COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 19.12.2007
SEC(2007) 1723

COMMISSION STAFF WORKING DOCUMENT

Accompanying document to the

PROPOSAL FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND COUNCIL

for a regulation to reduce CO_2 emissions from passenger cars

Impact Assessment

{COM(2007)856 final}
{SEC(2007)1724}

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1. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

1.1. Background in the development of the proposal

In its parallel Communications from February 2007 on the revised CO_2 and cars strategy[1] and on a Competitive Automotive Regulatory Framework for the 21st Century CARS 21[2] (referred to as "the earlier Communications" in this document) the Commission decided to pursue an integrated approach with a view to reaching the EU objective of 120 g/km carbon dioxide (CO_2) emissions on average from new cars by 2012. On the basis of the two impact assessments[3] (the "earlier impact assessments") accompanying these Communications, the Commission announced that it would propose a legislative framework, if possible in 2007 and at the latest by mid 2008, to achieve the EU objective of 120 g/km CO_2, focusing on mandatory reductions in the emissions of CO_2 to reach the objective of 130 g CO_2/km on average for the new car fleet by means of improvements in vehicle motor technology, and a further reduction of 10 g CO_2/km, or equivalent if technically necessary, by other technological improvements and by an increased use of bio-fuels.

The proposal which this impact assessment accompanies follows from the earlier Communications and their impact assessments, which set out the overall ambition level as well as the principles and design criteria for the future legislative framework. Consequently, this impact assessment builds upon the earlier impact assessments by considering the specific question of the design of the legislative framework for the achievement of the 130 g CO_2/km target for passenger cars (so-called "M1" vehicles).

1.2. Organisation and timing

For the preparation of this initiative (agenda planning number 2007/ENV/005) close interservice cooperation was ensured through the establishment of an interservice group which oversaw and followed the supporting study investigating of possible regulatory approaches (see 1.3). The services involved in this group were the following: three coordinating Directorates General (DG Environment, DG Enterprise and Industry and Secretariat General), DG Transport and Energy, DG Economic and Financial Affairs, DG Taxation and Customs Union, DG Employment, DG Research, Legal Service.

1.3. Consultation and expertise

In support of the earlier Communications, a first round of consultation of interested parties and of the general public was carried out by the Commission in 2005-2006 via an online Internet consultation complemented by a dedicated working group established under the European Climate Change Programme[4]. The CARS 21 stakeholder group[5]

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1 COM(2007) 19, 07.02.2007

2 COM(2007) 22, 07.02.2007

3 CO_2 and cars: SEC(2007) 60, 07.02.2007; CARS21: SEC(2007) 77, 22.03.2007

4 All documents of the working group, including minutes of meetings, are available here: http://circa.europa.eu/Public/irc/env/eccp_2/library?l=/light-duty_vehicles&vm=detailed&sb=Title

5 http://ec.europa.eu/enterprise/automotive/pagesbackground/competitiveness/cars21.htm

reviewed the role of environmental policy and CO_2 emissions as part of developing an overarching integrated policy framework for the automotive sector.

Building on this work, the following additional consultations were carried out, together with an external study aimed at investigating possible regulatory approaches to reducing CO_2 from light-duty vehicles:

– Between May and July 2007, an online internet public consultation was carried out, aimed at gathering the views of all stakeholders and members of the public on the implementation of the revised CO_2 and cars strategy;

– To complement this Internet consultation, a public hearing was organised by the Commission on 11 July 2007, where the stakeholders directly concerned by the upcoming legislation (automotive industry, suppliers, environmental NGOs, social partners, consumers…) had the opportunity to present their positions. The final report is attached in Annex II.

The minimum standards for the consultation[6] have been respected, as shown by the assessment below:

(1) Clear content of the consultation process

The objectives of the new legislative framework and the principles for its design were clearly described on the public consultation website. The public hearing has been publicised to relevant stakeholders as well as widely through a press release. The Commission services have made clear how comments received would be dealt with and how the process would proceed.

(2) Consultation target groups

The future legislative framework concerns the setting of CO_2 emission performance standards for new passenger cars in the EU and represents an important measure for combating climate change. It was therefore necessary to involve in the consultation automotive industry and the related branches, which would be affected by the regulation, such as automotive suppliers, environmental organisations, the Member States and the large public. The different industries were represented mainly through EU wide organisations.

(3) Publication

The preparation of the future regulatory framework was announced in the earlier Communications. Interested parties were aware that there was to be consultation on the issues to be addressed in line with the better regulation principles. A special website was created for the public consultation and the public hearing.

(4) Time limits for participation

[6] COM(2002) 704, 07.02.2002

The Commission provided stakeholders with a month or more notice of the public hearing. It has given 10 full weeks for the submissions of written comments to the public consultation. Stakeholders have been given adequate time to provide written comments to the public consultation, as well as make a public statement in the public hearing. Overall, the Commission has been in ongoing dialogue with stakeholders and met with all interested stakeholders requesting so. All stakeholders should therefore be able to express their views.

(5) Acknowledgement and feedback

Responses from stakeholders following the stakeholder meetings have been acknowledged and the stakeholders' responses, namely the organisations' responses, are publicly available at: http://ec.europa.eu/reducing_co2_emissions_from_cars/index_en.htm.

According to the privacy statement, no individuals' contribution can be posted therein without their consent. The Commission has not responded to the points raised in individual responses given the wide range of issues raised, it was however able to identify the main issues.

(6) Main results and how these have been taken into account

The majority of consultation responses have been made publicly available at http://ec.europa.eu/reducing_co2_emissions_from_cars/index_en.htm. The Commission has analysed the comments made, and the results of the consultation are presented in Annex III.

Input from stakeholders has been taken into account in assessing the different possible options to regulate CO_2 emissions from cars, particularly with regard to the design of the legislation, possible unwanted effects, implications for competition on automotive markets, global industrial competitiveness and environmental outcome. External expertise was used to assess the various options available, including aspects raised during the consultation process (the external contractor attended the public hearing and was informed about the results of the Internet consultation).

1.4. Inter-institutional process so far

1.4.1. Council

The earlier Communications have been well received in the Council. The Competitiveness Council, in May 2007, supported "*an integrated approach as proposed by the Commission, for reducing CO_2 emissions from motor vehicles*" and underlined "*that all the players must make their contribution to reducing emissions harmful to the climate"* and that *"the opportunity for a regulatory framework which is cost-effective, ensures affordable mobility and contributes to preserving the global competitiveness of the automotive industry*". The Environment Council, in June 2007, "*urged the European Commission to come forward, as soon as possible and before the end of 2007, with a legislative framework to reduce CO_2 emissions from cars (...)*"

These two Council formations, as well as the Transport Council in June 2007, called "*on the Commission to configure the planned framework for attaining the target for average*

CO_2 emissions from the fleet of new cars sold in the EU on the basis of a thorough impact assessment in a way that is as neutral as possible from the point of view of competition, and which is socially equitable and sustainable. It should be framed in such a way as to ensure that all manufacturers intensify their efforts to make their whole vehicle production more environmentally friendly in a cost-effective way".

1.4.2. European Parliament

In its resolution adopted on 24 October 2007, the European Parliament welcomed the Commission's plan to propose legislation and proposed that binding emission targets be implemented from 2011 onwards in order to ensure that by technical improvements to vehicles alone, the average new car fleet would reach 125 g CO_2/km in 2015. The Parliament also insisted that the average new car fleet should reach 95 g CO_2/km by 2020 and possibly 70 g CO_2/km by 2025 subject to a confirmation or review by the Commission no later than 2016.

Regarding the design of the legislation, the Parliament recommended that reduction targets be defined through a footprint (trackwidth times wheelbase) based limit value and proposed the creation of a closed market mechanism called "Carbon Allowance Reductions System" (CARS) separately from the EU ETS and linked to financial penalties expressed in €/gram. It was also recommended that carmakers should be allowed to exclude from the scheme up to 500 vehicles per year, and that carmakers selling less than 300.000 vehicles and new entrants with a market share below 1% be addressed through specific yet ambitious provisions.

1.5. Results of the consultation of the Impact Assessment Board

Two draft versions of the impact assessment report have been submitted to the Impact Assessment Board. The discussion has triggered substantial improvements in the methodology applied for the assessment of the policy options. In its final opinion, the Board stated[7] that the IA contains robust analysis of impacts and an appropriate range of options, based i.a. on an extensive Stakeholder consultation and a comparison with other compliance schemes. The final opinion recalled some more technical aspects that, given the importance of the proposal, needed to be clarified. These comments have been taken on board in the final draft of the IA as follows:

– The impact of the different policy options on the fleet composition (section 5.3.2.) and the effect it may have on attaining the target have been clarified (section 5.4.3.). The methodology is described with further details (section 5.1), in particular the difference between results from TREMOVE and ex-ante analysis, and the limits of the TREMOVE modelling exercise in this specific context.

– Given that the modelling and other estimates rely on a set of variables that might be influenced by external events, a sensitivity analysis for the ex-ante cost-effectiveness calculations has been performed on fuel prices and on autonomous weight increase parameters (section 5.2.1.)

[7] D(2007) 10823, 4/12/2007

– Regarding premiums, the report further explains the advantages/disadvantages of the different methodologies for level-setting and the way they could be introduced. (sections 4.2.4. and 5.4.2.)

– The report provides an overview of the expected market developments, complemented by an indication of where the automotive industry is concentrated, so as to provide a basis for an analysis of employment impacts (Section 5.3.1.)

– A short discussion on effects on the automotive supplier industry, mergers and takeovers, and competitiveness on external markets is included in section 5.2.3.

