, individual vehicle users could benefit from reduced fuel consumption, increased tyre life and greater safety. The additional cost will fall to the purchasers of new cars. There are no plans to require TPMS to be retro-fitted to existing vehicles. This would not be a practical proposition since the cost of adding such a system would outweigh the benefits on a car with a limited remaining life. Also, a TPMS system is largely integrated with the car (in the case of an indirect system, through the ABS brake system) and cannot be installed simply by replacing one tyre with another.

1.3.4. Wet Grip Performance

Wet grip performance, in other words, the skid resistance of tyres under wet road conditions, is a significant safety feature. There is no evidence to suggest that current new tyres, even tyres which have been designed for low noise or low rolling resistance, are substandard in this area. However, it is acknowledged that if additional requirements are introduced with regard to noise or rolling resistance, it is possible that some (cheaper) solutions to achieve better noise or rolling resistance could be detrimental to wet grip performance. This was recognised by the United Nations Economic Commission for Europe (UNECE) working group which developed standards for wet grip as part of the same regulation (UNECE Regulation 117) which specifies tyre/road noise limits along the same lines as Directive 2001/43/EC. It is proposed that the Regulation 117 wet grip test is introduced for all new car tyres, to ensure that safety standards are not compromised by other new requirements.

The benchmark for the Regulation 117 wet grip test is based on existing tyre types, so there will be no increased safety benefit from the introduction of this requirement. There will be a small additional cost for the regulatory approval (see section 4) but this will be negligible when spread over the entire tyre production.

2. OBJECTIVES

The Commission has high-level objectives relating to road safety, the environment and the competitiveness of its industries:

- Road Safety The White Paper on European Transport Policy, which was adopted by the Commission in 2001 provides an umbrella for the European Road Safety Action Programme, which sets out the Community's goal of reducing the number of road fatalities to less than 25,000 by the year 2010.

- Environment. A key target in the Commissions environmental strategy is the target of reducing emissions to 120 g/km for the average new car fleet.

- Competitiveness. The CARS 21 report identified a number of objectives relating to the competitiveness of the European motor industry, including:

  – ensuring an open and competitive Single Market, including competition

  – knowledge, such as research, innovation, and skills

  – better regulation

  – ensuring synergies between competitiveness, energy and environmental policies

  – ensuring full and fair participation in global markets

  – facilitating social and economic cohesion

The main objectives of the package of proposals covered by this Impact Assessment are as follows:

-to contribute to road safety objectives by reducing casualties by the introduction of requirements for advanced safety systems such as vehicle stability control, lane departure warning and advanced emergency braking

-to contribute to environmental objectives by reducing the amount of road noise and vehicle CO2 emissions through improvements to tyre performance, while at least maintaining and possibly improving the level of tyre safety

- to contribute to competitiveness objectives by simplify the existing vehicle safety type-approval legislation to improve transparency and ease administrative burden.

A full analysis of the current situation concerning the European Automotive industry, plus a discussion about the possible impact of the proposals discussed in this Impact Assessment on retail prices and affordability is given in Annex III.

3. POLICY OPTIONS

Because this proposal includes a number of separate elements, the policy options for each separate element are examined below.

3.1. Simplification aspects

The options identified are as follows:

a) Do nothing (maintain all existing safety –related Directives)

b) Do nothing as part of the current exercise, but review each Directive as and when they are due to be modified, and decide whether replacement is appropriate

c) Replace all existing Directives through the proposed Regulation

Option a) would mean continuing with the existing Directive structure and adding to it, as additional amendments to Directives became necessary. This Directive structure would continue to operate in parallel with the existing UNECE Regulatory structure with the technical requirements usually (but not always) being equivalent. This is currently the cause of much confusion for stakeholders who are not closely involved with the type-approval system, and leads to a situation of a regulatory system that is less than fully transparent. The CARS 21 group (and the following Communication) strongly recommended that the current situation should be simplified, Option b) would effectively be a piecemeal replacement of current Directives which would probably take place over a number of years. Option c) would represent a 'clean sheet of paper' and would therefore maximise the advantages of simplification. However, in most cases the technical requirements would be the same as the existing requirements, and in such cases the new regulation would allow existing vehicle types to remain subject to the existing requirements. Any requirements that represented a technical advance would only apply to new vehicle types.

A further analysis is included in section 4.1 .

3.2. Advanced Vehicle Technologies

The options identified are as follows:

a) Do nothing and allow the market to take the initiative.

b) Establish technical standards for such systems (where fitted) and allow manufacturers to fit them optionally.

c) Establish technical standards and mandatory fitting requirements.

Features such as ESC are already appearing on an increasing number of cars in some markets (In Germany, over 70% of new cars are fitted with ESC) so it could be argued that option a) is sufficient. However, on vehicles such as heavy trucks and tourist coaches, where the benefit of ESC may be even greater than for cars, there is often not the market incentive to fit ESC voluntarily (since, unlike the case with cars, the purchasers are not normally the beneficiaries). So if there is a good cost-benefit justification for fitting ESC, then option c) should be preferred. If the cost–benefit case does not justify mandatory fitment, then option b) should be considered since it would require common standards for such systems and would therefore offer protection for the consumer by ensuring that inferior systems were not allowed on the market. It could be argued that standardisation is not necessary, and that it should be left to the consumer to decide whether to pay more for a superior system or less for an inferior system. However, the quality of a stability control system is a difficult concept to put across to a non-technical consumer. It is easy for a consumer to compare cars on the basis of, say, engine size, and to decide whether it is worth paying more money for a car with a larger engine. However, vehicle stability control systems cannot be measured in the same way, and while manufacturers can use a wide vocabulary of technical terms to describe the capabilities of their particular system, this is not always objective, and it could thus be argued that a consumer needs the protection of a unified standard for vehicle stability control.

Other advanced systems such as AEBS and LDW are only now starting to appear on some higher specification vehicles, and it is difficult to predict the extent to which the market will encourage these systems to be fitted as standard. However, it is likely that these systems will follow the same pattern as ESC, i.e, a high take-up on higher-specification vehicles in the more affluent Member States, but a much lower take-up elsewhere. Also, it is unlikely that market forces alone will encourage 100% fitment on the vehicles where such systems are likely to yield the greatest benefits, such as heavy trucks. Because of the sophistication of these systems, and the fact that they may be seen to take over some functions which are normally the responsibility of the driver, it is especially important that sufficient performance requirements are introduced to ensure that the systems do not introduce additional risks. Thus option b) should be preferred to the non-regulatory option a). The decision on whether option b) or option c) is chosen may differ for various categories of vehicle, depending on the particular costs and benefits which apply to those particular vehicle categories. This is explored in more detail in Section 4.2.

3.3. Tyres and Tyre Systems

As indicated above, the tyre proposals include four different elements: noise, rolling resistance, wet grip and Tyre Pressure Monitoring Systems (TPMS). This leads to various options and combinations of options in relation to the choice of voluntary or mandatory application, or the level of technical difficulty that should be demanded. Table 2 examines possible combinations of options, and eliminates those which are thought not to be practical. The more practical options are examined in greater detail in Section 4.3.

Table 2 - Potential policy options for tyres

Tyre feature	Potential Policy Option			
	Do nothing	**Voluntary/market solution**	**Mandatory solution (lower technical difficulty)**	**Mandatory solution (higher technical difficulty)**
Noise	**X**. Studies show that some reduction in tyre/road noise is both feasible and necessary. As explained in section 1.3.1, without any action, the tyre noise problem is likely to increase in future years.	**X** Unlikely that tyre buyers will consider low-noise as a major priority. However, a labelling scheme could be considered in addition to mandatory requirements.	✓ (examined further in section 4.3)	✓(examined further in section 4.3)
Rolling Resistance	**X** It is essential that the use of low rolling resistance tyres is at least encouraged in order to meet CO2 reduction targets	✓ Buyers will see a benefit in fuel consumption when buying LRRT, so use of the market mechanism is a possibility.	✓(examined further in section 4.3)	✓(examined further in section 4.3)
Wet grip	**X** If proposals on noise or rolling resistance are adopted, then it is essential to have a wet grip requirement in order to ensure tyre design is not optimised at the expense of	**X** If proposals on noise or rolling resistance are adopted, then it is essential to have a wet grip requirement in order to ensure tyre design is not optimised at the expense of	✓(examined further in section 4.3)	X (There is no identified need for a standard higher than the existing Regulation 117 standard. However, if manufacturers wish to introduce a 'premium wet grip' standard, they are free

	wet grip safety.	wet grip safety, and existing levels of safety should be mandatory, not optional.		to do so.
TPMS	**X** The benefits of low rolling resistance tyres will only be realised if tyres are maintained at their optimum pressure	✓ Buyers will see a benefit in fuel consumption and safety when buying a vehicle equipped with TPMS, so use of the market mechanism is a possibility.	**X** Current generation TPMS systems are considered not to be sufficiently accurate to ensure optimum tyre pressures are maintained**.**	✓(examined further in section 4.3)

✓ Possible option. (Examined in greater detail in section 4) **X** Not a viable option, for reasons given

3.4. Subsidiarity and Proportionality

For high-volume manufacture, type-approval standards are already harmonised across the European Union for passenger cars and are becoming harmonised for other types of vehicle. This offers advantages of economies of scale and free access to all EU markets. However, in the case of low volume manufacture, the Framework Directive allows special provisions which can be used to exempt vehicles produced in low volumes from certain requirements where the burden on the manufacturer may be disproportionately high due to the need to spread development and approval costs over a smaller number of vehicles. There is also the option of National Type-approval for small-series vehicles, which allows Member States to lay down alternative technical requirements if the full EC type-approval requirements are considered over-burdensome or inappropriate. This is in line with the principle of subsidiarity.

4. ANALYSIS

An analysis of the three main elements of the package is given in sections 4.1-4.3. In general the impacts fall into three categories as follows

Economic Impacts. The simplification proposals outlined in 4.1 will aid the competitiveness of the automotive industry by reducing the duplication of Regulation. In addition, the accident reduction measures outlined in 4.2 will reduce the costs due to the congestion arising from road accidents. Finally, it can be shown that the use of low rolling resistance tyres and tyre pressure monitoring systems can reduce costs for vehicle owners or operators in the long term. Annex III discusses the economic aspects in more detail.

Social Impacts. Road casualties have an immense social impact, and their effect cannot be described purely in economic terms. Also, the effect of traffic noise (to which tyre noise makes a significant contribution) has a considerable social impact.

Environmental Impacts. The proposed tyre measures are intended to reduce the environmental effects of noise and CO_2 emissions. The proposals in this document relating to low rolling resistance tyres and tyre pressure monitoring systems are expected to make a contribution to the complementary measures aimed at achieving a target of 120 g/km. On the basis of the TNO estimated fuel saving of potential of LRRT and TPMS in passenger cars of 3% and 2.5% respectively, for new cars with expected engine test cycle performance of 130 g CO_2/km this would mean additional reductions of **3.9** (LRRT) and **3.25** (TPMS) g CO_2/km. The TREMOVE modelling of the real on-road performance of passenger cars shows that in 2020 the EU-27 average savings could be 2.5 g CO_2/km for LRRT and 3.0 g CO_2/km for TPMS. In addition, there will be benefits for fitting LRRT (and eventually TPMS) for commercial vehicles but these have not been included in this calculation.

As well as the effect on CO_2 emissions, reducing fuel consumption through more efficient tyres has other environmental benefits, for example in the reductions in consumption of raw material resources used for making producing fuels, and the environmental effects of processing and distributing those fuels. These effects are not easily quantified, but are likely to be significant.

In addition, road noise is considered as a significant environmental nuisance, and a possible concern for health. The tyre rolling noise proposals discussed in this document, in conjunction with infrastructure measures, are aimed at addressing this situation.

4.1. Simplification

Currently, a vehicle undergoing type-approval has to meet around 50 (depending on the category of vehicle) separate safety–related Directives. In many cases, the manufacturer has the option of meeting the requirement of an 'equivalent' UNECE Regulation which has been developed under the 1958 agreement[5] The EU is a signatory to the 1958 agreement and many of the Regulations adopted under that Agreement.

The relationship between EU and UNECE legislation is an important one. UNECE Regulations are essentially trading agreements between Contracting Parties which originally consisted mostly of European Countries, concerning various vehicle components. The ECE system pre-dated the EEC/EU Type Approval system, and when the latter system was set up in the early 1970's, most of the EEC Directives on vehicle parts were largely copies of the corresponding UNECE Regulations (although in some cases, the reverse was true). As technology has progressed, the EEC/EU Directives have been modified in line with UNECE Regulations although there are periods when, due to administrative procedures, the corresponding instruments may be out of line with each other. Since the introduction of European Whole Vehicle Type Approval in the 1990's, vehicle manufacturers seeking approval for their components or systems have had the choice of meeting either the relevant Directive or the corresponding UNECE Regulation, where available. As a result, manufacturers have shown an increasing tendency to choose an approval to the UNECE Regulation rather than the Directive since approval through the UNECE system allows access to markets out side the EU (such as Russia, South Africa or Japan). Hence the individual components Directives are becoming increasingly redundant where there is a suitable UNECE alternative available. The current duplication of regulation also increases the complexity of the regulatory framework, and involves much administrative effort from all stakeholders in keeping the regulations up to date, and keeping up to date with the regulations. Under Option a) (the 'do nothing' option) the situation would gradually worsen with the continual updating of legislation adding to the already extensive list of Directives.

Under Options b) and c) the existing Directives would be replaced as far as possible with references to UNECE Regulations, removing most of the existing duplication.

For many manufacturers who already use UNECE Regulations in preference to EU Directives, these changes would make little difference. However, by eliminating around 50 base Directives and over 100 amending Directives, the clarity of the vehicle regulatory system is improved, with definite (but not easily quantifiable) benefits for all stakeholders. UNECE Regulations are increasingly being aligned with Global Technical Regulations, which allow vehicles to be tested to a harmonised standard and sold across the world to all countries which are signatories to that particular Regulation. Therefore the increased use of the UNECE system will help manufactures reduce costs by avoiding duplication of tests and avoiding the design costs associated with meeting different sets of regulations. This will help increase the competitiveness of European products in world markets.