2. PROBLEM DEFINITION

2.1. What is the issue or problem that may require action?

The overall rationale for a revised CO_2 and cars strategy based on an integrated approach and implemented through a legislative framework has been analysed and explained in detail in the earlier Communications and impact assessments:

- All sectors must contribute to the fight against climate change: the EU is at the forefront of the fight against climate change and must deliver the greenhouse gas (GHG) reductions to which it has committed under the Kyoto Protocol for the 2012 horizon. Taking a longer perspective, the EU has committed itself to achieve at least a 20% reduction of GHG emissions by 2020 compared to 1990 levels, and up to a 30% reduction compared to 1990 as part of an international agreement. To avoid distortions, and for the sake of economic and social fairness, all sectors must contribute to the reduction effort, including transport;

- The CO_2 performance of new vehicles should improve at a faster rate: passenger car use accounts for about 12% of overall EU emissions of carbon dioxide (CO_2), the main greenhouse gas. Improvements in vehicle technology, in particular fuel efficiency, have led to a 14 % fuel efficiency improvement between 1995 and 2006. However, improvements in fuel efficiency have been offset mainly by the increase in demand for transport and vehicle size. While the EU as a whole has reduced its emissions of greenhouse gases (GHG) by just under 5% over the 1990-2004 period and emission have been declining in non-transport sectors, the CO_2 emissions from road transport have increased by 26%. This is partly linked to the limited progress in fuel efficiency improvements, and partly linked to the increase in demand for transport and vehicle size. Despite significant improvements in vehicle technology, in particular in fuel efficiency which also means lower CO_2 emissions, progress has been too slow in view of the EU objective of reaching an average new car fleet of 120 g CO_2/km;

- Road transport needs to use less oil: there is a direct link between improved fuel efficiency and lower CO_2 emissions. Road transport relies heavily on oil for which the EU's import dependency is higher than 80%. This has a significant impact on the EU's security of energy supply and makes the EU economies more susceptible to oil shocks. Road transport alone accounted for as much as 25% of the final energy consumption in the EU25 in 2004;

- Further reductions in CO_2 emissions must be achieved cost-effectively without undermining sustainable mobility and the car industry's competitiveness: cars are an important part of the everyday lives of a large number of Europeans and provide mobility, which is essential to European society and economy: in 2005, road transport accounted for ca. 86% of passenger transport activity and ca. 70% of freight transport activity in Europe. The automotive industry itself is a significant source of employment and growth in many regions of the EU. Europe is the world's largest producer of passenger cars and light commercial vehicles with ca. 30% of these vehicle types produced in Europe. The European automotive industry is a major component of Europe's manufacturing base. The vehicle industry accounts for about 20% of Europe's manufacturing R&D investment (over €20 billion), contributed about €60 billion to Europe's trade balance and contributes more than €350 billion in fiscal revenues, which represents ca. 8% of the European Union's total general government revenues. Consequently, the legislative framework must be designed in a way that does not undermine affordable mobility and compromise the global competitiveness of the automotive industry in Europe and its role in contributing to the Growth and Jobs agenda.

The overarching problem as identified in the earlier Communications is that existing policies to reduce CO_2 emissions and improve the fuel efficiency of new cars sold in the EU have not been able to deliver the progress needed for reaching the long-standing EU objective of an average new car fleet emission of 120 g CO_2/km. As a result, the Commission has decided to propose a legislative framework to implement the "integrated approach" as described in Section 1.1.

In the earlier Communications, the Commission also outlined the principles, conditions and considerations on which the future legislative proposal to achieve the 130 g CO_2/km target for passenger cars is to be designed. These are as follows: "*...the legislative framework implementing the average new car fleet target will be designed so as to ensure competitively neutral and socially equitable and sustainable reduction targets which are equitable to the diversity of the European automobile manufacturers and avoid any unjustified distortion of competition between automobile manufacturers. The legislative framework will be compatible with the overall objective of reaching the EU's Kyoto targets...*".

The specific problem which needs to addressed is how to design the legislative instrument which reflects the above criteria as set by the Commission.

2.2. What are the underlying drivers of the problem?

As far as overall CO_2 emissions from road transport are concerned, a wide range of factors influence the observed and predicted growth in CO_2 emissions from passenger road transport, such as supply and demand for cars, individual mobility needs, the availability of alternative public transport services and the costs of car ownership.

2.2.1. Increase in demand for transport[8]

While vehicle efficiency has been increasing to a certain extent, this has been offset by increased journey lengths and other trends leading to higher greenhouse gas emissions. The overall share of cars in passenger traffic has remained fairly constant over the years (73.5 % in 2004). Transport demand has for its part grown significantly and the number of passenger-kilometres driven by passenger cars increased by 17.7 % over the 1995-2004 period. The level of car ownership also increased substantially as shown below:

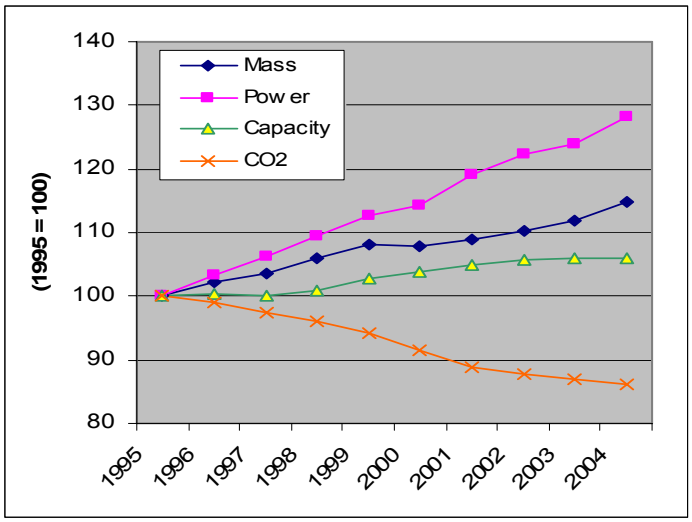
Table 1 - Evolution in car ownership and vehicle stock in the EU25 between 1990 and 2004

EU 25	1990	2004	Change
Number of cars per 1000 inhabitants	355	469	+ 32%
Vehicle stock (Million)	156	215	+ 38%

This increase took place despite a significant increase in consumer prices for the operation of personal transport equipment: over the 1996-2005 period, indexed operation costs increased by 38% (indexed vehicle purchase prices increased by less than 5%).

Figure 1 presents the evolution of the physical characteristics of passenger cars on the EU15 car market, over the 1995-2004 period: important increases in mass (+15%) and even more so in power (+28%) have taken place in parallel to a 12.4% reduction in specific CO_2 emissions.

Figure 1 - Physical evolution of ACEA's car fleet compared to base-year 1995 (source SEC(2006)1078)



[8] Source of the figures provided in this section: "*EU energy and transport in figures: 2006*", European Commission DG Transport and Energy in cooperation with Eurostat, 2007

This trend towards bigger and more powerful cars is explained by the evolution of manufacturers' offer and consumer demand, and by the measures and strategies adopted to influence these two parameters (such as advertising practices, fuel efficiency labelling etc.). A market environment characterised by cost competition and the fact that vehicle manufacturers need to sell cars in order to gain revenue from related products and services have also created a situation whereby consumer prices for cars have increased significantly less than headline inflation over the last years, de facto making better equipped, cleaner and more powerful cars cheaper than in the past[9].

The CO_2 profile of new cars sold by ACEA on the EU market between 1995 and 2004 is shown on Figure 2 and Figure 3, showing a clearly identifiable "wave-effect" towards reduced CO_2 emissions and an increase in the sales of low emitting vehicles.

Figure 2 - ACEA's "wave-effect" of CO_2 categories towards reduced CO_2 emissions (source SEC(2006)1078)

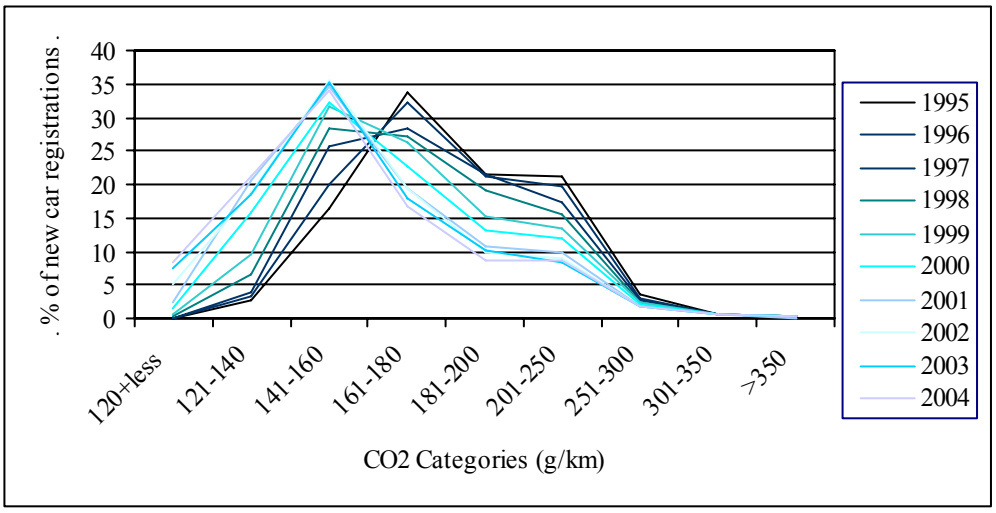
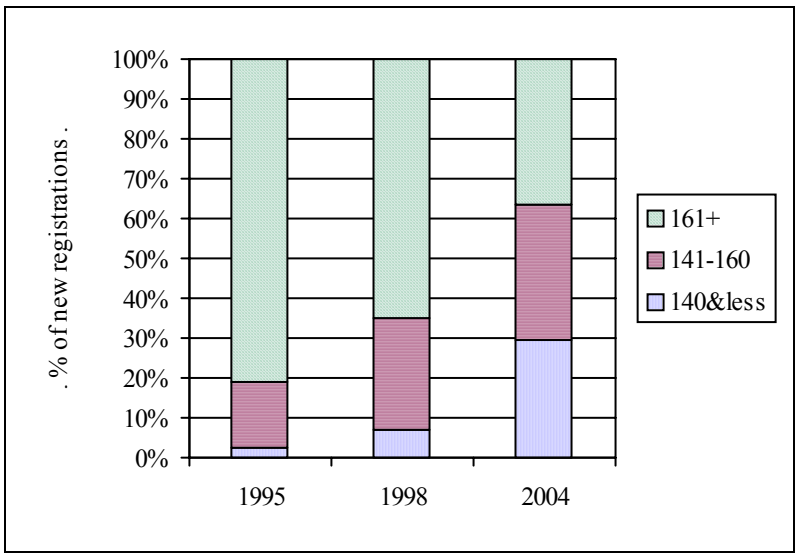