In addition, by using a direct-acting Regulation instead of a Directive, much of the administrative effort required by Member States to transpose Directives into national legislation will be avoided. Assuming that one full-time official per Member State is required to transpose these Directives (including any necessary consultation process)

5 'Agreement concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions' UN Geneva 1958.

then elimination of this task could represent a saving of around € 50,000 per Member State (€ 1.35m)

There will, obviously, be some administrative effort involved in the introduction of this new regulation (and the implementing legislation) but, unlike the existing system, this will not recur. There will be additional costs to manufacturers to meet the new technical areas mentioned in sections 4.2 and 4.3. However, in relation to the existing technical requirements, there will be no additional burden on manufacturers since approvals to the old Directives will still be accepted until technical change renders these requirements obsolete.

The difference between Option b) and Option c) is that that Option b) would change Directives to Regulations as and when the relevant Directives required, while Option c) would introduce the new regime straight away under a single new Regulation. Since some Directives may remain unchanged for many years to come, Option b) would probably not be fully implemented for several years, and would have no obvious advantages. Therefore Option c) is preferred.

4.2. Advanced safety features

4.2.1. Electronic Stability Control

Electronic stability control systems for light and heavy vehicles are treated separately in this section due to the different accident patterns between these vehicles and the different technical specifications proposed. Technical requirements for heavy vehicles have been developed by an UNECE working group and have been introduced in UNECE Regulation 13 which covers braking requirements on heavy vehicles, since ESC systems generally act on the braking system. Requirements for light vehicles are being developed through a Global Technical Regulation which is largely based on proposed US requirements. This is likely to be implemented in Europe (and many countries outside Europe) through UNECE Regulation 13H which covers braking on light vehicles.

4.2.1.1. Light Vehicles

4.2.1.1.1 Benefits

A report for DG TREN[6] by COWI looked at the costs and benefits of various new technologies, and in particular ESC for passenger cars. It reviewed a number of existing studies on the effectiveness of ESC and concluded that the potential savings per year for a fleet fully equipped with ESC could reduce accidents by around 15-20%. The report analysed the injury savings for the 20 year period leading up to full implementation, assuming that, even without legislation, 50% of cars would be fitted with ESC. The study then applied the valuations in table 3 to each category on injury, based on an average of values used throughout the EU25, adjusted to account for property damage and congestion costs.

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6 Cost-benefit assessment and prioritisation of vehicle safety technologies (COWI 2006) http://ec.europa.eu/transport/roadsafety_library/publications/vehicle_safety_technologies_final_report.pdf

Using the COWI methodology, but adjusting the values to take into account the EU enlargement and more recent registration statistics, the estimated annual casualty savings in the EU27 due to mandatory fitment would be around 2250 fatalities, 23,000 serious injuries and 226,000 slight injuries. This gives a total annual saving of 10,803 million Euros.

Table 3. Casualty valuations

Type of casualty	Cost per casualty (Euros)			
	Direct cost	**Property damage**	**Congestion**	**Total**
Fatalities	1,000,000	5,200	13,000	1,018,200
Severe Injury	135,000	4,400	3,700	143,100
Slight Injury	15,000	4,400	3,700	23,100

Assuming an average number of cars registered per year the EU 27 to be around 13 million, with an average 13 year lifespan, this means that the total stock of cars is around 170 million. The additional 50% of cars that would be fitted with ESC due to mandatory legislation would represent a total of 85 million cars (the other 85 million would have ESC fitted already). The average saving per car per year would be around 127 Euros.

4.2.1.1.2 Costs

The COWI report assumed an increased cost per vehicle of €250 which, using a discount rate of 4%, gave a benefit/cost ratio of **3.8.** This is similar to the figure of 3.9 given in the summary in Annex 2 which uses the slightly different vehicle registration assumptions outlined above. However, work carried out by the US Regulatory body NHTSA in preparation of the proposal for a Global Technical Regulation on ESC suggested a cost per car of 111 US dollars (around €76) assuming the vehicle was already fitted with ABS braking, which would almost certainly be the case in Europe. Therefore the 3.8 benefit /cost ratio cited by COWI can probably be considered as conservative.

4.2.1.2. Heavy Vehicles

The cost and benefit information in this section was obtained mainly from the working papers of the informal UNECE group[7] which developed the technical requirements for Regulation 13.

4.2.1.2.1 Benefits

Based on German accident studies, it is estimated that around 500 fatalities and 2500 serious injuries per year could be saved in the EU27 if heavy goods vehicles and tourist coaches were fitted with ESC. Applying the casualty valuations in Table 3, this gives an annual saving of around €867million.

[7] See http://www.unece.org/trans/main/wp29/wp29wgs/wp29grrf/grrf-infevsc8.html working group papers on the development of electronic vehicle stability control systems for heavy vehicles.

4.2.1.2.2 Costs

This proposal covers a large range of vehicle types and cost estimates for the addition of ESC vary from 400 to 1500 Euro per vehicle. This cost is likely to fall as these systems become standard equipment. For a vehicle already fitted with ABS braking (which would be the case with almost all vehicles in this category) then there is unlikely to be any increased maintenance cost. Therefore the €400-1500 figure represents the increased cost for a vehicle over its lifespan. In the EU there are approximately 425,000 goods vehicles over 3.5 tonnes and around 25, 000 buses of the type likely to be affected by the ESC requirement registered every year. Assuming a vehicle lifespan of 13 years, the average additional annual cost per vehicle would be would be in the range €30-€115, which would equate to €180-€675 million for the whole fleet.. Even using the higher of these figures, this still compares favourably with the estimated annual saving of €867 million. A summary of costs and benefits is given in Annex II, table 1.

4.2.1.3. Options for the Introduction of ESC

Section 3.2 identified the following options:

a) Do nothing and allow the market to take the initiative.

b) Establish technical standards for such systems (where fitted) and allow manufacturers to fit them optionally.

c) Establish technical standards and mandatory fitting requirements.

Since it is clear that for both light and heavy vehicles there is a positive cost-benefit case for these systems, it appears that the mandatory option, option c), is justified. However, there may be certain cases on some specialised vehicles (such as low-volume sports cars) where the cost of developing an ESC system would be disproportionately high since it would be spread over a small production run of vehicles; say, 50 compared with 500,000 for a volume production car. However, these limited cases can be dealt with under the small series exemptions of the Framework Directive.[8] Consultation with stakeholders has indicated that 2012 is a realistic date for introduction of mandatory ESC for new vehicle types. Longer lead times may be appropriate for some specialist vehicles.

4.2.2. Advanced Emergency Braking Systems (AEBS)

4.2.2.1. Benefits

Work carried out for DG Enterprise by TRL has indicated that there are significant casualty savings to be obtained by equipping vehicle with these systems. The level of casualties saved depends on the type of vehicle and the level of capability of the system. Current systems do not always avoid collisions, but they ensure that the collision takes place at a slower speed thus mitigating injuries. Future systems should be able to avoid collisions altogether, including may collisions with pedestrians. The TRL work indicates that the highest benefit to cost ratios are likely to be achieved through fitting these

[8] See Articles 22, 23 and 24 of Community Directive 2007/46/EC.

systems to heavy vehicles due to the increased severity of front to rear collisions involving these vehicles.

Table 4 Range of annual benefits for AEBS for various classes of vehicle (TRL study)[9]

Vehicle class AEBS fitted to.		System class		
		Current	Near future	Longer term
M1	Fatality reduction	313 – 1,149	2,043 – 7,489	1,349 – 4,946
	Break even cost (€)	26 – 216	136 – 966	96 – 703
M2/3	Fatality reduction	4 – 14	96 – 351	55 – 202
	Break even cost (€)	197 – 1,731	1,732 – 12,324	871 – 6,217
N1	Fatality reduction	44 – 160	148 – 543	185 – 681
	Break even cost (€)	26 – 182	68 – 443	76 – 500
N2/3	Fatality reduction	102 – 372	180 - 659	319 – 1,170
	Break even cost (€)	314 – 1,475	432 – 1,938	773 – 3,481
L	Fatality reduction			618 – 2,265
	Break even cost (€)			1,322 – 5,704

In table 4. “Current” systems can be defined as systems that are effective in front to rear shunt collisions with other vehicles with four or more wheels and collisions with rigid fixed objects on the carriageway. “Near future” systems may be expected to add function in collisions with rigid fixed objects off the carriageway and with pedestrians. “Longer term future developments” may be expected to add functionality in head on collisions and front to side collisions at junctions.

The 'break even cost' is the maximum the system could cost while still remaining cost-effective in terms of casualty reduction potential. Most current systems are not considered effective at preventing collisions; only in mitigating them. Therefore for a heavy truck, the system would possibly need to cost under € 314 to have a positive benefit. However, future systems with a wider capability are seen as having a far greater casualty prevention potential, and this would considerably raise the amount that could be spent on installing such a system (around €136 -966 for a passenger car and €1700-12000 for an M2 or M3 vehicle (bus or coach).

4.2.2.2. Costs

These systems combine advanced braking systems with sensing technologies using radar or laser. According to industry sources current systems cost over €1,000 per vehicle, but the technology cost is reducing rapidly, and will reduce further as volume increases. A recent estimate[10] suggests that once standard fitment has been achieved in main-stream models at 1 million units a year, a laser-based system can be installed for around €200 to

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9 Automated Emergency Brake Systems: Technical requirements, Costs and Benefits, see http://ec.europa.eu/enterprise/automotive/projects/index.htm

10 Automotive News Europe, June 11 2007.

€250 per car for hardware, software and installation. Thus, these will be highly cost-efficient, as their cost will be considerably below the break-even cost presented in Table 4. above. Also, once a vehicle has been fitted with ESC the additional hardware cost for an AEBS system is relatively low, and is unlikely to be very dependant on the category of vehicle. In Annex II, table 1, a mid-range assumption of €1,000 for a system cost is used (assuming the vehicle is already equipped with ESC). At this cost, the benefit/cost ratio is less than 1 for cars, but more than 2 for heavy vehicles. As these systems become more widely available, costs are likely to decrease significantly.

4.2.2.3. Options for the Introduction of AEBS

As with ESC, the options identified are as follows:

a) Do nothing and allow the market to take the initiative.

b) Establish technical standards for such systems (where fitted) and allow manufacturers to fit them optionally.

c) Establish technical standards and mandatory fitting requirements.

As such systems are rapidly becoming cost-effective, particularly on vehicles already equipped with ESC, Option c) is the right approach provided that the legislation foresees a transitory period of several years and that the systems are initially fitted only to heavy goods vehicles and buses. Unlike ESC, the cost–benefit balance for AEBS is more favourable for heavy vehicles than for light vehicles. This apparent contradiction is due to the fact that ESC tends to be quite expensive for heavy vehicles (due to the large number of axles and the relatively low production volumes). However, the additional cost of equipping a heavy vehicle with AEBS, once ESC has already been fitted, is relatively low since the sensors can be produced in high volumes and at a similar cost to the sensors used for cars. Thus the cost of fitting AEBS, as a percentage of the whole vehicle cost, is relatively low for larger vehicles.

Based on the feedback from system suppliers following the internet consultation, a realistic implementation date for these categories of vehicles may be around 2013. At a later stage it should be assessed whether mandatory installation of these technologies should be extended to light-duty vehicles and passenger cars.

4.2.3. Lane Departure Warning Systems.

4.2.3.1. Benefits.

The COWI report referenced in 4.2.1.1.1 also examined the costs and benefits of LDW systems using the same methodology as for ESC systems. The accident prevention potential of combined LDW and LCA systems, has been estimated at 25% for head on collisions, 25% for left roadway accidents and 60% for side collisions. An accident mitigation effect is also expected, in that the severity of accidents is shifted down a severity class - i.e. from fatality to severe injury and from severe to slight injury. The mitigation effect is 25% for head on collisions, 15% for left roadway accidents and 10% for side collisions. If all vehicles were fitted with LDW and LCA this could result in annual EU-wide savings of 5500 deaths, 30,800 serious injuries and 208,500 slight injuries, equivalent to an annual cost saving of 14,824 million Euro.

4.2.3.2. Costs

The COWI report assumed an increased cost per vehicle of €600 to include the installation of both LDW and LCA systems. Using the above benefit data, this would suggest a benefit/cost ratio of **1.7**. Using more recent EU registration data (see Annex II) suggests a slightly lower figure of 1.1. However, a lot of the hardware could probably be shared with other systems (such as AEBS) which could significantly reduce the cost. Therefore this figure is probably conservative.

4.2.3.3. Options for Lane Departure Warning Systems.

As with ESC and AEBS, the following options are identified:

a) Do nothing and allow the market to take the initiative.

b) Establish technical standards for such systems (where fitted) and allow manufacturers to fit them optionally.

c) Establish technical standards and mandatory fitting requirements.

The benefit/cost balance is not as favourable as for ESC, and it is likely that such systems will be more cost beneficial on heavy trucks than on cars (due to the lower cost of the system as a proportion of the vehicle cost, the greater problem of blind spots on larger vehicles, their greater distance travelled and the more serious consequences of an accident concerning large vehicles). Further work is being carried out for the Commission which will examine the costs and benefits in more detail in relation to different vehicle classes. Even on the current evidence, there appears to be a case for introducing mandatory LDW/LCA at least on heavy goods vehicles and buses, since the COWI report indicates that introduction of such systems through market mechanisms alone is likely to be very slow. Since these systems may use similar sensing hardware to AEBS system, it would seem logical to introduce them on a similar timescale.

4.3. Tyres and Tyre Systems

4.3.1. Tyre Noise

The FEHRL report mentioned in section 1.3.1 considered the costs and benefits involved in tightening the tyre noise limits. A major part of this study involved analysis of the noise performance of existing tyres on the market, to assess the feasibility of tightening the noise limits in the future. Table 5 shows the percentage of tyres tested which were able to meet the existing levels with margins of 3dB(A) and 5 dB(A).