Figure 3 - Change in ACEA's Fleet Composition by "aggregated CO_2 Categories" (source SEC(2006)1078)

[9] See European Commission DG MARKT 2006 report on "*Car price differentials within the European Union*", http://ec.europa.eu/comm/competition/car_sector/price_diffs/


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% of new registrations .
1995
1998
2004
161+
141-160
140&less

Global perspective

The EU has one of the most fuel efficient new car fleets in the world, which needs to be considered from the angle of the global competitiveness of the European automotive industry: the promotion of fuel efficiency will create a first mover advantage especially in the perspective of the penetration of emerging markets where oil is already scarce. The EU has thus an interest in promoting fuel efficiency in vehicles in other parts of the world, where it will be able to reap the rewards of its technological leadership in this field. The recent years have seen a move from third countries towards either the adoption or the reinforcement of fuel efficiency/GHG standards for light vehicles.

At the same time, the ambition level of the domestic targets and the way in which they are implemented must take into account the short-term competitiveness of the European automotive industry. An underlying driver of the limited progress in the CO_2 reductions observed up to 2006 is linked to the lack of truly level playing field amongst carmakers: this situation stems from the fact that so far a voluntary approach was pursued under which it appears that manufacturers have applied very varying degrees of effort in delivering the reductions that were required. It may thus be that the approach pursued so far did not provide for sufficient pressure amongst stakeholders to ensure the overall delivery of the EU objectives.

2.3. Stakeholders affected

A wide range of stakeholders are affected by the problem:

- The population of the European Union is increasingly affected by climate change through the increased climate variability and more frequent extreme weather events, and their related impacts (higher maximum temperatures, more hot days and heat waves lead to increased incidence of death and serious illness in older or more sensitive groups of the population; more intense precipitation events lead to increased floods, landslide, avalanche, mudslides, soil erosion and related increased pressure on Government and flood insurance systems and disaster relief; increased summer drying over mid altitude continental zones and associated risk of drought lead to decreased crop yields, water resource quantity and quality as well as increased risk of forest fire and damage to building foundations caused by ground shrinkage).

- The consumers of motor vehicles are affected by possible increases in the price of new vehicles and reductions in their running costs, due to stricter requirements on CO_2 emissions and related improvements in fuel consumption. Consumers of motor vehicles are also affected by possible changes in the level of performance (power, comfort) of new vehicles. Conversely, poor fuel efficiency contributes to an enhanced dependency on foreign oil imports and to the related exposure to possible price surges due to supply shortages.

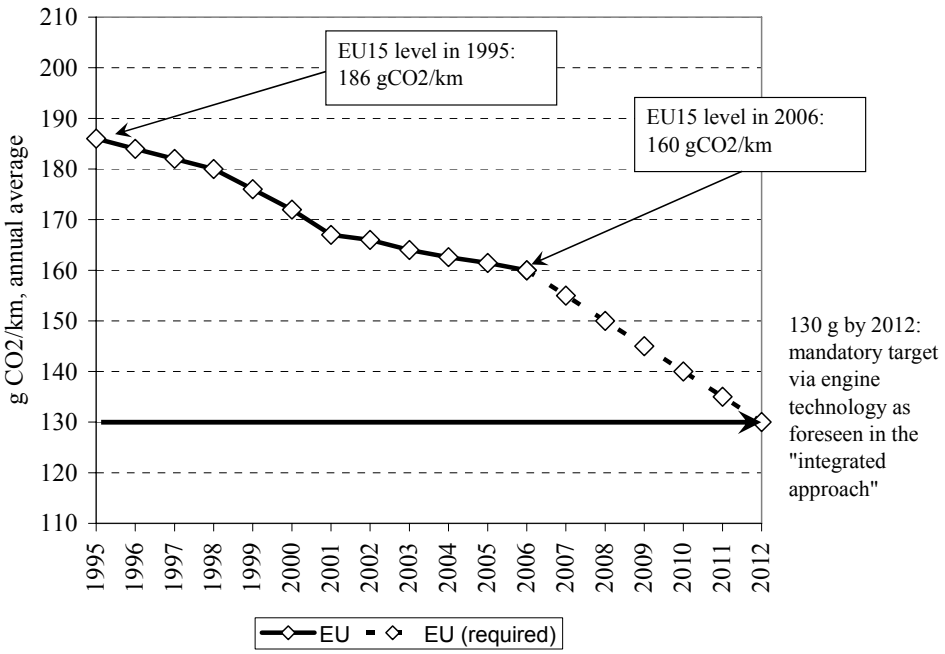
- Carmakers will be affected by the obligation to comply with the new regulatory scheme to reduce CO_2 emissions through resulting increases in the cost of car production and the need to further modify the structure of their product portfolios. As the level of ambition sought by the legislative framework has been set already, the distributional effects of the future legislation will be of key importance as these will determine how the legislative framework will impact individual carmakers, their

production costs, the retail price of their products and profit margins. The EU is the largest car market in the world and stricter fuel efficiency requirements in Europe will affect those vehicle manufacturers who sell their products on the EU market by requiring improvements to new vehicles through the development and introduction of better technologies. Component suppliers will also be affected by increasing demand for advanced technologies and higher pressure on costs as a result of the impact of the delivery of the targets on consumer prices.

2.4. How would the problem evolve, all things being equal?

Figure 4 presents the evolution of the average specific CO_2 emissions from new cars sold in the EU over the 1995-2006 period. The analysis of the reduction trends over this period shows that prior to the entry into force of the car industry's voluntary commitments (1995-1997), the average yearly reduction ranged in the order of 2 grams per year; in the absence of a dedicated policy instrument, this could be considered an "autonomous" improvement implemented by carmakers without regulatory push. In the early years of the Commitments (1999-2001), the yearly reduction rate increased significantly, up to 5 grams per year, but subsequently slowed down at 1-2 grams per year up to 2006. The improvement rates necessary to deliver the 130 g CO_2/km will require a return to earlier levels, at 5 gram per year over the 2007-2012 period.

Figure 4 – Evolution of the average new car fleet CO_2 emissions in the EU



While it is difficult to precisely predict what the average new car emission would be in 2012 in the absence of additional measures, it is useful to establish some considerations for a baseline against which various options will be compared. Several influences need to be factored in.

- The recent trend may continue without additional measures, implying 1.5 gram reduction per year (average over the 2002-2006 period). The likely 2012 emission

level would be 151 g CO_2/km based on a linear projection in the absence of additional measures.

- A less conservative approach would be to assume that in light of the revised CO_2 and cars strategy and the announcement of the upcoming legislative framework, car manufacturers will step up their efforts ahead of the actual entry into force of the legislation.

- Alternatively, an inverse trend may be observed, whereby in the absence of a dedicated instrument, especially after 2008-9 and the end of the voluntary agreements, average CO_2 emissions would in fact be reduced at a slower rate, and possibly increase due e.g. to a continued autonomous power and weight increase.

In any case, in its recent review of the EU CO_2 and cars strategy, the Commission has underlined that, based on the experience gained in the past in the implementation of the strategy, the EU objective of 120 g CO_2/km would not be reached by 2012 in the absence of additional measures. None of the assumptions above put into question the earlier assessment made by the Commission in which it proposed to adopt a revised strategy, based on an integrated approach: a legislative framework will be proposed in order to meet the 120 g CO_2/km objective, focusing on mandatory reductions of the emissions of CO_2 to reach the objective of 130 g CO_2/km for the average new car fleet by means of improvements in vehicle motor technology, and a further reduction of 10 g CO_2/km, or equivalent if technically necessary, by other technological improvements and by an increased use of biofuels.

In order to provide a basis for the assessment of the future legislative framework, baseline assumptions have been made and are presented in section 4.2.

2.5. Subsidiarity principle

The subsidiarity principle is respected, since the policy objectives cannot be sufficiently achieved by actions of the Member States, and can be better achieved at Community level. European Community action is necessary because of the need to avoid the emergence of barriers to the single market notably in the field of the automotive industry, and because of the transnational nature of climate change. At the national level, Member States can monitor the average specific CO_2 emissions of the new cars registered in their territory for the purpose of compilation and comparison at the EU level against the established target. However, in view of the widely varying characteristics of the new cars sold in the various EU Member States, domestic action would not allow for the achievement of a target defined as the average of the EU new car sales. Taking a wider perspective, Member States can also facilitate the implementation of the legislation via action at the national level, notably to raise awareness about climate change and drive consumer demand towards more fuel efficient vehicles.

3. OBJECTIVES

3.1. Policy objectives

The proposal pursues the following general policy objectives:

- Providing for a high level of environmental protection in the European Union and contributing to reaching the EU's Kyoto targets,

- Improving the EU energy security of supply,

- Fostering the competitiveness of the European automotive industry and encouraging research into fuel efficiency technologies.

The specific objectives cover:

- Reducing the climate change impacts and improving the fuel efficiency of passenger cars by reaching the objective of an average emission value of 130 g CO_2/km for newly sold cars.

The operational objectives include:

- Designing a legislative framework efficiently implementing the average new car fleet target ensuring competitively neutral and socially equitable and sustainable reduction targets which are equitable to the diversity of the European automobile manufacturers and avoid any unjustified distortion of competition between automobile manufacturers. The legislative framework will be compatible with the overall objective of reaching the EU's Kyoto targets.