Table 5. Performance of current tyres in relation to existing limit values

Category	Percentage ≥ 3 dB(A) below	Percentage ≥ 5 dB(A) below
C1b	68	10
C1c	45	5
C1d	66	19
C1e	57	16
C2	50	13
C3	75	53

On the basis of the above results, and further comparisons which indicated no significant relationship between noise, wet grip or rolling resistance on the tyres tested, FEHRL concluded that it was feasible to introduce new limits in the order of 5dB(A) lower than the existing limits. Taking into account the normal product cycle of tyres, it was suggested that a date of 2012 was feasible for the introduction of the new noise limits, with a possible interim step in 2008. The FEHRL report also suggested a number of other changes, including:

- A realignment of the width 'bands' to recognise the increased average width of modern car tyres
- A change in the method of 'rounding' the raw measurement data to give the final approval figure
- Recommendations to introduce testing of wet grip and rolling resistance to ensure that future tyre designs to not sacrifice these qualities in the pursuit of lower noise levels
- Recommendations on changes to the test surface and measuring procedures
- Increased consumer awareness through a labelling scheme

Options concerning the introduction of new limits, the realignment of width bands, changes to the rounding procedure and a possible labelling scheme are discussed later in this section. Requirements concerning wet grip and rolling resistance are covered in other sections. Changes to the test procedure and the test surface will be discussed in the context of possible changes to UNECE Regulation 117, since the proposed Regulation would refer to the Regulation 117 test procedure.

4.3.1.1. Benefits from Reduced Tyre Noise

The benefits of tyre/road noise reductions were calculated using a valuation that was established by the EU Working group on Health and Socio–Economic Aspects in 2003. This put a value of noise reduction to households of 25 Euro per dB per household per year. This figure is lower than figures used in some national studies in the wealthier Member States, and therefore could be considered to be conservative. However, the figure was reached by a wide consensus of academics for use across the EU with input from national governments and industry. The FEHRL report adjusted this 25 Euro figure to 27 Euro to reflect the growth in per capita GDP between 2003 and 2006. The estimated number of households in the EU 27 is around 215 million. Therefore the total benefit across the EU 27 would be

27 X 215 million = 5805 million Euro per dB per year. (say 5.8 billion Euro)

As indicated in the previous section, FEHRL considered that proposed noise limit reductions per tyre of around 5 dB(A) were feasible so this figure formed the basis of calculations to determine the effect on the general public. A noise reduction of 5 dB (A) per tyre does not mean that the noise reduction perceived by a person (for example, at the roadside or in a nearby building) would be 5 dB(A). This is due to a number of factors:

- Even if the noise limit is reduced by 5 dB(A) this does not mean the average noise value per tyre is reduced by the same amount. This is because some tyres already meet the proposed limits as it would be technically difficult (or impossible) for them to improve by another 5 dB(A). The likely result is that the distribution of tyre noise values will become narrower, on average around 3 dB(A) below current values.

- Due to the variations between test road surfaces and actual road surfaces, the reductions in tyre noise values may not always be reflected in reductions in actual tyre road/noise values.

- The other sources of noise from the vehicles also need to be taken into account.

These factors are discussed in detail in section 5.3 of the FEHRL report, which also describes two mathematical noise models which have been developed for use in traffic noise calculations and noise mapping in European towns and cities; HARMONOISE and TraNECam. Both these models were used to predict the noise benefits achieved for the population as a result of the proposed tyre noise limits. Predictions were made for a range of scenarios from motorways to congested urban conditions. It was concluded that there was considerable agreement between model predictions, leading to greater confidence in the predictions made. However, there were some relatively small differences between the noise level reductions predicted by HARMONOISE and TraNECam, so the results of both models were considered as conservative and optimistic assumptions respectively.

Based on the two models, FEHRL assumed a lower value of **0.9 dB(A)** and an upper value of **2.3 dB(A)** for the overall average traffic noise reduction resulting from the tyre noise limits **for C1 tyres only**. There would be greater benefits than this if the proposal covered C1, C2 and C3 tyres.

4.3.1.2. Valuation of benefits from new noise limits for C1 tyres

The valuation of 5.8 Billion Euro/dB/annum from section 4.3.1.1 needs to be multiplied by the actual noise reduction in dB(A) that would occur in real traffic. This then provides the annual benefit to the public across the EU27 of the proposed new noise limits, in 2006 Euro values.

(i) Using the 0.9 dB(A) estimate:

Annual benefit =	5.8 billion Euro/dB/annum x 0.9 dB(A)
Annual benefit to EU27 of proposed new noise limits using 0.9 dB(A) estimate =	*5.22 billion Euro/annum*

(ii) Using the 2.3 dB(A) estimate:

Annual benefit =	5.8 billion Euro/dB/annum x 2.3 dB(A)
Annual benefit to EU27 of proposed new noise limits using 2.3 dB(A) estimate =	*13.34 billion Euro/annum*

Taking (i) and (ii) together:

Estimate of the annual benefit of the proposed new noise limits =	***5.22 -13.34 billion Euro/annum***

This is a simplified analysis of the benefits achievable from a reduction in the limit values of 5dB per tyre. A more detailed analysis of the benefits over time is provided in section 7.5.2 of the FEHRL report. This predicts a total benefit of 48-123 billion Euros for the EU25 over the period of 2010 to 2022. Adjusting this figure to the EU27 gives a total benefit of around 50-129 billion Euros. The summary table in Annex II gives values for the benefit per car, based on a mid-range annual benefit of 9bn Euro/annum.

4.3.1.3. Costs of Tyre Noise Reductions

Any costs for compliance with the proposed changes to the Directive are assumed to be borne by the following stakeholders:

Any increased costs for the original tyre, due to extra material or labour costs, or extra research and development, would initially be borne by the tyre manufacturer, but would be passed on to the consumer either directly (in the case of after market tyres) or via the vehicle manufacturer (in the case of original equipment tyres)

Any increase in running costs (such as increases in fuel consumption or increased wear) would be borne directly by the consumer.

The FEHRL report concluded that 35% of C1 tyres on sale in 2000-2005 already met noise limits around 4.5-5 dB(A) below the current level, that is to say, the noise level reductions assumed when calculating the benefits described in the previous paragraph. This would indicate that the research and development to meet the new noise limits has already been carried out by the manufacturers, and tyres achieving the new noise limits are apparently being mass produced without difficulty, and are price competitive with non-compliant tyres.

Other requirements of tyres, such as safety and visual appeal, must already have achieved levels that are satisfactory both to sellers and buyers. There was also no evidence from any available literature that tyres meeting the lower noise level suffered significantly from any reduced durability or increased rolling resistance. Therefore it could be concluded that there are unlikely to be any increased running costs for the consumer.

FEHRL concluded that the only major cost to manufacturers would lie in discontinuing production of any tyre lines that did not meet the proposed noise limits. The tyre industry has indicated that there are around 6,000 tyre lines on sale at any one time. Therefore we consider that there is unlikely to be an undersupply of the market due to such discontinuation, though there is a danger that customer choice could be reduced, particularly in some 'niche' markets. There would of course be tooling costs for replacing tyre moulds, but given that the time-span for introduction of these requirements is likely to be around 8 years, this should fit in with the normal product replacement cycle (bearing in mind that not all tyre variants will need to be replaced).

Although it could be claimed that the R&D effort has already been spent, since there are tyres in production that already meet the new limits, it is accepted that the limits will be more difficult to meet with respect to some types of tyre than with others. Also, the normal tyre design cycle may have to be accelerated in order to meet the proposed deadlines, requiring extra research and development resources. This is discussed in detail in section 7.6 of the FEHRL report, which quotes a tyre industry estimate of 2 billion Euro per annum to achieve this. It is difficult to provide an independent validation of this figure, and FEHRL considers it to be an over-estimate. FEHRL calculated that, on the basis of industry–supplied figures stating that research and development expenditure was around 3.5-5% of sales in the EU, amounting to around 400million Euros, if the industry were to increase their entire research and development over the transitional period by 50%, this would represent an extra 200million Euro per annum. If it was assumed that this research was concentrated on developing original equipment tyres for new cars and this cost was spread across the entire EU sales of new cars (around 13 million per annum) this would represent about 15 Euro per car. Alternatively, using the assumption that 33% of cars already meet the limit values, the extra costs may only fall on the 67% of tyres that do not, which would lead to a increase in cost per car of 22.5 Euros.

Table 6 Proposal for noise limits for C1 (car) tyres

Old tyre class (width in mm)	Old value (dB(A))	Proposed class (width in mm)	Possible intermediate values			Final values		
			Proposed value (dB(A))	Reductions compared with current values	'Real'* reductions)	Proposed value (dB(A))	Reductions compared with current values	'Real'* reductions)
≤ 145 (c1a)	72	≤ 185 (C1A)	73	-1.0	0.5	71	1.0	2.5
> 145 ≤ 165 (c1b)	73			0	1.5		2.0	3.5
> 165 ≤ 185 (c1c)	74			1.0	2.5		3.0	4.5
> 185 ≤ 215 (c1d)	75	> 185 ≤ 215 (C1B)	74	1.0	2.5	72	3.0	4.5
> 215 (c1e)	76	> 215 ≤ 245 (C1C)	74	2.0	3.5	72	4.0	5.5
		> 245 ≤ 275 (C1D)	75	1.0	2.5	73	3.0	4.5
		> 275 (C1E)	77	-1.0	0.5	75	1.0	2.5

* Currently, the 'raw' measurements are rounded down to the nearest whole number, then 1dB is subtracted to give the final approval value. The FEHRL proposal was to take the raw measurement and round it up or down to the nearest whole number to give the approval value. The effect of this would be to increase the difference between the old and new targets by, on average, 1.5 dB

4.3.1.4. Options for Reducing Tyre Noise

As indicated in table 2, the options of doing nothing or relying on market forces to reduce tyre noise have been eliminated. Other measures, such as improving road surfaces, can be considered as part of an 'integrated approach' to reducing tyre noise, but such measures should be complementary to, and not replace, direct measures to reduce the tyre's contribution to the problem. The main issue to decide is the level of ambition of the proposed tyre noise levels and the associated timescale.

4.3.1.4.1 C1 (car) tyres

Table 6 proposes two sets of proposed values for C1 (car) tyres, together with their reductions from the current values required by the 2001/43 Directive. The 'final' values in the right hand columns represent the '2012' proposals included in the FEHRL document. The 'intermediate' values in the middle columns represent the '2008' proposals included in the FEHRL report. These were included to allow a phasing-in of the requirements. It would not be practical to implement these requirements by 2008 as originally suggested, but a possible option would be to ease the burden on industry by introducing the intermediate requirements in, say, 2012 with the final requirements following in, say 2016.

It should be noted that part of the proposal included in table 6 is the realignment of tyre width categories to represent more accurately the distribution of tyres on the current market. It is more difficult for wider tyres to meet low-noise requirements and the existing and proposed limits reflect this. However, it has been argued that allowing higher limits for wider tyres encourages vehicle manufacturers to specify wider tyres than are necessary for a particular vehicle. Clearly, a wider tyre increases the amount of road contact surface, and therefore offers a potential safety advantage. However, in many cases it could be argued that this safety advantage is only relevant beyond the limits of performance that the vehicle is designed for.

Research carried out by the Transport Research Laboratory (TRL)[11] in the UK proposed a different set of future noise limits, summarised in Table 7. This proposal would require the same limits for all widths of C1 tyre under the existing classification, but would allow an extra 2dB(A) for a new class of tyre wider than 245mm.

The effect of this proposal would be particularly severe on tyres just under the 245mm threshold, and it might be necessary to adjust some of the limits or thresholds. However, the general principle of reducing the number of width categories from five to two may be worthy of further consideration.

[11] Tyre/road noise –Assessment of existing and proposed tyre noise limits : report for UK Department for Transport Watts et al, TRL May 2006, http://www.dft.gov.uk/pgr/roads/environment/research/cqvcf/tyrenoise/tyreroadnoisereport

Table 7 . TRL proposal for C1 noise limits

Tyre Class	Width (mm)	Limit values (dB(A)			
		Current limit	Proposed limit	Reduction	'Real' reduction (see table 5 footnote)
C1a	≤ 145	72	71	1.0	2.5
C1b	> 145 ≤ 165	73	71	2.0	3.5
C1c	> 165 ≤ 185	74	71	3.0	4.5
C1d	> 185 ≤ 215	75	71	4.0	5.5
C1e	> 215 ≤ 245	76	71	5.0	6.5
C1f	> 245	76	73	3.0	4.5

Table 8. Summary of Options for C1 Tyres

Tyre width class	Actual reduction in limit values (dB(A))			
	Option a **(FEHRL recommended limits)**	**Option b** **(FEHRL recommended limits - 2 phase)**		**Option c** **(TRL recommended limits)**
Possible implementation date (new tyre types)	2012	2010	2014	2012
≤ 145	2.5	0.5	2.5	2.5
> 145 ≤ 165	3.5	1.5	3.5	3.5
> 165 ≤ 185	4.5	2.5	4.5	4.5
> 185 ≤ 215	4.5	2.5	4.5	5.5
> 215 ≤ 245	5.5	3.5	5.5	6.5
> 245 ≤ 275	4.5	2.5	4.5	4.5
> 275	2.5	0.5	2.5	4.5

Ultimately, bearing in mind the scientific evidence that a limit reduction of around 5dB(A) is feasible, and the increasing evidence on the adverse health effects of environmental noise pollution, it would be difficult to justify a smaller reduction than this. However, there remain questions on timescale (and whether to go for a two-phase approach) and to what extent wider tyres should benefit from an additional allowance. Table 8 summarises the three options, based on the above discussion. The costs and benefits of Option a are generally as described in 4.3.1.2 and 4.3.1.3. Option b would, in effect, be a delay of two years which would mean that two years of benefits arising from the implementation of the full limits would be lost. On the other hand, the longer introduction period would allow the industry time to integrate the new requirements with its normal tyre replacement programme and thus reduce the costs due to accelerated replacement. It could be argued that the "intermediate' limit will have little actual effect, since, according to FEHRL, 76% of tyres meet this limit already and most new tyres which are introduced around 2010 will be designed to meet the 2nd stage limits in order to enable a full design life of about 8 years to be achieved. Option c) is, in general, slightly more severe than Option a) so the costs and benefits would be slightly greater.