3.2. Consistency with horizontal objectives of the European Union

3.2.1. Lisbon strategy

The policy objectives of the revised strategy are in line with the three pillars of the European Union's Lisbon strategy, namely "*making Europe a more attractive place to invest and work*", "*knowledge and innovation for growth*" and "*creating more and better jobs*".

Tighter requirements on CO_2 emissions and fuel efficiency for passenger cars will encourage the development and application of new environmental technologies. The policy objectives therefore promote innovation and technological development, enabling the EU car industry to achieve global leadership in the field of clean and fuel efficient technologies. Europe already has world leading diesel engine technology, and will be able to further develop this technology while making advances in petrol engines fuel efficiency and hybrid powertrains.

Leadership in fuel efficiency should in the short term pave the way to exports of technologies and vehicles to emerging markets where oil is scarce and that have set ambitious fuel efficiency targets. In the longer term, it is expected to provide a long-standing competitive edge and the advanced technologies required to move towards a truly low-carbon road transport system.

By promoting further advances in technologies, the strategy will promote highly qualified jobs in Europe. Although the industry has pointed to the risk of the production capacity being relocated outside the EU to reduce labour costs while meeting fuel efficiency standards, it should be noted that non-EU manufacturers (from Japan, Korea and the United States) will be subject to the same standards as regards their exports to

Europe, and that stringent fuel efficiency policies are already implemented in their domestic market and, in some cases, currently subject to a revision. It should, however, be noted that those European producers that have proportionally higher sales on the European market will be proportionally more affected by the new policy instrument than some of their international competitors. To ensure that the new legislative framework is in line with the Lisbon Strategy, the design of the instrument will seek to minimise the cost consequences to manufacturing and to consumers while ensuring that the diverse nature of the European car industry (which plays a substantial role in its global competitiveness) is preserved.

3.2.2. Sustainable Development strategy

The overall objective of the Renewed Sustainable Development Strategy (RSDS) of the European Union[10], as regards sustainable transport is "*to ensure that our transport systems meet society's economic, social and environmental needs whilst minimising their undesirable impacts on the economy, society and the environment*". The related operational objective and targets are to ensure the decoupling of economic growth and the demand for transport with the aim of reducing environmental impacts, achieving sustainable levels of transport energy use and reducing transport greenhouse gas emissions and "*in line with the EU strategy on CO_2 emissions from light duty vehicles, the average new car fleet should achieve CO_2 emissions of 140g/km (2008/09) and 120g/km (2012)*".

The policy objectives of the revised CO_2 and cars strategy are in line with the RSDS by contributing to a more sustainable mobility. Making transport more sustainable would facilitate achieving other sustainable development goals. This relationship is particularly strong between transport and climate change, public health, conservation of natural resources and social inclusion. Leaner vehicles will bring economic, social and environmental benefits by reducing the energy consumption induced by their use. The implementation of the RSDS also means that challenges must be addressed in parallel in the face of sometimes conflicting objectives. Such situations include for example air quality and climate change (e.g. reducing nitrogen oxides vs. reducing CO_2) or environment and safety (e.g. impacts on average car weight), and all aspects must be addressed in a compatible way. The assessment of Member States contributions to the first progress report on EU SDS implementation shows that all Member States are taking some action on promoting sustainable energy use and reducing greenhouse gas emissions via mainly fiscal measures designed to stimulate the purchase of smaller, more fuel efficient vehicles and to promote alternative fuels. However, it is clear that only few Member States perform well in terms of taking actions to realize the objectives. There is therefore a justified concern about the effectiveness of Member States action in this field and the proposed initiative taken at the EU level could substantially support the action of Member States.

[10] European Council, June 2006

4. POLICY OPTIONS

4.1. Introduction and options discarded at an early stage

On the basis of the earlier impact assessments accompanying the review of the CO_2 and cars strategy and the CARS21 Communication, the Commission has concluded in February 2007 that "*as the voluntary agreement did not succeed, (it) considered necessary to resort to a legislative approach"*. As a result, the options of "no policy change" and of "alternatives to regulation" (voluntary agreement) have been discarded at an early stage.

The use of regulatory market mechanisms could be envisaged as a regulatory option, but was also discarded at an early stage:

- Concerns about its effectiveness and the difficulty of adopting proposals on the basis of unanimity have led to excluding the option of relying exclusively on excise duties in transport fuels as a policy option;

- As regards a possible link of road transport to the EU Emission trading system, the Commission has announced that it would consider this option for the third trading period, which will begin in 2013. This assessment will take into account differences in sectoral abatement costs, market impacts, the compatibility of this approach with a possible sector specific target setting for road transport, the need to promote technological innovation as well as to achieving CO_2 reductions in a globally cost-effective manner. This option has thus been also discarded for the present exercise, because the timetable as defined by the Commission committed for the delivery of the 130 g CO_2/km target in 2012.

This section will thus focus on the various ways in which a "conventional" regulatory approach could be designed so as to follow the criteria outlined by the Commission in the earlier Communications (as described in Section 3.1).

4.2. Design parameters

The EU strategy to reduce CO_2 emissions from light vehicles defines CO_2 emission targets for the "*average new vehicle fleet sold in 2012*". This means that, the average of the CO_2 emissions of all the new vehicles of all models and segments placed on the market by all EU and non EU manufacturers need to respect the stated CO_2 objectives. The question thus arises of how to translate this "overall" average-based target into a legislative proposal in a way that allows a burden sharing between the various stakeholders concerned, taking into account in particular the specific and operational objectives listed in Section 3.1. The main questions of the present impact assessment are thus linked to distributional compliance with an established target: who is responsible for the delivery, how, what are the flexibilities and what is the compliance mechanism?

A number of parameters need to be considered in order to be able to design a legislative framework, which would be cost-effective, efficient, consistent and practically workable.

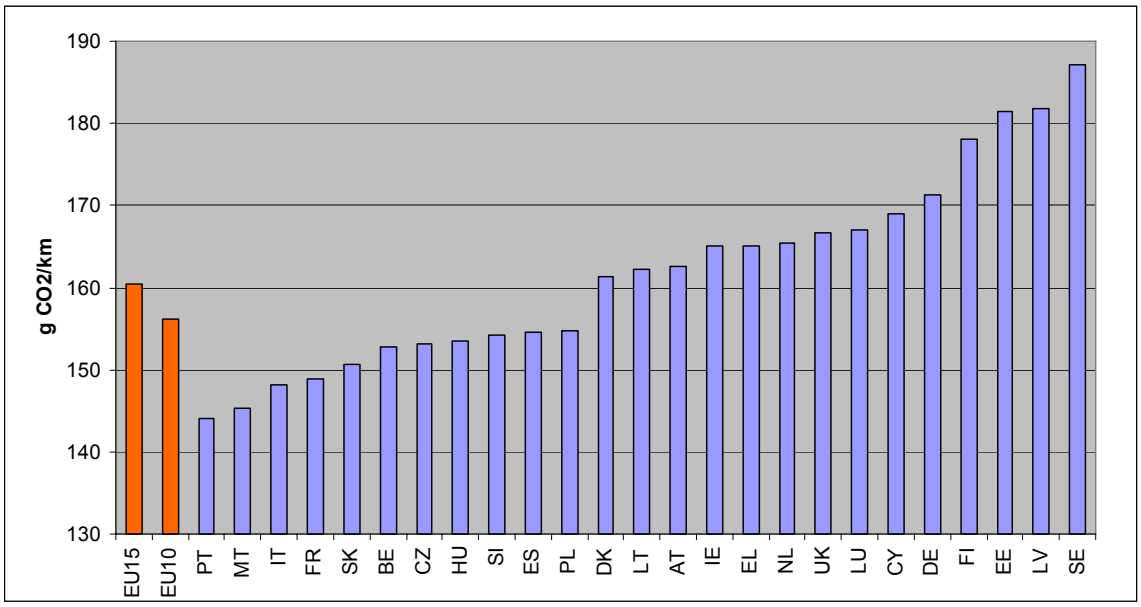
4.2.1. Who should be responsible for delivering CO_2 reductions under the new system?

Consideration must be given to who should be regulated i.e. amongst which stakeholders the burden (the delivery of the EU average target) will be shared.

The legal obligation could rest directly on the automotive industry (i.e. on the car manufacturers in the general sense namely the person or entity responsible for the type approval of the vehicles placed on the market), on dealers and retailers of vehicles in Member States, or on Member States themselves, which would then have to translate the obligations at the national level through secondary legislation.

Options setting the obligations at the level of Member State would not offer the necessary practical workability: indeed, they would not allow an easy link to be made between the national obligations and the overall EU targets which are defined for the average of all the new cars sold in the EU27 in 2012. This problem would be complicated from the start by the fact that average new car sale CO_2 emissions are very different in various Member States (in 2006, the average new car sold in Portugal emitted 144 g CO_2/km, against 187 g CO_2/km in Sweden – see Figure 5). Such an approach would thus either impose an un-transparent "burden sharing" between Member States which creates difficulties and goes against the spirit of EU-wide policies of the CO_2 efficiency of cars as assisting Member States in meeting the targets for the non EU ETS sectors. First of all, it is unknown how much EU-wide measures will deliver exactly in each Member State. EU-wide regulations of the CO_2 efficiency of cars will reduce emissions in relative terms per car, but actual reductions will depend on the amount of cars sold, the amount of mileage driven, driving behavior, or the extent to which a Member State takes supplementary measures such as car (CO_2) taxation, fuel taxation etc. Secondly this approach could also contribute to distortions of competition between national car markets. As Member States have little control over the contributions that manufacturers could make to their targets, defining national targets could contribute to an unwelcome fragmentation of the market with little certainty over their environmental outcome (restrictions on certain vehicles in certain countries would likely be circumvented by consumers purchasing in other more flexible countries).