4.3.1.4.2 Commercial Vehicle Tyres (C2 and C3)

The FEHRL recommendations for noise limits for commercial vehicle tyres are given in Table 9A As with C1 tyres, two levels are proposed , shown on the table as 'intermediate' and 'final' thus allowing the possibility of a 2 phase introduction.

Options for implementation for C2 and C3 are shown in Table 9B. As there are no width categories within these classes and therefore no opportunity to adjust these categories, only two options are presented. As with the C1 category the two-stage option (option b) is likely to provide lower costs and lower benefits. It would seem reasonable to follow the FEHRL proposed timetable for the introduction of the new requirements for new tyre types (2012). However, due to the large number of tyre lines in existence, it would be necessary to allow a longer-than-normal transition period to allow existing tyre types to continue to be sold (say four years).

Table 9A FERHL recommendations for light commercial (C2) and heavy commercial (C3) tyres.

Tyre class	Category of use	Limit values in dB(A)						
		Current	Intermediate requirements			Full requirements		
			Limit	Nominal Reduction	Actual* reduction	Limit	Nominal reduction	Actual* reduction
C2	Normal	75	73	2.0	3.5	71	4.0	5.5
	Snow (M+S)	77	74	3.0	4.5	72	5.0	6.5
	Special	78	76	2.0	3.5	74	4.0	5.5
C3	Normal	76	73	3.0	4.5	71	5.0	6.5
	Snow (M+S)	78	75	3.0	4.5	73	5.0	6.5
	Special	79	77	2.0	3.5	75	4.0	5.5

* Currently, the 'raw' measurements are rounded down to the nearest whole number, then 1dB is subtracted to give the final approval value. The FEHRL proposal was to take the raw measurement and round it up or down to the nearest whole number to give the approval value. The effect of this is would be to increase the difference between the old and new targets by, on average, 1.5 dB.

Table 9B – Options for C2 and C3 tyres

		Actual limit reduction (dB(A))		
		Option a)	Option b)	
Possible introduction date		2012	2010	2014
C2	Normal	5.5	3.5	5.5
	Snow (M+S)	6.5	4.5	6.5
	Special	5.5	3.5	5.5
C3	Normal	6.5	4.5	6.5
	Snow (M+S)	6.5	4.5	6.5
	Special	5.5	3.5	5.5

4.3.1.4.3. Additional Options

The possibility of noise labelling to inform consumers of the noise characteristics of particular tyres has been raised. Although it is not considered that this could be a viable alternative to legislation, since there is little customer incentive to buy low-noise tyres, there is a possibility that noise values, together with wet grip values, could be added to the CO_2 label discussed in Section 4.3.2 to give the consumer a full range of information.

In addition, it has been suggested that retreaded tyres should also meet the noise requirements. Currently this would only affect after-market tyres since retreaded tyres are currently not allowed on new cars within the scope of type-approval. Also, there has been no study on the feasibility of applying the proposed limits on retreaded tyres. The FEHRL study indicates that for retreaded tyres on heavy vehicles (the vehicles for which they are most often used) the values for retreaded tyres are 2-4 dB(A) noisier than new tyres so there may be problems with the feasibility of meeting the proposed standards. Further investigation may be required in this area.

4.3.1.5. Further Analysis of Practical Noise Limits.

Following the initial consultation, a study by SP Technical Research Institute of Sweden[12], sponsored by the Swedish Government, examined the rolling noise of currently available tyres in the C1, C2 and C3 categories. In the C2 and C3 categories; for which the FEHRL study had offered considerably less data than for C1 tyres, the SP data suggested that the 5.5-6.5 db(A) reductions proposed by the FEHRL study might be over-ambitious. In addition, for C3 tyres, it was suggested that there was a considerable difference between the noise emitted from tyres uses on the drive axle(s) and those used on the steering axles. Tyres used on the drive axles, often termed 'traction tyres' also tend to be approved as mud and snow (M+S) tyres. To allow continued use of these tyres, it would seem appropriate to allow an additional 2db(A) for traction tyres compared with standard tyres.

Furthermore, there are certain tyres which used for heavy-duty off-road applications categories which would have difficulty meeting either the noise or rolling resistance limits. It would seem reasonable to exempt these tyres (termed as 'professional off-road tyres') from the noise and rolling resistance requirements provided these were for genuine off-road applications and not for normal road-going vehicles. For this reason, it is suggested that such exemptions are limited to tyres with a speed capability of no more than 100km/hr.

Taking the above factors into account, the complete table of proposed limit values is given in Table 10. Column 1 gives the proposed values measured in the same way as in the current Directive (rounding down to the nearest whole number value and subtracting a tolerance of 1db(A)). Column 2 gives the proposed values using the rounding method proposed by FEHRL (rounding up or down to the nearest whole number with no additional tolerance).

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[12] Jonasson, Hans (2007): "Rolling Noise Emission of Tyres – A Market Survey". SP Report: 2007:70, SP Technical Research Institute of Sweden, Borås, Sweden.

Table 10 – Summary of Proposed Limit Values

Tyre Class	**Limit value (db(A)**	
	1. Using current Directive Method	**2. Using FEHRL proposed method**
C1A (≤ 185mm)	70	71
C1B (> 185 ≤ 215mm)	71	72
C1C (> 215 ≤ 245mm)	71	72
C1D (> 245 ≤ 275mm)	72	73
C1E (> 275mm)	74	75
C2	71	72
C2 M+S	72	73
C3	72	73
C3 M+S	74	75

'Professional off-road tyres' meeting certain criteria would be exempt from these requirements.

4.3.2. Tyre Rolling Resistance

The following sections analyse the costs and benefits of introducing low rolling resistance tyres across the vehicle fleet. The analysis is based on the results of the TNO study which concentrated on passenger cars. Passenger cars are seen as the first priority with respect to CO_2 emission targets. However the use of low rolling resistance tyres on commercial vehicles is also discussed later in this section.

There is currently no formal definition of a 'Low Rolling Resistance Tyre' (LRRT). However, a draft international standard for a rolling resistance measuring procedure (ISO 28580) is currently under preparation.

4.3.2.1. Calculation of Benefits at the Vehicle Level

The TNO study indicated that low rolling resistance tyres could reduce a car's fuel consumption by between 1% and 5% . As outlined in section 4.3.2.3 , one option is to designate tyres into rolling resistance 'bands' so that, say, a band A tyre gives the maximum rolling resistance reduction (corresponding to, say, a 5% fuel consumption reduction) and a band D tyre gives the minimum permissible improvement (corresponding to, say, a 1% fuel consumption reduction) Thus, an average rolling vehicle fuel consumption reduction of 3% is assumed for the purposes of this analysis.

Full details of the TNO analysis are given in section 5.3 of the TNO report. However, the main conclusions are that, based on an annual distance of 16,000 km, a car using LRRT would on average save 0.09 tonnes of CO_2 per year (well to wheel). In the longer term , a TREMOVE[13] analysis has predicted that the mandatory fitting of original-equipment and replacement LRRT, phased in from 2012, would result in a total reduction of CO2 emissions from passenger cars of 1.45% in 2020. In addition, there would be fuel cost savings for the vehicle owner, depending the cost of fuel at the time. For a fuel cost of 0.21€/l (excluding tax) the annual saving would be €7. For a fuel cost of 0.60 €/l, the annual saving would be €19. The actual fuel cost to the motorist will include tax, which would significantly increase the cost advantages of LRRT.

4.3.2.2. Calculation of Costs at the Vehicle Level

The TNO study estimated the additional cost to the consumer of fitting a set of LRRT to a vehicle would be €60. Assuming a typical tyre life of 3 years this would lead to an additional annual cost of €20. There was no evidence of any durability or safety penalty in purchasing LRRT, so the €24 would represent the total annual additional cost. For the tyre manufacturers, many of the same arguments apply as for tyre noise. LRRT are already proven to be feasible but if a deadline is applied which prohibits the sale of non-compliant tyres, there may be additional costs to the manufacturer in accelerating the replacement of such tyre types.

4.3.2.3. Options for Introducing Tyre Rolling Resistance Requirements

4.3.2.3.1 Car Tyres

As indicated in Table 4, it is possible to use the market mechanism as well as regulation to promote the use of LRRT. The TNO report suggests that 50% of new tyres already fall within the category of LRRT, which suggests that the market mechanism is already working to some extent. This is largely due to the fact that vehicle manufacturers like to achieve low fuel consumption figures for their products, and therefore have an incentive to provide energy–saving tyres. For the after-market, there is unlikely to be such an incentive since other factors (such as purchase cost) are more likely to play a major role particularly with the oldest cars. However, the development of a tyre grading and labelling system to give consumers more information on the fuel consumption benefits of LRRT may be beneficial**.**

An outline proposal on a banding system for LRRT is given in Table 11A below. (The number of bands and the associated threshold levels may be subject to further modification). The table includes indicative figures from the tyre industry on the percentage market share over time of tyres in the various grades. (Band A represents the best performance level)

Table 11A – Possible Grading System for Rolling Resistance (C1 tyres)

	Band	Band	Band	Band

[13] For background on TREMOVE see http://www.tremove.org/

		A	B	C	D
Maximum rolling resistance coefficient per band (kg/tonne)		9.0	10.5	12.0	13.5
% Market share	2004	1.7	14.8	40.5	33.8
	2012 (est)	10.0	25.0	35.0	30.0
	2015(est)	20.0	26.7	26.7	26.7

Although it is a reasonable assumption that market forces will tend to push tyres to the higher band categories, as indicated above, markets are difficult to predict and it may be necessary to include a legislative option to ensure that at least the worst performing tyres are removed from the market. Hence three options are proposed.

Option a) Rely on a grading and labelling scheme to encourage the increased use of low rolling resistance tyres. For tyres supplied as original equipment, rely on the vehicle manufacturers' incentive to produce cars with low fuel consumption, and to produce cars with a low CO_2 rating in order to meet future CO_2 emission targets.

Option b) Introduce a grading and labelling scheme as in Option a) but make at least the minimum (band D) standard mandatory for vehicle and component type approval.

Option c) Same as Option b) but would also apply to after-market tyres.

The costs and benefits for Options a and b are likely to be as indicated in sections 4.3.2.1 and 4.3.2.2 above. Option c may incur additional costs for manufacturers (likely to be passed on to consumers) if the level of difficulty is such that a large number of tyre designs have to be replaced over a short timescale. However, it is the option that provides the greatest degree of certainty. It is also the only option that lives up to the Commission's commitment made in the Commission's communications of 7 February 2007[14] to ensure that a reduction of a further 10g CO_2 /kg is achieved, over and above the 130g to be achieved by vehicle technology means. Savings due to tyres supplied as original equipment are already accounted for in the vehicle's CO_2 rating. So it is only the tyres for the after-market that can contribute to the 10 g CO_2 /kg target. Since these tyres will be fitted to all vehicles of the existing fleet, they have a potential for reducing CO_2 which is up to ten times higher than tyres for new vehicles. Thus, Option c) is the preferred option.

[14] See http://eur-lex.europa.eu/LexUriServ/site/en/com/2007/com2007_0019en01.pdf

4.3.2.3.2 Commercial vehicle tyres.

The options for C2 and C3 tyres are generally the same as for C1 tyres. However, there is limited data on the current rolling resistance performance of C3 tyres. Therefore a single limit rather than a grading system is proposed for this category of tyre.

4.3.2.3.3. Labelling

In order for options a and b in section 4.2.3.2.1 to work effectively it would be necessary to introduce a clear understandable labelling system to advise the end-user on the best choice of replacement tyres with regard to fuel consumption (and hence CO_2 emissions). Labelling has been used with respect to passenger cars (see section 11 of the TNO report) and there is a strong argument for using a similar system for tyres, possibly using the same seven-band format as used on other consumer products. The addition of 3 more bands would not seem to increase the costs of the labelling scheme. In fact, it is likely to present an incentive for manufacturers to move to the higher bands. Thus the market share of band G tyres (see table 11B below) is likely to decrease somewhat faster over time than it otherwise would. Initial requirements could be introduced from 2012. At a later stage (say 2 years) it is envisaged that approvals to the lowest band would cease.

Table 11B –Modified Grading System

Tyre Category	Maximum rolling resistance coefficient per band (kg/tonne)						
	Band A	Band B	Band C	Band D	Band E	Band F	Band G
C1	4.5	6.0	7.5	9.0	10.5	12.0	13.5
C2	4.5	5.5	6.5	7.5	9.0	10.5	12.0

It is estimated that the 3.3 g/km CO_2 reduction figure quoted by TNO would correspond to a tyre falling between categories E and F in the above table.

Further analysis of any labelling system would be needed. Therefore this proposal would be limited to setting minimum requirements for type approval. Actual requirements for labelling will be introduced through other regulatory acts.

The 2007 consultation proposed limit values of 13.5 for C1 and 12.0 for C2 (equivalent to Band G in the table above) However, further research presented at the International Transport Forum[15] suggested that lower values were achievable in the short term. Thus a first phase implementation of mandatory limits based on Band F would seem reasonable, followed by a minimum requirement of Band E as a second stage.

[15] See http://www.internationaltransportforum.org/docs/SPnordwijk07.pdf

4.3.3. Tyre Pressure Monitoring Systems

4.3.3.1. Benefits

Tyre Pressure Monitoring Systems offer benefits in terms of both casualty and CO_2 reduction.

4.3.3.1.1. Safety Benefits

The study referred to in 4.3.1.1.1 indicated that if all cars were fitted with effective tyre pressure monitoring systems, then annual savings of around 29 fatalities, 340 serious injuries and 3350 slight injuries could be foreseen. Applying the values in table 3 leads to annual casualty savings of € 155million. Based on a vehicle stock of 220 Million, the saving comes to around € 0.7 per vehicle per year.

4.3.3.1.2. CO2/ fuel saving benefits.

The potential fuel saving benefits arising from the use of a TPMS system depends on the degree of under-inflation of tyres in current use, and the degree to which TPMS systems can address this. There are a number of studies ongoing in this area, which indicate that the under-inflation problem varies considerably between Member States. The TNO study (section 5.3) looked at the CO2 benefits of TPMS using a similar methodology to their analysis of LRRT. It estimated that an accurate TPMS system could generate fuel savings of 2.5%. Using an average car usage of 16,000 km the annual savings per car could come to between 6€ (assuming a fuel price of 0.21€ /litre) and 16 € (assuming 0.6€ /litre). In line with normal cost-benefit methodology the above fuel costs do not include indirect taxes. However, in reality the fuel cost to the motorist will include such taxes, thus the annual fuel cost saving due to the use of TPMS will be considerably greater than indicated above.

The associated saving on CO_2 would be 0.09 tonnes per year (well to wheel). In the longer term, a TREMOVE analysis has predicted that the mandatory fitting of TPMS systems meeting the above specifications, phased in from 2012, would result in a total reduction of CO2 emissions from passenger cars of 1.6% in 2020 and 2.3% in 2030.

4.3.3.2. Costs

The TNO study assumed that the additional cost of fitting a TPMS tyre system to a car would be € 50. However TNO suggests this cost might rise by around 25% bearing in mind that the accuracy of TPMS systems would have to improve over current levels in order to be effective at improving fuel consumption (although the present level of accuracy will still yield the safety benefits) . More recent information received via suppliers suggests that the current cost of a system which exceeds the current requirements is around € 30, Assuming a vehicle life of 13 years and no additional maintenance costs this works out at € 2.3 per vehicle per year. Allowing for a 25% increase to ensure that future requirements are met, this still comes to just under €3 per vehicle per year.

4.3.3.3. Options for introducing Tyre Pressure Monitoring Systems

The options identified from table 2 were as follows:

a) Do nothing and allow the market to take the initiative.

b) Establish technical standards for such systems (where fitted) and allow manufacturers to fit them optionally.

c) Establish technical standards and mandatory fitting requirements.

In the case of LRRT there was the additional manufacturer incentive to supply new cars with LRRT in order to reduce that vehicle's fuel consumption or CO_2 emission rating and thus comply with the Commission's future target. However, this would not apply with TPMS since TPMS does not affect the fuel consumption or CO_2 rating of a new car (since a car will be tested for its fuel consumption with its tyres correctly inflated). However, TPMS can affect the fuel consumption of a car in 'real world' driving conditions.

Option a) would allow the continued use of TPMS systems to current standards, which may yield the safety benefits described in section 4.3.3.1.1 but are unlikely to be sufficiently accurate to yield the CO_2 and fuel saving benefits described in section 4.3.3.1.2. Thus a cheaper system costing €2.5 per vehicle per year would only provide the safety benefits of €0.7 per vehicle per year. Following the market approach (option a) would encourage cheaper systems which would give little or no fuel consumption benefits and could in fact make things worse since a driver might be tempted to allow his tyre pressures to fall until the TPMS alert was activated, which could be considerably below the normal tyre pressure. However, a more expensive system costing €3 per vehicle per year would yield the full benefits of between €6.7 and €16.7 per year depending on fuel prices. Thus setting a higher standard (as in option b) would result in a net benefit to the driver in the range of between €3-13 even before considering the environmental benefits. To maximise the benefits, and to ensure the maximum likelihood of reaching the CO_2 reduction targets, option c) would be preferred.

Subject to the agreement of satisfactory technical standards, it is envisaged that TPMS requirements could apply from 2012 to passenger cars. TPMS for other vehicle categories could be added at a later date, subject to technical feasibility and the development of appropriate standards.

4.3.4. Wet Grip Requirements

4.3.4.1. Benefits

Generally, it is considered that current tyre designs offer a good degree of wet grip performance and there has been no identified need to increase this level of performance. Indeed, the wet grip procedure developed for car tyres in UNECE Regulation 117 (and which is proposed for this regulation) does not require a significantly greater wet grip performance than current tyres. The main purpose is to ensure that there is no deterioration of wet grip performance as a result of designing tyres to meet low noise and/or rolling resistance requirements.

4.3.4.2. Costs

As current tyre designs are considered to meet the proposed requirements, there is unlikely to be any additional development or production cost involved in meeting the wet grip requirements. There may be costs involved in meeting the noise and rolling resistance requirements without compromising the wet grip requirements but these costs would be attributed to the noise/rolling resistance development costs covered under sections 4.3.1.3 and 4.3.2.2. The only additional cost to the manufacturer is likely to be the cost of approval testing, which is estimated at €1,000 per tyre type. Even assuming a modest production run of 100,000 tyres per type, the resulting cost per tyre is €0.01, so the cost can be considered as negligible.

Therefore it can be concluded that there are no additional cost or benefits of introducing wet grip requirements, and the main purpose of introducing such requirements is to maintain the 'status quo'.

4.3.4.3. Options for Introducing Wet Grip Requirements

As indicated in table 2, it is considered that only the option of a mandatory requirement for wet grip for car tyres (on the basis of UNECE Regulation 117) should be considered, otherwise there is a risk that some design solutions to achieve lower noise or rolling resistance could result in a reduction in safety. There is no evidence of the need for a tighter wet-grip standard than the Regulation 117 standard. It is possible that the tyre labelling proposed for rolling resistance (and possibly noise) could indicate if the wet grip performance exceeded the minimum requirement. This additional performance would be at the manufacturer's discretion, therefore there would be no additional regulatory cost if this option were taken. Thus, as far as the minimum regulatory requirements are concerned, the preferred option is to require all car tyres to meet at least the wet grip requirements of UNECE Regulation 117. Since most car tyres would already meet this requirement, it could be introduced with the minimum lead time (say 2 years from adoption of any Regulation). Work is under way to develop a standard for wet grip for C2 and C3 tyres which is likely to be incorporated into Regulation 117 in the future.

5. MONITORING AND EVALUATION

The proposed Regulation will take effect through the vehicle type-approval process. Vehicle manufacturers will need to demonstrate that vehicles comply with – amongst other things – the test requirements specified in order to receive a type-approval certificate.

Monitoring of the effect of the Regulation is effectively undertaken by type-approval authorities who oversee in-use compliance processes to ensure that the requirements of the Regulation are met. More generally, monitoring data, which are required on those tests specified for monitoring purposes only, will provide the necessary basis for further development of requirements, while also giving an indication of the wider success of the policy.

6. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

6.1. Internet Consultation.

An internet consultation covering outline proposals on all the aspects covered by this Impact Assessment was carried out between August and October 2007. Around 80 responses were received. These are available on the website http://ec.europa.eu/enterprise/automotive/index_en.htm In summary, the breakdown of responses was as follows:

Twelve responses were from Member States, four were from non-MS governments, four from other (mostly regional) government organisations, 29 were from industry/business organisations, 27 from NGOs, professional organisations and research groups and 5 from private individuals. There was general support for most of the measures proposed. However, some of the main comments, and our responses, are given in table 12 below.

Table 12 – Summary of Internet Consultation Responses on Main Issues

Comment	Respondent (s)	DG ENTR Response
Simplification issues		
New regulation not necessary. Simplification would be achieved by referring directly to UNECE Regulations within Type-approval Framework Directive	ACEA and some member vehicle manufacturers	Direct reference would remove the EU's power to improve safety or environmental requirements if the relevant UNECE Regulation was inadequate or could not be improved.
Advanced Safety Issues		
Additional safety features should be mandated such as ISOfix, seat belt reminders, alcohol locks, Intelligent Speed Adaptation, Advanced lighting systems	Various	Features such as ISOfix and seat belt reminders will be mandated by reference UNECE Regulations. Other features could be mandated under the proposed Regulation at a late date, subject to further cost/benefit analysis.
Too early to mandate systems such as AEBS	Vehicle manufacturers	Accept need to set realistic timescale and to limit the scope of application, at least initially, to heavy goods vehicles and buses.
AEBS possible for new types of heavy vehicle by 2010, light commercial vehicles by 2012, cars by 2014.	CLEPA (vehicle system/component manufacturers).	
Tyre issues		
Proposed noise standards unfeasible	Vehicle and tyre manufacturers	FEHRL report, supported by TRL and M+P reports, suggest proposal is feasible. However, we accept the need for adequate lead times to allow manufacturers to comply.
Proposed noise standards not sufficiently ambitious	Various environmental organisations.	
Rolling resistance banding unambitious (will not drive market forward)	Various	Accept that banding will need to be refined, using a seven band system. However, this may be implemented through a

		separate regulatory Act
TPMS (various estimates of required level of accuracy, ranging from 10-25%)	Various	Required technical specifications for TPMS will be discussed at Working Group level.

6.2. Opinion of the Impact Assessment Board

A draft version of the present impact assessment report was examined by the Impact Assessment Board (IAB). The opinion of the IAB formulated a number of recommendations on the draft impact assessment. These recommendations have been taken into account in the final document in the following way:

Recommendation 1. Paragraph 1.2 has been expanded to explain how the safety measures not specifically covered under this Regulation are covered by other EU or UNECE legislation. Annex I has also been clarified in this respect.

Recommendation 2. Paragraph 4.1 has been expanded to clarify how the move towards UNECE-based Regulations will aid simplification and competitiveness.

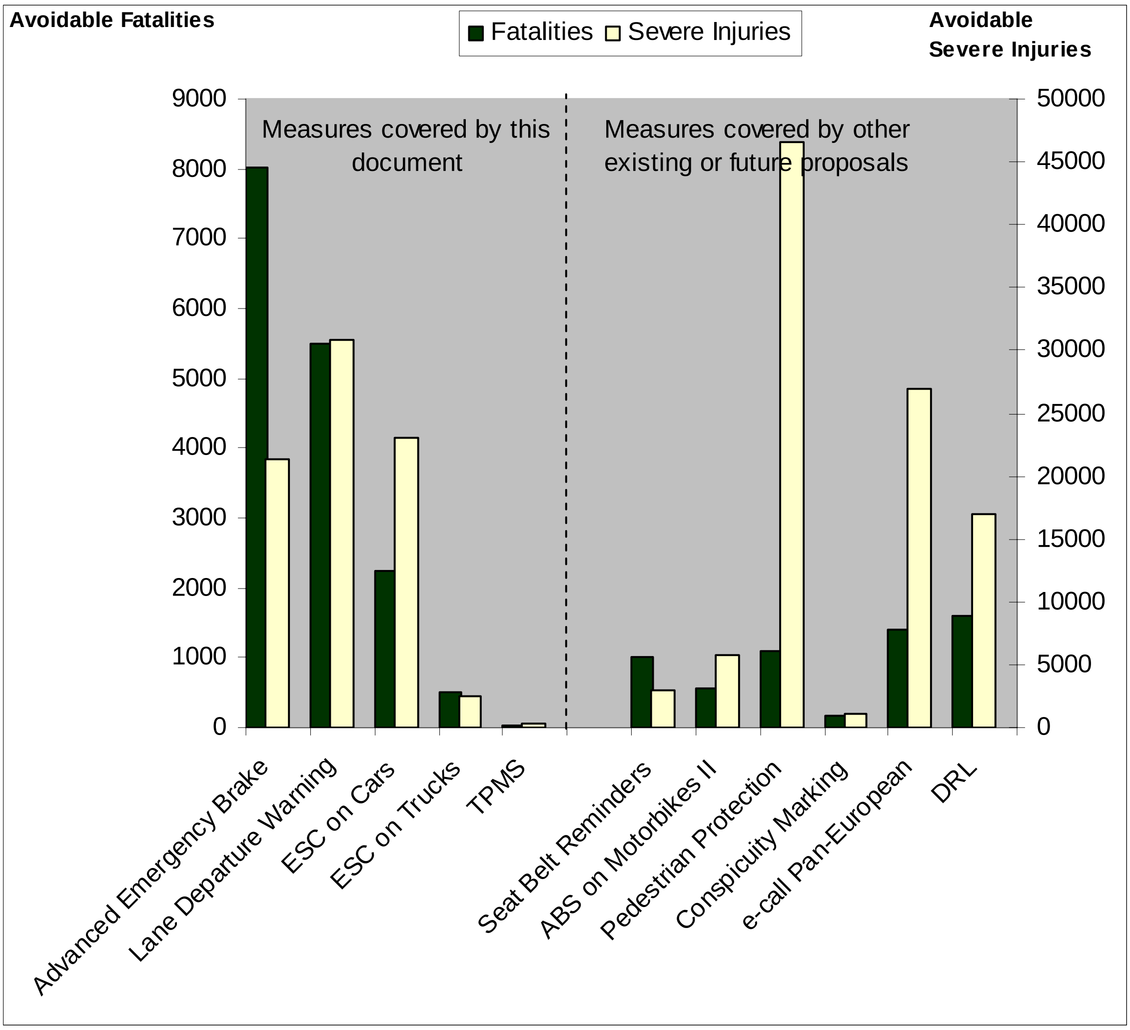
Recommendation 3. A new Annex II has been added to provide a summary of the costs and benefits of the various features under discussion. In addition, a new Annex III provides a full analysis of the current situation concerning the European Automotive industry, plus a discussion about the possible impact of the proposals discussed in this Impact Assessment on retail prices and affordability.

Recommendation 4. Paragraph 4 has been amended in each section to give approximate implementations times and, where appropriate, to explain why the market-mechanism is insufficient to achieve the desired safety and environmental objectives. In addition, the table in Annex II gives estimates of the percentage of new vehicles which are already fitted with the feature under discussion.

Recommendation 5. Various references to research studies have been have been updated and expanded where appropriate

ANNEX I

POTENTIAL CASUALTY SAVINGS ACHIEVABLE THROUGH VARIOUS TECHNOLOGIES.



ANNEX II COMPARISON OF COSTS AND BENEFITS FOR VARIOUS TECHNOLOGIES

Table 1. Advanced Safety Features

Note: The following table gives an indicative comparison between the costs and benefits of various technologies. Due to the different source data used, some of the assumptions used (for example, on vehicle fleet sizes and casualty costs) may differ, so comparisons should be treated with caution).