Figure 5 - Average new car fleet CO_2 emissions in EU15, EU10 and individual Member States (source: data reported by Member States under Decision 1753/2000/EC, year 2006)



To a great extent, attributing the obligation to dealers or retailers of cars would raise similar problems as with Member States being the regulated entity: dealers are usually implanted nationally and they have little control over the cars that are produced by carmakers.

Car manufacturers on the other hand operate on the basis of a single European market and are directly in control of the product mix they offer for sale on the various EU national markets, and can better follow the evolution of their sales in the course of a year. They cannot directly influence the marketing choices made by their competitors (and related impacts on the fleet average CO_2 emissions) but they are able to put in place an EU wide sales policy more compatible with the definition of the EU target. Furthermore, car manufacturers have a long standing experience in monitoring their sales and CO_2 performance: although the voluntary commitments did not prove successful, the monitoring mechanisms in place have shown the ability of both Member States to deliver good quality data, and of manufacturers to follow accurately their performance under the agreement.

As a result, it was decided to consider regulatory options having car manufacturers as regulated entity, without prejudice as to whether the CO_2 limit would be defined at the vehicle or manufacturer level.

4.2.2. How can the burden be shared between car manufacturers?

Having selected car manufacturers as the regulated entity, it is then necessary to devise a method in order to share the reduction burden between the stakeholders concerned. Three main options have been identified to that effect:

- Uniform target: the same obligation could be given to all car manufacturers i.e. they would all have to individually meet the 130 g CO_2/km target by 2012. In view of the wide variety of vehicles and emission levels on the market today (ranging from 88 to 560 g CO_2/km), the achievement of a uniform 130 g CO_2/km target would only be possible with the introduction of market mechanisms (cap and trade) at the

manufacturer level. This would ensure that the objective of 130 g CO_2/km is met, provided that all manufacturers respect the target or that it is possible to trade a sufficient number of "credits" between manufacturers.

- Utility based targets: in this approach, the CO_2 obligation would be defined as a function of a so-called "utility" parameter reflecting the utility of the cars as perceived by customers. This would reflect the fact that different cars have different utilities and emit different levels of CO_2 (i.e. that a family station wagon emits more than a mini urban car). As regards the utility function that could be used, both linear and non-linear approaches have been considered in the supporting study. However non-linear approaches have been discarded because the sales-weighted cloud of points representing cars' utility and CO_2 did not show a marked non-linear trend. Besides non-linear approaches did not appear to deliver benefits in terms of cost-efficiency/competitive neutrality (an assessment confirmed by subsequent analysis - see section 5.2.2) compared to linear functions that are more transparent and thus less sensitive to regulatory capture. It should also be underlined that linear functions do not imply that small and big cars have to deliver the same relative effort – see discussion on the slope of the curve in Box 2. The question that arises is which utility parameter would be the most suitable. After analysis based on external expertise and taking into account the results of the public consultation, two parameters have been retained for further consideration: mass[11] and footprint[12]. These two parameters are also the ones used on the other important world markets (USA use footprint for light trucks, and Japan and China use mass for passenger cars). This system, which reflects better the "diversity" of cars/car makers, would provide more realistic targets for individual manufacturers, but could be the source of perverse incentives (e.g. if carmakers chose to increase utility instead of decreasing CO_2 – see discussion below on utility parameters). Means to prevent such perverse incentives should be considered in order to ensure that 130 g CO_2/km target is respected.

- Percentage reduction based targets: in this approach, the CO_2 obligation would be defined as a function of a percentage reduction compared to earlier performance. The "% reduction" method is based at the manufacturer level on a % reduction applied to a baseline (e.g. the 2006 emission level) and could include fines/feebates or trading. This method respects diversity and seems *a priori* fair to all manufacturers as all have to deliver the same relative reduction, although in absolute terms bigger emitters will have to deliver more CO_2 reductions than small ones (percentage). This method requires agreement to be reached on a baseline and can only be applied at the manufacturer level (since it is impossible to know how individual cars will evolve in five years - the 2012 "Golf" cannot be asked to emit X% less than the 2006 "Golf"). Special provisions would be needed for new entrants on the market, since they would not have a baseline against which to define the reduction target.

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[11] Mass of the car with bodywork in running order

[12] Two definitions can be applied: either the total length times the total width (also called pan area), or the length between the front and rear wheels times the width of the car. Because data is only available for pan area, all modelling presented in the impact assessment as far as footprint is concerned is based on the pan area definition

In practical terms, deriving the 2012 obligation for all three options and analysing their impacts require assumptions to be made on the evolution from the 2006 situation, and the related costs and CO_2 impacts (see boxes 1 and 2).

Box 1: defining the obligation for all three options, taking into account potential changes in the fleet composition

The baseline relies on the 2006 data[13] of cars sold in the EU15. New cars sold in the EU10 represented just above 3% of EU25 sales in 2006 (no data available for Bulgaria and Romania for 2006), and it is not expected that EU10 sales will follow significantly different patterns than those of EU15 up to 2012 (although likely to increase in absolute terms). Consequently it is considered that the EU15 baseline provides enough information for the purpose of EU27 projections at the 2012 horizon.

By using 2006 data on CO_2 emissions and utility it is possible to determine a sales weighted correlation-line for 2006 (with CO_2 emissions as a function of utility). On this basis, assumptions need to be made in order to derive a baseline for the 2012 new car fleet. The model used for the cost assessment relies on an overall segmentation[14] which is not expected to vary significantly between now and 2012. The most relevant factor[15]to take into account to project the 2012 fleet is the evolution of its average mass, and assumptions need to be made on the expected Autonomous Mass Increase (AMI) between 2006 and 2012 as a function of historic trends, price signals including measures addressing demand such as fiscal incentives. This was previously analysed in the earlier impact assessments. In the earlier impact assessments, two assumptions were made: the historic assumption assumed that a 1.5 % per year mass increase will take place between 2006 and 2012 – this assumption was based on historic data, a lower assumption of 0.82 % per year assumed that due to external factors (e.g. revised labelling directive, fiscal measures in Member States) and because safety improvements (which tend to add additional mass to vehicles) will not have the same weight effect as in the past. This is because the most important "passive safety" measures (restraint systems, airbags) are "one-offs" that have by now been introduced on most new cars while additional systems and new auxiliaries will largely relate to electronics based "active safety" with limited mass implications. Two additional scenarios were modelled assuming an extreme mass increase of 2.5 % and no mass increase assuming that the proposed legislative framework will provide a strong deterrent against any further mass increase.

Consequently, to account for the variety of possible futures and the important uncertainties involved in forward projections of consumers and producers behaviours, the

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13 The cost model used in the supporting study relies on 2002 as starting year, but 2006 sales and emission data are introduced in its baseline in order to takount of the evolution of the fleet up to that year

14 The segmentation referred to here is not the refined market segmentation (mini, sedan, sport...) but the six general segments of the cost model: small, medium and large for petrol and diesel vehicles

15 Other factors relating more generally to the transport and climate change policy, such as the penetration of biofuels, are not relevant for this analysis: indeed, the 130 g CO2/km target is a "tailpipe emission" target which cannot cover upstream (well to tank) CO2 savings in order to avoid double counting of savings. Biofuels are considered as part of the 10 g CO2/km additional savings in the proposed Integrated approach. Assumptions also have to be made on any shift in the petrol-diesel mix. This has been handled as in the earlier impact assessments with no further variations analysed.

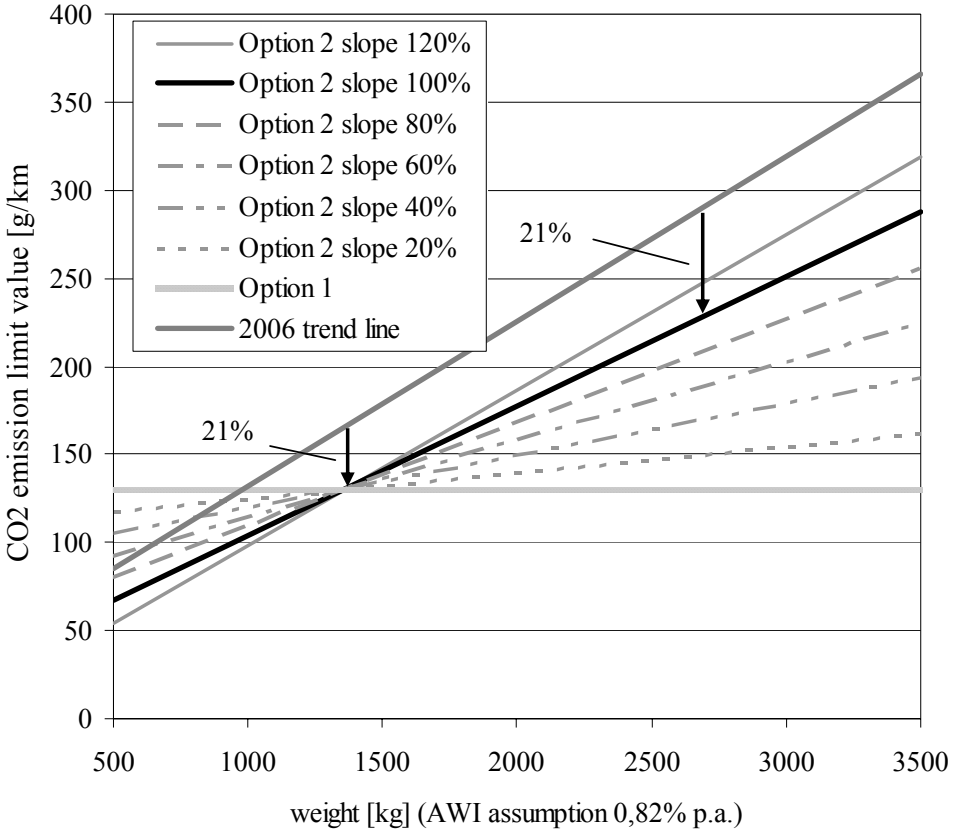
impact assessment is conducted on the basis of multiple AMI scenarios: 1. 0%, 2. 0.82 %, 3. 1.5 % and 4. 2.5 %.