	Electronic Stability Control		Advanced Emergency Braking		Lane Departure Warning (all vehicles)
	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	
Increase in vehicle cost €	250	1000	1000	1000	600
Fatalities saved (per annum)_	2250	500	7000	1020	5500
Serious injuries saved (per annum)	23000	2,500	17000	4280	30800
Slight injuries saved (per annum)	260000	0	-15000	-1800	208500
Value of casualty savings per annum (Million €)	10, 802	867	9,213	1608.9	14, 824
Total per vehicle per year €	127	148	54.5	275	84.7
Total value of casualties saved though 13 year vehicle life €	1651	1926	708.5	3575	1101
Present value €	991	1155	425	2147	661
Benefit /Cost Ratio	3.97	1.16	0.43	2.15	1.1

Table 2 ;Summary of Tyre Measures (light vehicles only)

	Tyre noise proposal	Rolling resistance proposal	Wet grip proposal	TPMS
Increased technology cost per vehicle (average) **€**	15	60	0	40
Value of noise reduction (per car per annum) **€**	53.2	-	-	-
Value of CO_2 reduction.(tonnes/year)	-	0.09	-	0.09
Fuel savings per car per annum	-	13**	-	11**
Casualty savings per car per annum **€**	-	-	-	0.7
Savings over tyre lifetime (car lifetime for TPMS)	159.6	39	-	152.1
Present value (at 4% discount)	142	34.6	-	91.3
Benefit /cost ratio	9.46	0.53	1***	2.28

** Average estimate. This value is sensitive to fuel cost. See section 4.3.2.1.

*** No technology cost. Approval cost can be disregarded when spread over entire tyre production. Possible slight casualty reduction but this can not be quantified.

Table 3 – Effect on Initial Vehicle Cost

	Light vehicles €			Heavy vehicles €		
	Cost of technology	Percentage of vehicles currently fitted	Average increased cost per vehicle (where mandatory)	Cost of technology	Percentage of vehicles currently fitted	Average increased cost per vehicle (where mandatory)
Advanced safety systems						
ESC	250	50	125	1000	10	900
AEBS	1000	0	optional	1000	0	1000
LDW	600	0	optional	600	10	540
Total advanced safety	1850		125	2600		2440
Tyres						
noise	15	50	7.50	30	50	15
LRRT	60	50	30	120	50	60
wet grip	0	95	0	N/A	N/A	N/A
TPMS	40	0*	40	N/A	N/A	N/A
Total tyres	115		77.50	150	100	75
Total/vehicle	**1965**		**202.50**	**2750**		**2515**

* Some TPMS systems are fitted, but do not meet the proposed standards.

Assumptions used in tables 1-3

1) Annual cars registered in the EU = 13 million .

2) Number of heavy duty vehicles subject to ESC requirements registered per year = 450,000

3) Lifetime of a vehicle = 13 years.

4) Lifetime of a tyre = 3 years

5) Fuel costs used do not include taxes

6) Some slight injuries will increase, due to serious or fatal injuries being mitigated to slight injuries.

ANNEX III

CONSIDERATION OF THE PRODUCTION, EMPLOYMENT AND AFFORDABILITY EFFECTS OF THE PROPOSALS COVERED BY THIS IMPACT ASSESSMENT

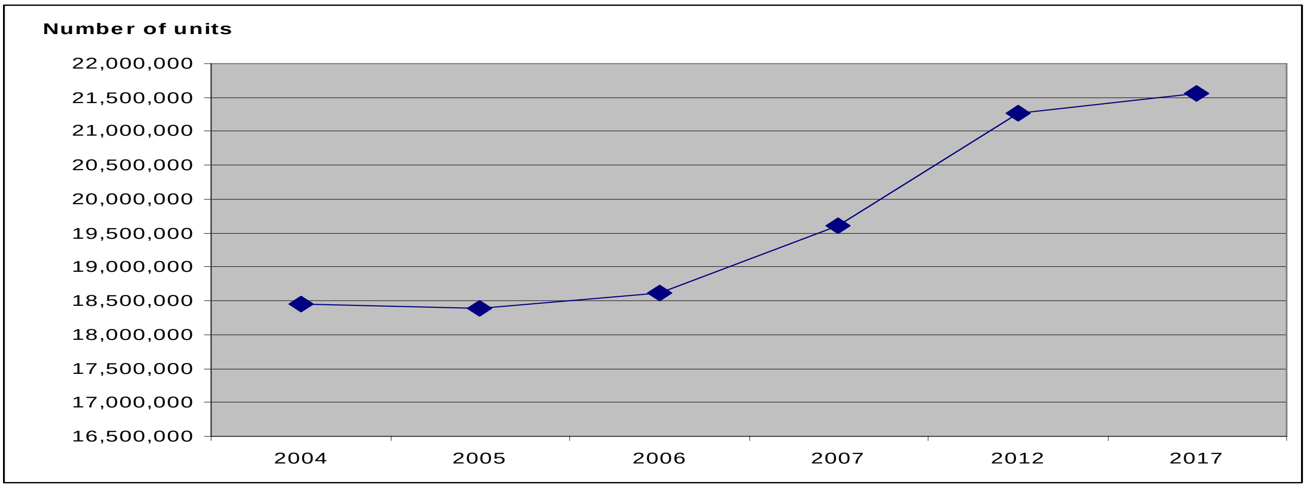
This Annex is structured into two parts: the first provides quantitative data and a summary discussion of the main indicators for the automotive industry while the second engages in a discussion about the possible impact of the proposal on retail prices and affordability.

1. Overview of the main production, sales, trade and employment indicators

1.1. Production and sales of vehicles in the European Union

Together with North America and Asia, Europe is one of the largest vehicle production locations globally as well as one of the main automotive markets in the world. The graphs below present the number of vehicles produced and sold in the European Union since 2004 together with a forecast for the 2012 and 2017 timeframe.

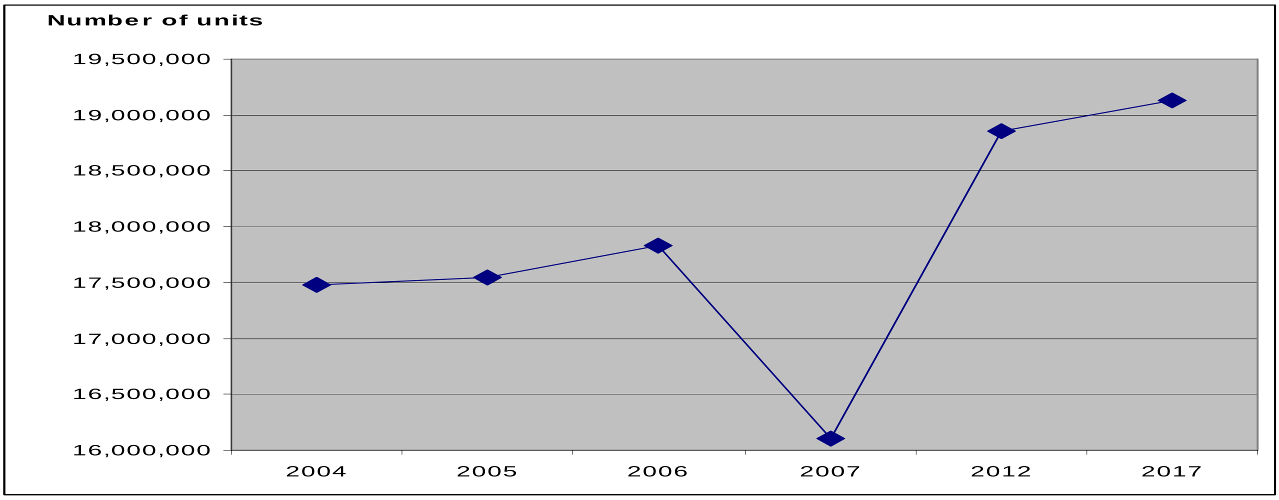
Graph 1: Production of vehicles in the European Union[16]



Source: Global Insight

[16] Data covers: Austria, Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Hungary, Italy, Lithuania, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

Graph 2 Sales of vehicles in European Union



Source: Global Insight

As can be seen from the above, both vehicle production and sales in the European Union are expected to increase in the medium term perspective and the Commission does not foresee that the current proposal will have an impact on this trend, which is impacted by a host of factors which are entirely independent of EU regulations in the field of vehicle safety (e.g. product planning, future market outlook, previous capital expenditure, labour costs, future marketing strategies of different vehicle manufacturers, agreements reached between company managements and employee representatives etc.). Production figures in 2012 and 2017 respectively are expected to be 8.7% and 10.2% higher than in 2007.

Although most European countries are involved in the automotive value chain, its relative role in the economic structures of different EU Member States can vary significantly. Given that the assessment of the potential economic and social impacts of legislative proposals should provide an indication of possible distributional effects between different European regions, the tables below show the break-down of vehicle production and sales by different Member States (including a forecast for the 2012 and 2017 perspective).

Table 1: Production of vehicles in the European Union by selected member states

	2004	2005	2006	2007	2012	2017
Austria	222,634	230,794	252,948	237,353	125,778	100,627
Belgium	525,156	538,362	560,215	530,744	702,950	678,739
Bulgaria	0	0	0	0	231	257
Czech Republic	446,320	602,288	851,988	901,519	1,184,760	1,267,183
Finland	10,510	21,644	32,746	24,184	30,757	32,894
France	3,652,427	3,535,162	3,153,186	2,977,140	3,190,728	3,196,215

Germany	5,559,861	5,751,353	5,811,062	6,197,594	6,582,612	6,521,372
Hungary	117,184	148,371	187,770	295,279	334,960	369,523
Italy	1,140,226	1,036,907	1,209,978	1,334,243	1,428,590	1,316,604
Lithuania	649	1,256	1,529	1,970	2,869	2,922
Netherlands	223,342	156,584	131,834	110,574	146,934	130,586
Poland	590,476	616,713	718,504	791,816	977,560	969,641
Portugal	224,392	219,455	222,603	174,194	166,118	175,035
Romania	122,185	194,802	213,589	218,801	555,526	534,922
Slovakia	181,498	177,511	267,088	520,430	699,354	719,988
Slovenia	131,761	177,945	153,126	200,350	119,389	157,919
Spain	2,945,162	2,676,659	2,703,515	2,870,131	2,766,660	2,934,843
Sweden	504,572	498,931	493,826	513,070	494,348	507,613
United Kingdom	1,854,873	1,801,618	1,648,522	1,709,331	1,750,036	1,936,583

Source: Global Insight

Table 2: Sales of vehicles in the European Union by selected member states

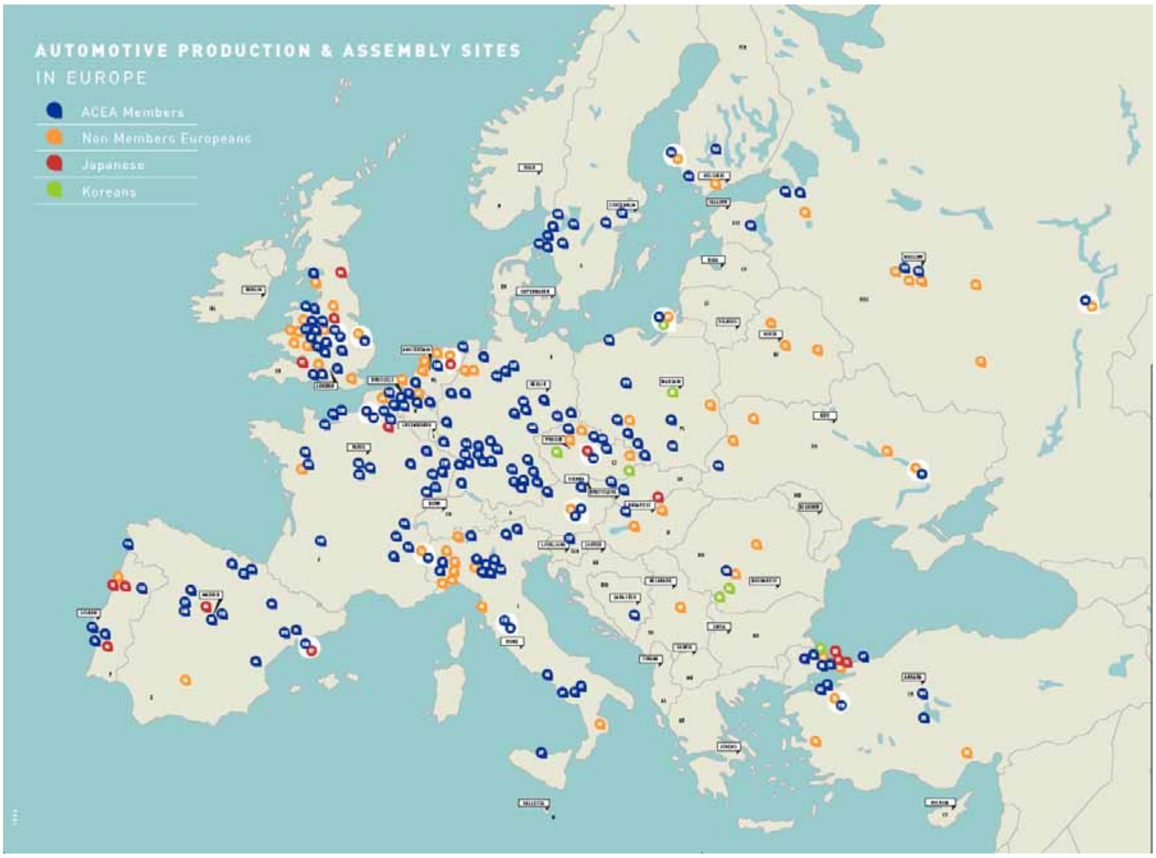
	2004	**2005**	**2006**	**2007**	**2012**	**2017**
Austria	349,850	344,934	346,554	338,386	346,911	351,295
Belgium	599,930	600,345	645,536	649,962	609,621	588,626
Bulgaria	25,785	34,478	45,422	56,413	76,370	88,727
Czech Republic	167,423	171,990	178,928	196,136	253,163	289,775
Denmark	170,557	208,689	225,630	228,430	237,928	225,368
Estonia	19,461	23,433	30,741	39,644	45,426	47,859
Finland	164,102	167,710	166,225	152,664	169,966	172,958
France	2,468,173	2,542,135	2,493,250	2,531,835	2,667,363	2,674,008
Germany	3,537,744	3,603,968	3,760,299	3,477,743	3,777,892	3,851,811
Greece	311,719	293,186	291,441	305,445	340,102	354,286
Hungary	235,629	225,479	206,345	203,940	252,084	279,202

Ireland	187,520	212,171	222,894	235,849	228,787	217,754
Italy	2,522,000	2,489,233	2,590,332	2,743,041	2,562,713	2,539,906
Latvia	13,707	19,750	30,337	42,677	52,583	58,721
Lithuania	13,509	16,025	21,472	30,937	38,702	44,163
Netherlands	583,989	544,481	567,647	595,506	606,602	590,250
Poland	366,892	282,585	295,008	365,807	522,705	595,808
Portugal	273,871	277,743	264,586	266,842	375,392	401,052
Romania	180,567	255,912	294,649	353,294	418,759	482,057
Slovakia	70,318	74,642	82,902	90,482	106,716	116,546
Slovenia	71,115	68,949	68,078	78,730	86,792	92,997
Spain	1,887,816	1,956,031	1,949,165		1,924,662	1,890,246
Sweden	299,959	314,951	328,687	347,896	343,655	338,146
United Kingdom	2,953,401	2,821,500	2,727,607	2,774,841	2,810,868	2,842,804

Source: Global Insight

Finally, the current vehicle production situation in Europe is presented in Figure 1 below, which indicates the main automotive production sites in Europe.