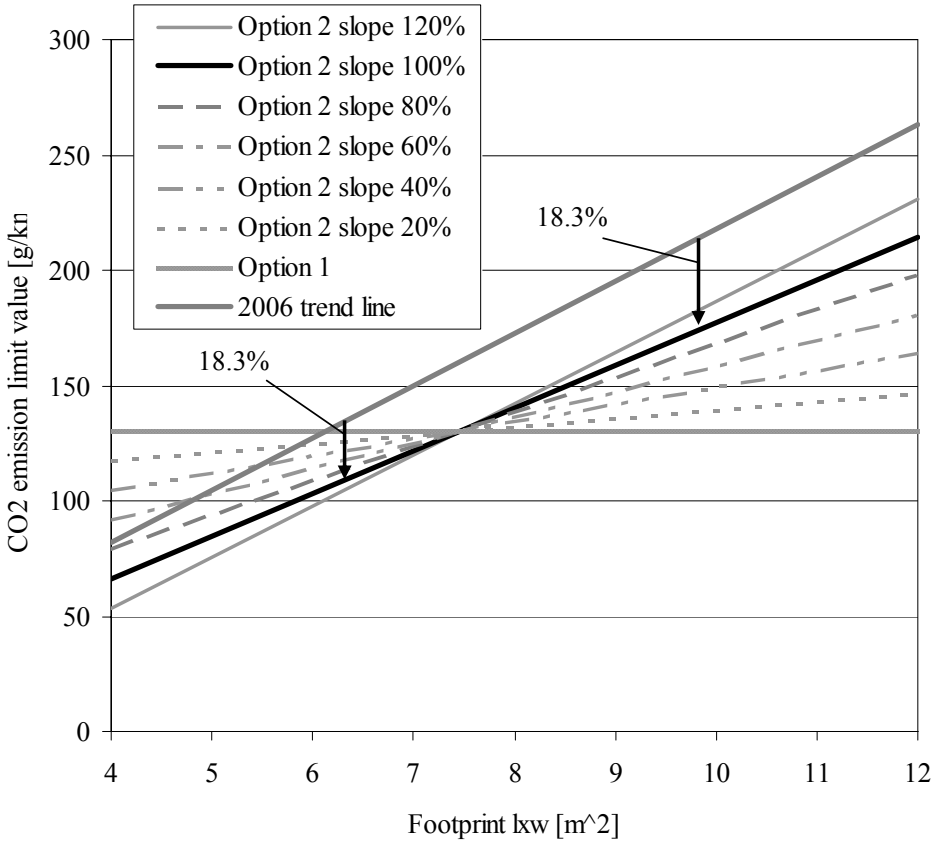
Because mass increase leads to an increase in CO_2 emissions, AMI will have an impact on the costs to achieve the target because its CO_2 impact needs to be compensated (this means that if AMI occurs, even maintaining a constant CO_2 emission level has a cost, as the mass effect on CO_2 needs to be compensated).

Building on these four 2012 scenarios, it is then possible to define 2012 trend lines such that by that year, the average new car fleet respects the 130 gram target: clearly, for Option 1 "Uniform target", the 2012 lines corresponds to a horizontal line (y=130 gram – see Figure 6) that manufacturers must respect; the line is independent of the AMI assumptions, which will only affect costs. Similarly for Option 3 "% reduction", the manufacturer targets are defined against their 2006 levels, and thus again AMI affects the costs, not the target setting. For Option 2 "Utility line" however, because the 2012 line will define for each vehicle a CO_2 objective as a function of a utility parameter, AMI needs to be considered when building the target curve if mass is used as utility. The 2012 line derived from the 2006 line without compensating for any AMI-related CO_2 increase would result in the fleet not reaching 130 grams on average. On the other hand, if an assumed AMI does not occur in practice manufacturers would have to deliver more than 130g CO_2/km on average. As can be seen from the graphs in Figure 6 assuming a 0.82% AMI with mass as the parameter, would lead to a higher percentage reduction in CO_2 than is the case with using pan area as parameter. For Option 2, (should mass be used as the utility parameter) the linear function must therefore make a correct assumption on the AMI (or include an adaptation mechanism, which would allow to correct the AMI assumption made today in order to reflect real-world developments closer to the target date) to ensure that the target to be met in 2012 is in reality 130 g CO_2/km and to avoid an over or under achievement.

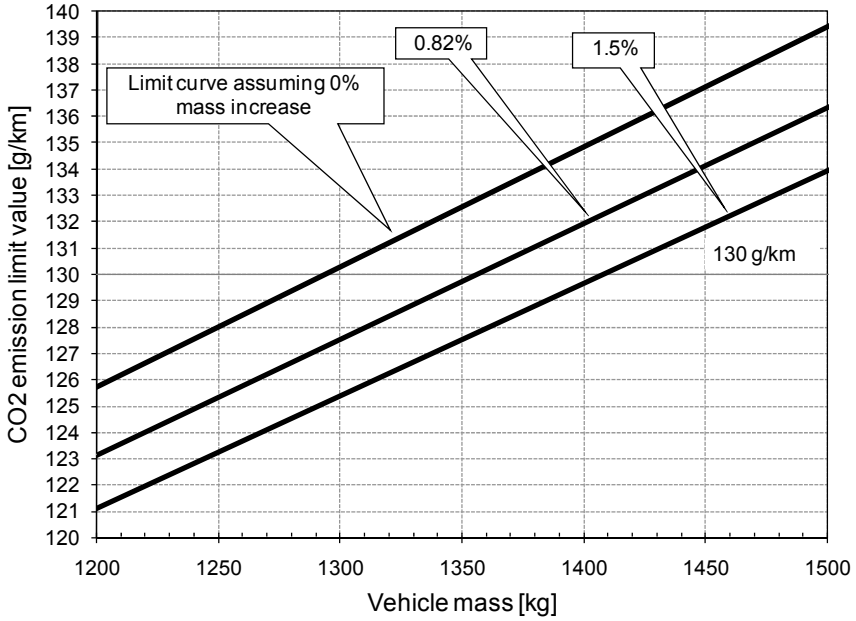
The figure below represents the 2006 trend line, the horizontal line for Option 1 (y=130 g CO_2/km) and different inclinations of the utility line for Option 2 for mass and for footprint (Option 3 cannot be represented graphically since it would be based on a table giving per manufacturer the CO_2 objective to be reached).

Figure 6 - Examples of graphical representations for Options 1 and 2 using mass and footprint as utility parameter assuming an AMI of 0.82% without any prejudice to the AMI level eventually chosen (for mass, the 0.82% AMI assumption per year leads to a higher overall reduction requirement than for footprint: the reasons is that the increased CO_2 emissions resulting from the AMI have to be compensated by an additional CO_2 reduction requirement, explaining the figure of -21% for weight against -18.3% for footprint).


Option 2 slope 120%
Option 2 slope 100%
Option 2 slope 80%
Option 2 slope 60%
Option 2 slope 40%
Option 2 slope 20%
Option 1
2006 trend line
21%
21%
CO2 emission limit value [g/km
400
350
300
250
200
150
100
50
0
500
1000
1500
2000
2500
3000
3500
weight [kg] (AWI assumption 0,82% p.a.)


Option 2 slope 120%
Option 2 slope 100%
Option 2 slope 80%
Option 2 slope 60%
Option 2 slope 40%
Option 2 slope 20%
Option 1
2006 trend line
18.3%
18.3%
CO2 emission limit value [g/kn
300
250
200
150
100
50
0
4
5
6
7
8
9
10
11
12
Footprint lxw [m^2]

The following figure illustrates the influence of different assumptions on AWI on the limit value curve for the case of a 60% slope.



Box 2 – refining Option 2 through different inclinations

As explained in Box 1, Option 2 will be represented by a linear function giving the CO_2 limit as a function of utility: the line is such that, taking into account the assumption made on the AMI, the average new car fleet in 2012 will respect 130 grams. The most straight forward way to derive the 2012 curve is to start from the 2006 curve to which a uniform reduction[16] is applied: this results in shifting downwards and tilting the 2006 line into a 2012 limit line. By definition, the 2006 trend line provides the best statistical relation between utility parameter and CO_2; applying the same relative reduction to all points on the 2006 line to derive the 2012 line will maintain this "fully parametered" relation. It will be called the 100% inclination.

On this curve, the point having the 2012 average utility and average CO_2 value (130 gram) will be the centre of gravity of the 2012 sales. This means that if the 2012 limit line was rotated around this point, the average would still be 130 grams, and thus the objective achieved. The rotation could have the effect of making the curve flatter than the 100% inclination curve, in which case the cars with a higher utility would have to reduce emissions relatively more than lower utility cars (compared to the 100% curve which strictly maintains the utility/CO_2 relation): these curves will have a lower inclination (see 40, 60, 80% lines on Figure 6). Alternatively, the curve could be steeper than 100%: small utility cars would be asked more reductions than bigger cars (see 120% inclination on Figure 6). Variations in inclination will have different impacts on manufacturers,

[16] The reduction applied is a percentage corresponding to distance between 130 grams and the projected 2012 baseline level value taking into account AMI-related CO2 increase and anticipated change in the petrol/diesel share.

depending on their current levels and on their abatement costs, and on the achievement of the environmental outcome.

The curves as depicted in Figure 6 can be expressed in the following form:

$$\text{Target} = 130\text{g/km} + a \times (u - u_0)$$

a = slope parameter

u = utility parameter of the vehicle

u_0 = projected average utility parameter

The parameters a and u_0 are shown in the following table for a number of slopes and for mass as utility parameter.

AMI	Slope	a [(g/km) / kg]	M_0 [kg]
0%	40%	0,0305	1289,0
	50%	0,0381	1289,0
	60%	0,0457	1289,0
	70%	0,0533	1289,0
	80%	0,0610	1289,0
0.82%	40%	0,0294	1353,7
	50%	0,0367	1353,7
	60%	0,0441	1353,7
	70%	0,0514	1353,7
	80%	0,0588	1353,7
1.5%	40%	0,0285	1409,4
	50%	0,0357	1409,4
	60%	0,0428	1409,4
	70%	0,0499	1409,4
	80%	0,0571	1409,4

Each of the above mentioned main options include a wide variety of sub-options, depending on whether the CO_2 limit is defined at the vehicle or manufacturer level, depending on whether and what flexibility mechanisms are foreseen, the types of compliance mechanisms etc. These additional parameters are discussed below.

4.2.3. Flexibility mechanisms

Flexibility will be an important determinant of the cost implications of future legislation. Different levels of flexibility will be envisaged:

- Fleet averaging: manufacturers could average their CO_2 emissions over their fleet (rather than having to respect a target for each car they sell);

- Pooling: manufacturers could do the same fleet averaging amongst companies belonging to the same group; similarly different manufacturers could be allowed to create a pool on their own initiative and trade the credits they need, should this help to optimise the cost of delivering CO_2 reductions needed;

- Trading: an internal trading system could be put in place, whereby manufacturers would buy and sell the credits needed in order to overall achieve the target set by the legislation;

- Specialist derogation for small volume independent manufacturers:some specialised independent manufacturers who make small numbers of vehicles such as sports cars may not find either solution accessible e.g. through a lack of pooling partners.

Fleet averaging will be modelled by the fact that at the manufacturer level, the model assumes that the cheapest reductions are delivered first. Trading will also be modelled, with the same assumption across the whole fleet. These two flexibility options will set the boundaries for the impact of pooling on abatement costs as this option can be considered as an intermediate option between fleet averaging and full trading.

Banking and borrowing are additional options that introduce a time related flexibility whereby car manufacturers could either bank overachievement in year N, and use it in year N+1 if they under achieve, or do less in year N (borrowing) provided they deliver more in year N+1. Because the objective must be reached at a given date (2012), borrowing will not be considered. The relevance of banking will be assessed.

The possibility of combining Options 2 and 3 has also been put forward. The idea would be to give the choice to manufacturers of either meeting a utility based target, or delivering a % reduction. This solution could provide flexibility for niche manufacturers who would face a very high burden against a utility curve, and could thus be better off delivering a % reduction, even if it was an above average reduction.

The specialist derogation has not been investigated in further detail because of its very small impact on the overall level of achieved average emissions.,A suitable level of cut-off appears to be an annual production volume of 10,000 vehicles.In order to provide incentives for such manufacturers to also improve their vehicles, ad-hoc targets could be set for each one, in view of the efforts made by the bulk of the vehicle fleet and depending on the characteristics of their own fleet.

4.2.4. Compliance mechanisms

Two main types of compliance mechanisms can be envisaged in the case of an automotive legislation:

- Market access restrictions in case of non-compliance: this is the most rigid system. Because average fleet can only be calculated ex-post, such an ex-ante system can only be applied at the level of individual vehicles. Because the EU target is defined as the average of the CO_2 emissions of the new cars sold in a given year, even if non compliant vehicles are prevented from accessing the market, there will be no guarantee that the average emission level will respect the set target (unless the target is uniform for all vehicles, which is not realistic as explained in section 4.2.2). Finally

such an approach would not allow for any flexibility due to the very nature of market access restrictions. Besides, using market access restrictions would not allow targets to be set as a fleet average for manufacturers, since it would then be impossible to identify the vehicles to exclude from the market.

- Financial penalties in case of non compliance: non-compliance would result in a payment of an excess emission premium (EPP) defined in €/gram above the established target, depending on the regulatory system in place. On the one hand, the objective of the regulatory scheme is to deliver the CO_2 targets and penalties should act as a deterrent to ensure that emissions reductions are delivered (in order to prevent a cheap buy out instead of the delivery of the target). On the other hand, penalties should remain proportionate, take into account the cost of CO_2 and not undermine the global competitiveness of the European automotive industry (European manufacturers will be more affected due to having a higher proportion of global sales on the EU market). The premium could be paid for every vehicle above the limit, or be calculated at the manufacturer level after fleet averaging (which would allow low emitting cars to offset cars above the limit); in the latter case the premium would be calculated as the product of the distance to target (in grams) by the premium level (€/gram) and by the number of cars sold by the car manufacturer under consideration.

Based on the above considerations, financial penalties have been identified as being the most suitable way forward. The level of the premium will obviously be of crucial importance for both the effectiveness of the scheme as well as the competitiveness of the automotive industry. Three aspects have been taken into account when considering possible premium levels:

- Deterrent effect against non compliance: the objective of the legislation being the achievement of the CO_2 average fleet targets, penalties must be sufficiently high in order to have a deterrent effect. A possible benchmark to guarantee this deterrent effect would be to set the level of the penalties at least at the level of the technical costs to achieve the target: under this approach it would basically cost more to miss the target than to introduce the technologies needed to meet it. For this approach, it should be noted that the technical cost curves are not linear, which means that different actors in the market face different marginal costs of abatement: achieving a deterrent effect across the board would require basing premium levels on the upper range of the marginal abatement costs (150 €/gram) for certain manufacturers. A premium of 150 €/gram could be considered as an example of a premium level which would provide a very strong deterrent effect, while 25 €/gram would reflect the lower range of the average abatement cost. An upper range of the marginal abatement costs (95 €/gram) for mainstream manufacturers could be also considered[17].

- Competitiveness dimension: the second effect to consider when setting the level of the penalties is their effect on global competitiveness and the automotive value chain's ability to continue contributing to the Growth and Jobs agenda. Depending on the level of premiums and on the extent to which the target could be missed, a manufacturer could potentially face very high overall penalties. (see section 5.3.2).

[17] The marginal abatement cost represents the cost of delivering the last gram needed to reach the obligation

Given that the marginal CO_2 abatement cost through vehicle technology is relatively high, premium levels based on technical costs could led to high premium levels. Furthermore, high premium levels will have a different overall impact on different market participants depending on the proportion of their global sales in the European market. The issue of proportionality should also be considered given that premiums based on technical costs would price CO_2 at a significantly higher price than the price of CO_2 under the EU Emissions Trading Scheme. This issue also has to be placed into the context of the EU industry's competitiveness as a whole: on the one hand a number of sectors within the ETS are more subject to international competition when placing their products on the EU market than car manufacturers, who will all have to respect the EU CO_2 legislation; on the other hand, sectors in the ETS have the opportunity to purchase CO_2 on the open market at the market price, which the automotive industry cannot do. A premium level of 7€/g - 10€/gram would reflect a range for the expected price of carbon under the ETS system in the future while a premium level of 25€ /gram would reflect the ETS penalty price.

- Time dimension: Together with the competitiveness dimension, it should also be taken into account that manufacturers do not have full control over the average of their sales in a given year and the target is defined as the average of all the cars placed on the market. This creates a margin for error, which manufacturers could to a degree reduce through putting in place continuous sales monitoring or through introducing a safety margin for uncertainties. The combination of these factors suggests that there would be a case for allowing a gradual increase in the premium level over time, to reflect the uncertainties faced by manufacturers. Using such a gradual approach could be designed in such a way that it becomes more and more costly to miss on the delivery of the target. Such an approach could be to introduce a gradually increasing premium, whereby the premium in year N+1 would be higher than the premium in year N.

Against this background, premium levels set in legislative frameworks pursuing similar objectives are of interest, although situations are not *stricto sensu* comparable:

- Fines under the U.S. CAFE programme (Corporate Average Fuel Economy) are set at $5.5 for every tenth gallon/mile by which the target is exceeded and US fines correspond to roughly 10-15 €/gCO_2/km[18]. The US CAFE programme is based on a uniform fuel efficiency target set for the average fleet of all manufacturers selling cars in the US. It was designed in the 1970s, and reflects the fact that major car manufacturers offer vehicles in all market segments, thus being able to overall deliver on the fleet targets. As far as European carmakers are concerned, because their average fleet did not meet the CAFE standards, they have regularly been fined for non compliance: in 2004, Porsche paid more than 6.3 M$, Volkswagen 3.4 M$ and DaimlerChrysler 8.5M$[19]. Although the fact that only certain manufacturers pay fines reflects one of the drawbacks of a uniform target based approach, it also shows that the level of the fines did not achieve a deterrent to non compliance in the US;

[18] Estimate based on an average vehicle (because fuel economy (miles/gallon) is inversely related to fuel consumption limits (gallon/miles or g CO_2/km), a constant conversion factor cannot be used)

[19] http://www.nhtsa.gov/cars/rules/CAFE/FINES-COLLECTED-SUMMARY.html

- Fines for non-compliance in the Japanese top-runner system at set at circa € 6000 per manufacturer: while the figure is very low, it is noteworthy that all manufacturers subject to the system have met the 2010 Japanese standard way ahead of the deadline, which would indicate either that compliance with the standard was relatively easy, or that in Japan other considerations than the deterrent effect of financial penalties would have driven car manufacturers to deliver targets that were attributed to them by the authorities;

- Another relevant example is that of the compliance mechanism of the EU Emissions Trading Directive, whereby the penalty level for non compliance is set at 100 € per ton of CO_2 for the 2008-2012 trading period. This level of financial premium, which would correspond to an estimated 25€ per g CO_2/km[20] is considerably lower than marginal costs to reach the 130 g CO_2/km. However it should be underlined that, to remain inline with the EU ETS approach, the missing reductions in year N would be subject to both the said penalty *and* the obligation in year N+1 to deliver the missing reductions.