Figure1 - Automotive production locations on the European continent



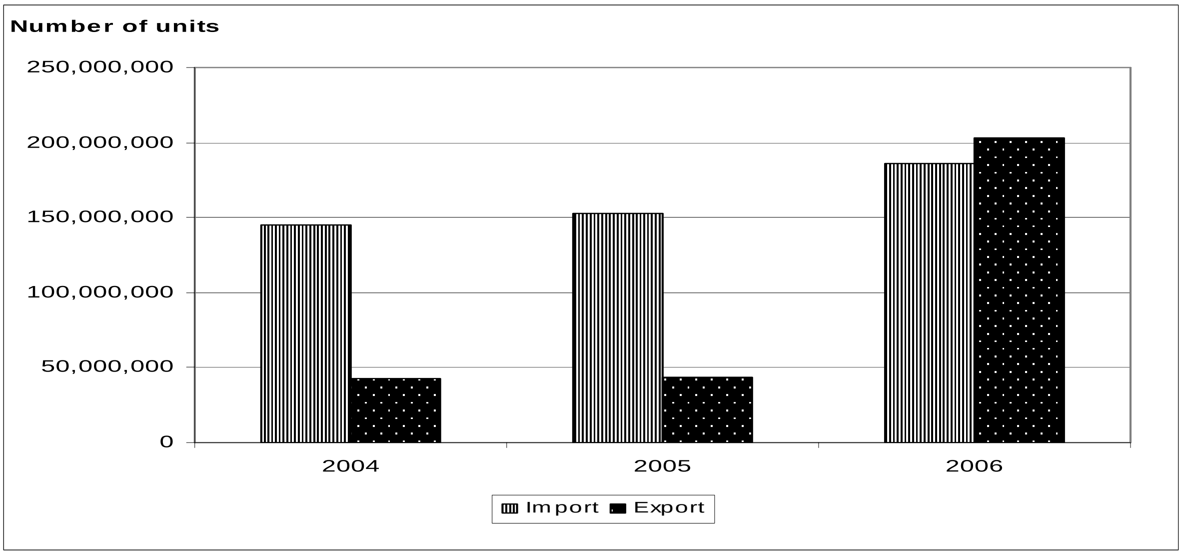
Source: European Automobile Manufacturers Association (ACEA)

The main conclusion to be drawn from the above is that most of the EU countries currently hosting automotive industry production facilities are forecast to see production remain stable or increase in terms of output units. Biggest growth in output is expected to occur in the new Member States (particularly Romania, Slovakia, the Czech Republic and Poland) while vehicle production is expected to see a slight decline in Austria, Italy, Sweden and, surprisingly, Slovenia.

1.2. Trade performance

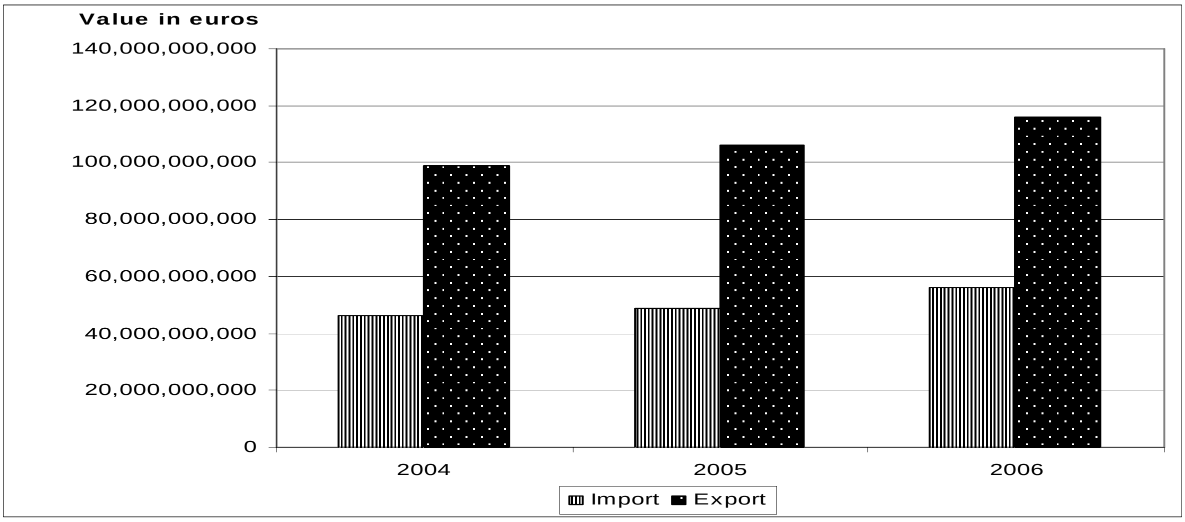
Trade in automotive products makes a significant contribution (ca. € 60 billion) to the European Union's trade balance. This is demonstrated by graphs 3and 4 below, which show Europe's trade performance in vehicles, accessories and parts by both unit and monetary values.

Graph 3: Imports and export EU-27 – extra EU-27 for motor vehicles, tractors, accessories and parts expressed in number of units traded



Source: Eurostat

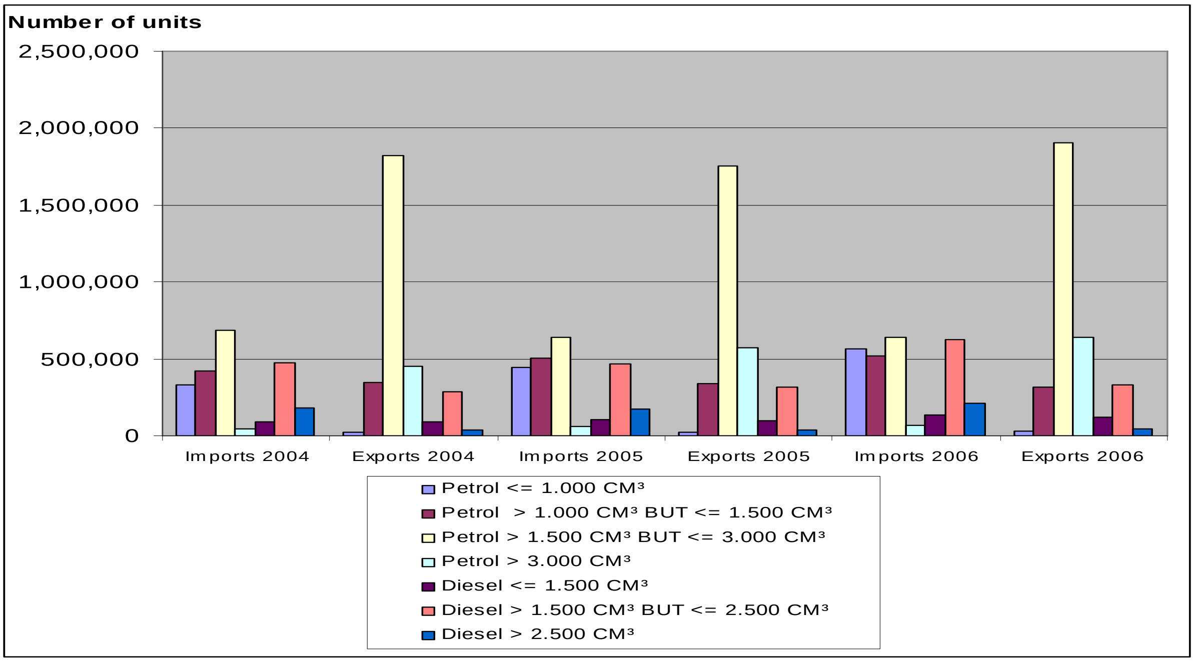
Graph 4: Imports and export EU-27 – extra EU-27 for motor vehicles, tractors, accessories and parts expressed in value in Euros



Source: Eurostat

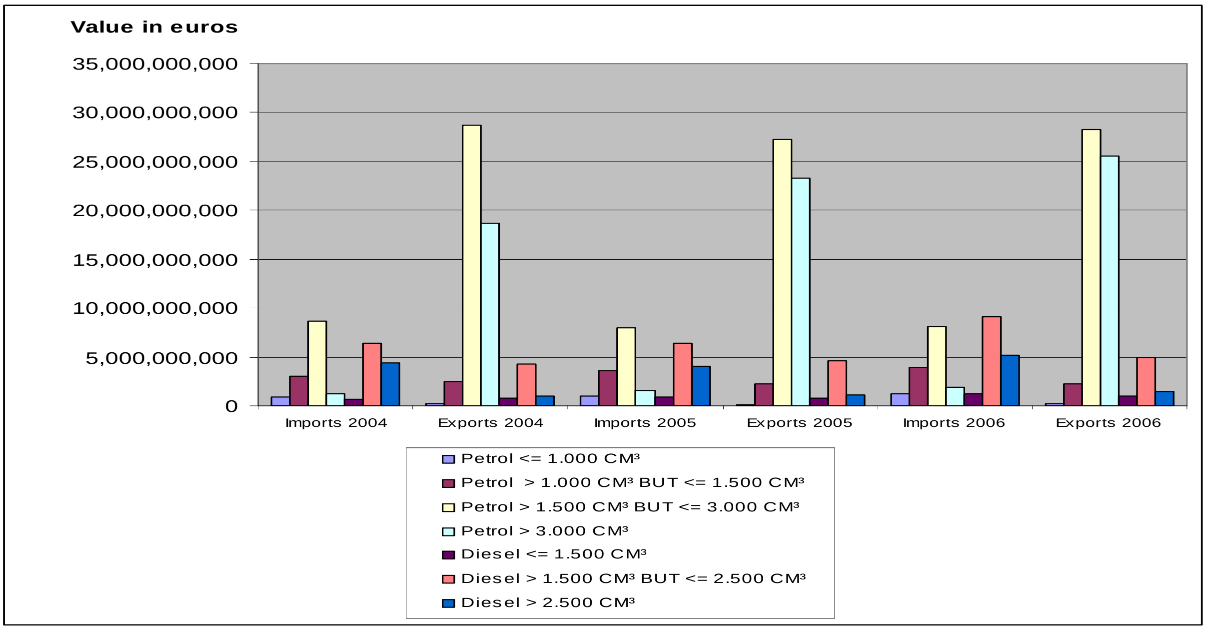
Generally, the most profitable part of the European automotive industry is the manufacture of larger, premium vehicles which accounts for ca. € 9 billion of the approx. € 15 billion total profits made by the European automotive industry. This trend is also reflected in trade statistics where an overwhelming proportion of trade revenues from cars is earned from the export of petrol vehicles with an engine sizes of between 1,500 and 3,000 cm^3 and petrol vehicles with engine capacities over 3,000 cm^3. Trade data for different vehicle segments as defined by engine type and size is presented in graphs 5 and 6 below.

Graph 5: Imports and export EU-27 – extra EU-27 by engine type and size (units)



Source: Eurostat

Graph 6: Imports and export EU-27 – extra EU-27 by engine type and size (value)



Source: Eurostat

The fact that Europe primarily exports medium and large petrol vehicles is related not only to the quality of European-produced and branded vehicles in those segments but also to the fact that for high quantity mass market vehicles manufacturers tend to produce on, or close to the markets in which their sales take place. Consequently, it is unlikely that any cost increases resulting from this proposal will have a major impact on the ability of European producers to continue successfully exporting in the premium segments because in many cases the technologies covered have already been implemented in these segments (or are available as optional extras).

It should also be noted the current demand structure in emerging markets suggests that exporters of new premium vehicles generally have a customer base, which is relatively price insensitive while the buyers of "mass market" vehicles tend to be very price-conscious, which suggests that added cost to mass-produced vehicles is unlikely to give European producers a competitive advantage in those segments. However, given that mass market products are more likely to be produced *in situ* using production facilities which do not correspond to those used for the European market, it is likely that the scope of any disadvantage would be reduced. On the other hand, it should also be noted that the competitive advantage which safer and more fuel efficient vehicles could provide is likely to become more relevant in emerging markets with the passage of time and the creation of a larger middle-class customer base. Market experience in the mature markets (such as Europe) has shown that with increasing prosperity, consumers are willing to pay more vehicles with an enhanced safety performance.

1.3. Employment

Table 3 below presents the data for employment in the vehicle manufacturing and parts sector broken down by different Member States.

Table 3: Number of persons employed in the- manufacture of motor vehicles and the manufacture of parts & accessories for motor vehicles

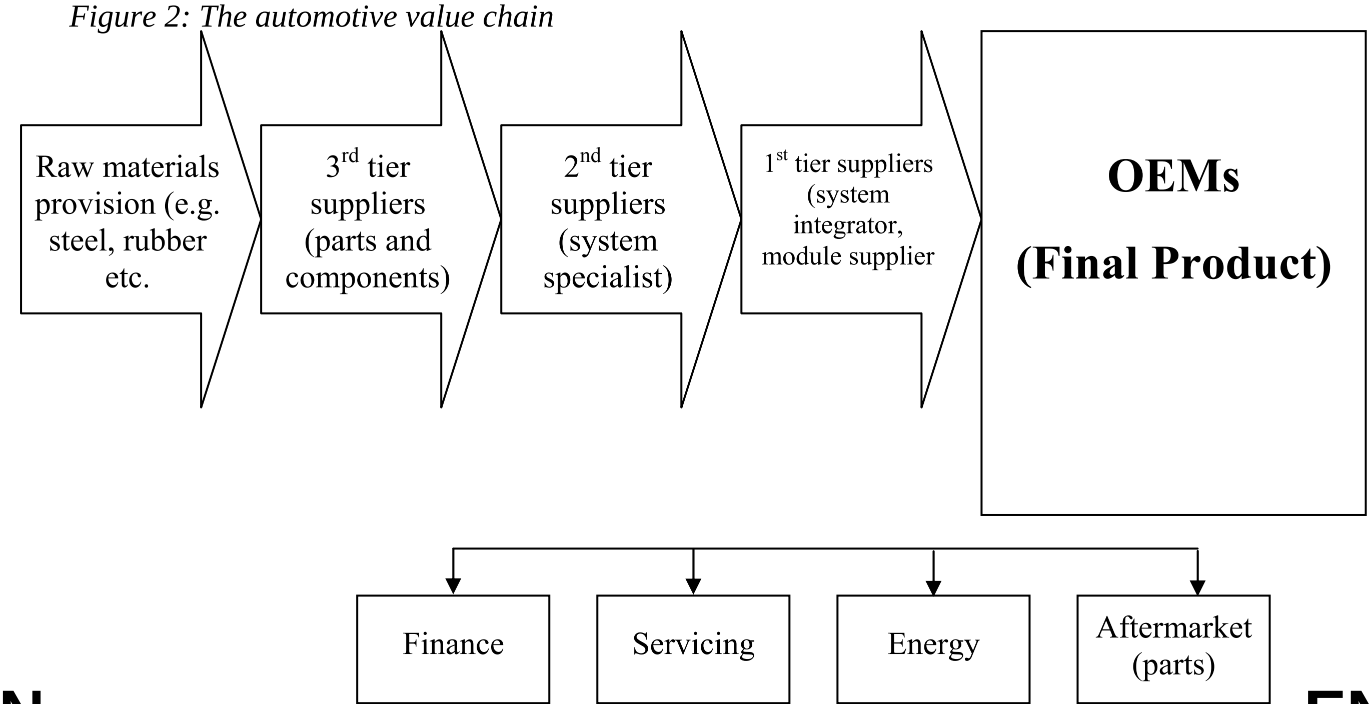
	MOTOR VEHICLES			**PARTS AND ACCESSORIES**		
	2003	***2004***	***2005***	***2003***	***2004***	***2005***
Belgium	31,774	29,336	28,890	10,770	11,353	11,323
Bulgaria	142	207	c	2,151	2,070	2,675
Czech Republic	c	c	c	57,072	62,788	:
Denmark	c	c	c	c	c	3,904
Germany	526,057	526,934	516,639	300,991	304,748	309,401
Estonia	99	103	136	1,283	1,310	1,297
Ireland	247	291	299	2,572	2,500	2,627
Greece	:	1,467	1,081	:	949	815
Spain	77,327	75,100	74,551	72,629	73,160	70,591
France	172,121	168,200	167,536	86,589	82,752	79,587
Italy	59,462	66,533	67,599	87,934	84,395	83,355

Cyprus	0	0	0	227	151	128
Latvia	172	0	20	168	236	362
Lithuania	66	147	159	387	208	269
Hungary	9,977	10,338	9,575	27,989	28,669	30,735
Netherlands	10,589	10,471	9,789	6,080	4,620	4,631
Austria	15,484	16,999	16,758	10,990	13,142	13,344
Poland	24,253	26,696	28,405	55,926	68,928	73,207
Portugal	8,046	6,740	6,682	11,521	12,376	13,018
Romania	c	c	16,262	39,828	46,619	42,110
Slovenia	2,410	c	2,997	3,359	c	3,870
Slovakia	c	c	c	9,954	10,636	11,060
Finland	2,871	2,110	2,194	800	757	784
Sweden	45,247	48,273	50,114	26,246	27,345	26,247
United Kingdom	95,054	89,278	85,898	95,012	88,471	80,982
Total	**1,081,398**	**1,079,223**	**1,085,584**	**910,478**	**928,183**	**866,322**

Source: Eurostat

It should be noted, however, that the data above does not present the full picture of the automotive value chain a graphical expression of which has been presented in Figure 2 below.

Figure 2: The automotive value chain



Given that a number of automotive production related activities are not reflected in the statistical classification as presented in the above table (e.g. electrical equipment for engines and vehicles, steel and aluminium production, paints, tyres, synthetic and textile products, servicing and repair etc.) one can safely assume that the whole automotive value chain provides employment for significantly larger number of people.

It should also be noted that automotive suppliers account for circa 2/3 of the final product and over 50% of research in this sector. Effective supply chain management is one of the key competitive advantages of the European industry while production of advanced components is an important strength of the European supply industry. As suppliers play an increasing role in the value chain over time, increased vehicle value is often viewed as a key avenue for future growth in the supplier industry, particularly given that Europe is well represented with specialist suppliers. Given that the proposal is expected to further increase the value of vehicle components included in the final product, it is likely that the proposal could lead to a rise in direct employment depending on what share of extra costs were to go into extra labour.

It should be borne in mind that the additional features proposed by this legislation do not require the development and introduction of revolutionary new technologies but relate rather to the further proliferation of already available technologies throughout the entire vehicle fleet. Consequently, it is not expected that this proposal will create a dramatic technological shift but will rather pose the question of how available technologies are to be introduced into the lower segments of the market.

There is currently a substantial consolidation process under way in the supplier industry despite the fact that the suppliers' volume of production has more than doubled over the last 10 years (due to continued outsourcing of manufacturing and services by end-product manufacturers and an increasing number of vehicle fittings many of which are also purchased externally). There are a number of reasons for this process which, among other things, reflect the heterogeneity of the suppliers (small-and medium sized suppliers have experienced difficulties in accessing capital, there has been significant downward pressure on prices initiated by manufacturers seeking to cut costs, passing higher commodity prices on to consumers has at times been difficult for a number of component manufacturers, competition between suppliers has intensified etc.) but the overall effect has been increased pressure to rationalise the market and promote mergers[17].

2. Affordability and impact on retail prices

The main issue regarding the impact of new legislation on affordability usually concerns smaller vehicle categories. This is the case because it is assumed that larger, premium vehicles will already contain many of the new features introduced by legislation and will hence be less effected than lower sections of the market. Additional concerns are raised because the larger profit margins of larger vehicles should enable for an easier absorption of additional costs while purchasers of bigger and more expensive cars are also better positioned to pay increased retail prices should costs be directly passed on to the

[17] A study by Mercer Management Consulting and Fraunhofer Gesellschaft foresees that despite the expected substantial expansion in production and added value in the industry, the number of independent component manufacturers worldwide will decrease from 5,600 in 2000 to 2,800 in 2015.

consumers. Finally, discussions about affordability stress the higher proportional impact on the total price of the car in smaller (and cheaper) vehicle segments as well as raising the issue of purchasing power where it is assumed that households with smaller incomes tend to buy smaller new cars. This section will give some consideration to these issues in the light of the proposed legislation.

2.1. Different vehicle segments

Some of the options discussed in section 4 of the Impact Assessment would make several features which are currently optional, mandatory. This would, first and foremost, impact smaller vehicles as well as having a different impact on different Member States where different technologies have penetrated the market to varying degrees. Table 4 below provides a summary of the assumed additional cost to new vehicles assuming that the options for mandatory fitting were chosen.

Table 4: Ex-ante additional cost assumptions of the proposal

Advanced Vehicle Safety Features and Tyres	Electronic Stability Control	€125[18]
	Advanced Emergency Breaking	€250[19]
	Lane Departure Warning	€600[20]
	Low Rolling Resistance Tyres/noise/wet grip	€60
	Tyre Pressure Monitoring Systems	€30

From an affordability perspective the effect on different vehicle segments is highly relevant because profitability cushions to absorb additional compliance costs vary substantially between segments while the cost of complying with regulatory requirements will also vary for vehicles in different sections of the market. Table 5 below presents the profit estimates per vehicle segment.

SEGMENT	ESTIMATED PROFIT PER VEHICLE
Small (e.g. Renault Clio, Peugeot 107)	€150 - €400
Compact (e.g. Audi A3, Citroen C4)	€650 - €900
Medium (e.g. BMW 3 series, Skoda	€900-€1500

18 Average cost across the car fleet assuming that 50% of new cars are already equipped with ESC and that all cars are fitted with anti-lock breaking systems (ABS).

19 Assumes that new cars are already equipped with ABS and Brake Assist.

20 Assumes that new cars are already equipped with Advanced Emergency Braking Systems and that some sensors can be shared between the systems.

Octavia)	
Large (e.g. Mercedes E-Class, BMW 5 series)	€2600-€2700

Source: A.T. Kearney

There is hence little doubt that premium segment vehicles are better positioned to pass additional costs on to consumers.

2.2. Additional considerations regarding retail price developments

From an affordability perspective therefore, the primary question relates to the development of costs over time and the extent to which companies will choose to pass costs on to their customers. Three main considerations should be borne in mind:

- **Economies of scale:** the building up of production capacities and volumes for different products is an important part of the automotive industry's *modus operandi* because this represents one of the most effective means of cost reduction. The cost of diesel particulate filters which have undergone a significant decrease with increased market penetration and production volumes offers a good example. Much of the actual future price impact will depend on the speed with which such economies of scale are achieved. This consideration is very relevant to this legislative proposal given that most the technologies covered by the proposal are already on the market and have been of production for some time. Furthermore, the automotive industry has for long been aware that legislation will be proposed with regard to the issues covered given that the proposed technologies were discussed in the CARS 21 High Level Group.

- **Initial investment retrieval interval:** cost pass-through to consumers is not static. In addition to developing economies of scale, there can be a tendency for manufacturers to attempt the recuperation of product development costs in the early stages of marketing (in the automotive sector this could be ca. 3-5 years). After this initial period, product prices can fall relatively quickly.

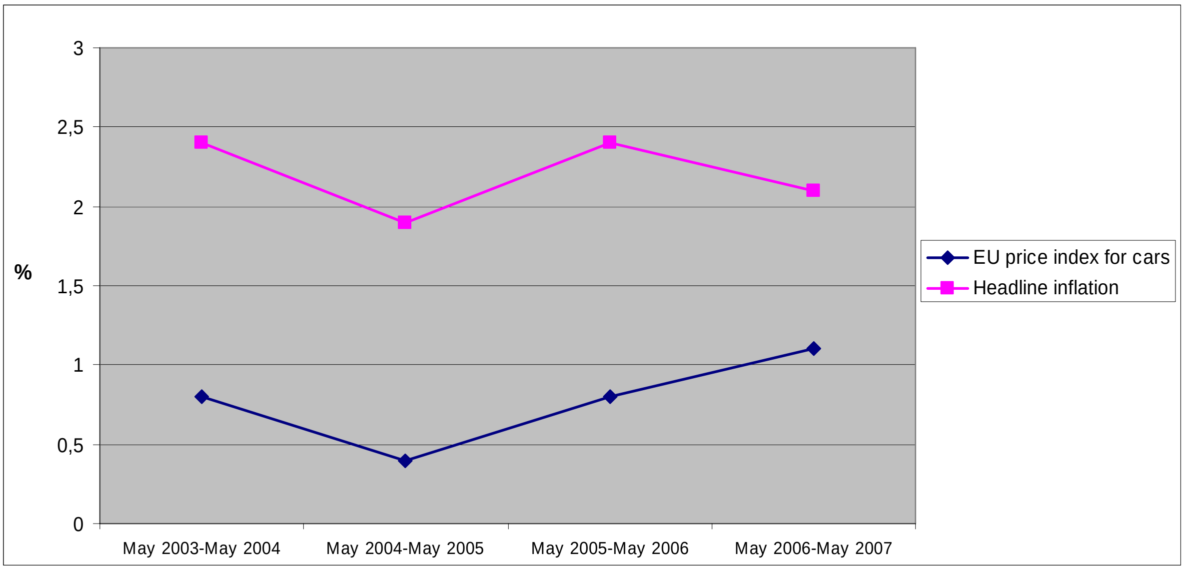
- **Competitive- and market environment in the automotive sector:** some segments of the automotive market are characterised by increased competitive pressure and strong price competition. This is particularly the case in the small and medium segments, which raise most of the affordability concerns. This has led to an increase in the share of earnings, which manufacturers attempt to derive from post-sale activities (e.g. spare parts, financing etc.) as these offer higher profit margins than traditional manufacturing activity. However, strong sales of the core product (i.e. the car itself) are a pre-requisite for accessing such additional earnings. The combination of competitive pressure and future earnings potential can lead to a situation where margins are lowered, which can in turn be reflected in the retail price.

2.3. Historical retail price developments

Given the number of factors which influence the pricing strategy of companies in the automotive sector, it is very difficult to predict the future monetary impact of individual elements proposed by legislation. However, given that the automotive industry has a long history of responding to regulatory requirements it is worthwhile looking at empirical evidence of car price developments in order to assess possible future impacts.

Historical price developments in the automotive sector indicate that the EU price index for cars (reflecting actual prices paid by consumers, including VAT and registration taxes) has for some time been increasing at a substantially lower rate than headline inflation. Graph 7 below presents the comparison between the two from 2003 onwards.

Graph 7: Comparison between headline inflation and car price developments



Source: DG Competition

In real terms, car prices have been declining.

2.4. Additional consideration on affordability

It is often assumed that vehicle size provides a good proxy for assessing social equity: the implication being that buyers of new smaller vehicles are households with proportionally lower purchasing power. It is important to point out that while this may hold true partially, car size cannot be considered to be a perfect proxy insofar as it does not account for the ability of households to purchase vehicles on the second-hand market as well as the practical needs of individual families (e.g. a family consisting of 4 members may not find that purchasing a new "small" vehicle would best serve their needs).