- Taking into account the current discussions regarding the GHG/RES impact assessments, a premium level of 7 to 10€/gram would reflect the possible future price of carbon post-2012.

Based on the cost estimates provided in the supporting study and taking into account the above mentioned considerations five hypotheses have been retained for the further analysis: 7€ per g, 10€ per g, 25€ per g, 95€ per g and 150€ per g. Consideration will also be given to a possible gradual increase in the level of the premiums over time. A careful balance has to be struck between the deterrent effect on the one hand and the effects on the global competitiveness on the other.]

4.3. Conclusion and summary of the policy options identified

Based on the analysis of the possible options described in the previous sections, the following regulatory options have been considered as possible means to meet the policy objectives identified in section 3.1:

(1) **Uniform target:** this option sets a common CO_2 emission limit for each manufacturer for the average of their new passenger car fleets sold in 2012. To be workable, this option needs to rely on a trading mechanism providing the necessary flexibility in view of the current diversity of car manufacturers;

(2) **Utility parameter based limit curve:** a linear function provides the CO_2 limit to be respected as a function of the utility of the vehicle under consideration. Two utility parameters have been identified: mass and footprint. Furthermore there are various ways to establish the linear function, as an inflexion of its inclination will influence the way in which the burden is shared amongst manufacturers and the certainty of the environmental outcome;

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[20] Preliminary estimate based on a direct translation from ETS monitoring to type approval values, with a lifetime mileage estimated at 250.000 km and without assumptions on future CO_2 penalty levels in the ETS, nor discounting

(3) **% reduction based targets:** on the basis of the 2006 emission levels averaged per manufacturer, reduction targets are established corresponding to the distance between the current level and the 2012 target (e.g. for passenger cars the distance between the 2006 level of 160 g CO_2/km and the 2012 target of 130 g CO_2/km corresponds to a circa 19% reduction, so all manufacturers would have to deliver by 2012 a 19% against their 2006 levels).

For all options, flexibility mechanisms, and compliance mechanisms based on premium levels of 7€/gram, 10€/gram, 25€/gram, 95€/gram and 150 €/gram will be considered, including the possibility of a gradual increase in the level of the premiums over time.

5. ANALYSIS OF IMPACTS

In its February Communication, the Commission has set out the operational objectives listed in section 3.1. These principles will be considered as part of the overarching economic, social and environmental impacts for the purpose of the analysis of the options.

The economic impacts are primarily analysed with regard to overall cost-effectiveness, distributional effects among manufacturers and innovation and trade. The social impacts are primarily analysed with regard to employment, affordability of cars and the effect on different segments of the vehicle market. The environmental impacts are primarily analysed with regard to effectiveness of the different options.

It should be underlined that the respect of these principles, which can broadly be grouped into social equity, neutrality for competition and cost-efficiency (including achievement of the environmental outcome) can in some cases lead to trade offs for example between the competitive position of certain manufacturers on the one hand, and the objective of maintaining the affordability of cars on the other; similarly, depending on its stringency, the compliance mechanism could influence significantly the environmental outcome of the scheme as well as the competitive position of European manufacturers compared to both domestic and international competitors. The analysis of the impacts will thus be carried out taking into account the separate principles first in the present section, and then bringing together the assessment in Section 6 in order to provide an overview of the impacts and possible trade offs of the three options considered against the said principles.

5.1. Description of the methodology

The methodology followed for the analysis of the impacts of the policy options builds upon the analytical framework developed in support of the earlier impact assessments complemented by the supporting study and stakeholder input provided through the public consultation. To reflect in the modelling the overall socio-economic impacts, the modelling time horizon is 2020.

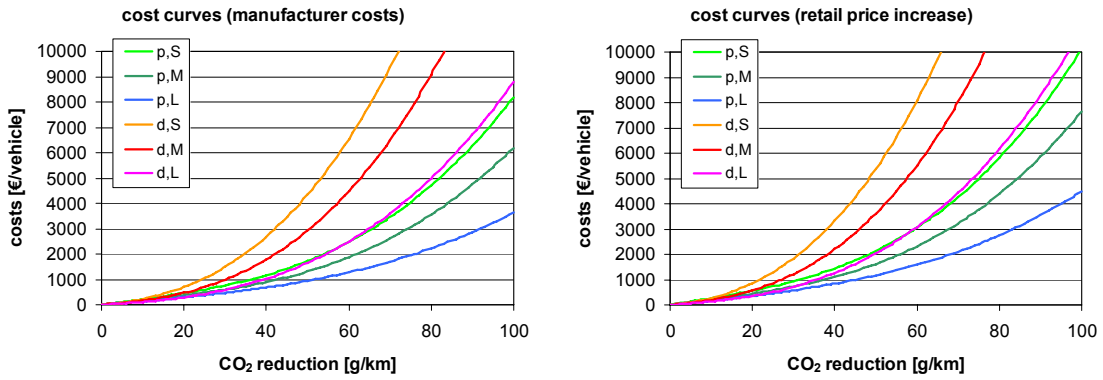
The quantitative assessment of the economic, environmental and social impacts of the policy options for the regulation is function of the cost increase per segment, the related fuel cost savings, and the way in which manufacturers will pass through costs to consumers at the segment level and by cross subsidisation between segments since fleet averaging would be allowed. Obviously, modelling the evolution of the car market

segmentation, and different manufacturers behaviour, is difficult, and the IA report relies on two assessment sources in order to provide the upper and lower boundaries of the cost effectiveness of the options pursued.

5.1.1. Ex-ante estimates from the supporting study

The cost model used in the supporting study is based on 6 cost curves covering small, petrol and large diesel and petrol vehicles (see Figure 7), and is well known to stakeholders: the cost curves have been developed further to an extensive consultation in the preparation of the earlier impact assessments[21].

Figure 7 - Cost curves for manufacturer costs and retail price increase (based on Task A but excluding manufacturer and dealer margins)



As explained in Box 1, on the basis of fleet evolution assumptions between 2006 and 2012, the cost model used in the supporting IEEP/TNO/CE study provides ex-ante compliance cost estimates at the manufacturer level, and thus cost-effectiveness estimates taking into account the related fuel savings. In this ex-ante assessment, no significant variation to overall segmentation of the car market is expected by 2012, bearing in mind that the segmentation under consideration is not the refined market segmentation (mini, sedan, sport...) but the six general segments of the cost model: small, medium and large for petrol and diesel vehicles.

5.1.2. Dynamic modelling with TREMOVE

In addition to the modelling of cost impacts at manufacturer and consumer level, TREMOVE runs have been carried out. TREMOVE is a transport and emissions simulation model developed for the European Commission. It is designed to study the effects of different transport and environment policies on the emissions of the transport sector. The model estimates the changes in transport demand, modal split, vehicle fleets, emissions of air pollutants and welfare level of different policy scenarios. The scenarios for the present IA report have been modelled using the latest version of the model TREMOVE 2.52, which covers all EU-27 Member States over the period 1995-2030.

[21] See Task A study publicly available at http://circa.europa.eu/Public/irc/env/eccp_2/library?l=/light-duty_vehicles/task_a/report_2006_31pdf/_EN_1.0_&a=d

The details on the model structure and the baseline can be found in the final report of the service contract for the development of the model[22].

For the present report, a variant of the baseline, called 2.53, has been used, modifying both the type-approval CO2 emissions and vehicle retail costs over the period 2006-2012 and beyond, in order to be fully consistent with the assumptions used in the [supporting study] for baseline b1. The results presented here cannot therefore be directly compared to the calculation of cost-effectiveness of SEC(2007) 60, that referred to 140g by 2008/9 as a baseline. Another factor makes difficult any comparison with the TREMOVE runs undertaken in 2006: the model has been substantially improved in 2007 by Transport & Mobility Leuven, on the basis of the expert model review and stakeholder suggestions: The main changes are an update of the emission factors model (from Copert III to Copert IV) and the improvement of the vehicle choice *logit* module (i.a. introducing imperfect consumer information on fuel savings over lifetime, as discussed in June 2006 workshop on TREMOVE vehicle choice modelling). Moreover, the present simulations are performed very close to TREMOVE model boundary conditions. The coarse segmentation in 6 vehicle categories was very useful to define ambition levels – and this was done in 2006 for SEC(2007) 60 – but is less adapted for the fine tuning of the regulation.

Against that background, the three options have been modelled with TREMOVE (for Option 2, both mass and footprint and slopes of 40 and 80% have been considered in order to provide a representative overview of the slopes under consideration). The scenarios implemented consist in a variation of the car purchase price, for each vehicle category (small, medium and large, for both petrol and diesel cars), over the period 2006-2012, together with a variation in fuel consumption, both variables expressed in relative terms as a percentage variation over 2002 absolute levels (TREMOVE does not take into account increased maintenance costs for the purpose of assessing the impacts of environmental legislation). Using the TREMOVE model allows assessing the effect of potential changes in sales structure on the cost-effectiveness of the scheme.

5.2. Economic impacts

5.2.1. Least cost solution for the society and cost-effectiveness

The economic impacts for the society as a whole are first and foremost function of the level of ambition of the targets which were defined by the Commission in its earlier Communications on the basis of the earlier impact assessments. Based on the ex-ante cost assessment model used to assess different approaches/options for target setting, the least cost option for the society at manufacturer level would be based on Option 2, with a % inclination of circa 123%[23] i.e. a line which would require more savings from cars with a small utility compared to bigger cars. This is mainly explained by the fact that the bulk of the sales in the EU take place in the small and medium segments (thus reductions in the bigger segments only would not suffice to deliver the average targets).

Obviously, the least cost solution would lead to substantially higher cost increases for small cars and thus raise concerns in terms of affordability. It is noteworthy that although

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22 www.tremove.org

23 Valid both for footprint and weight

the optimum lies above 120%, the average cost variations per car when fleet averaging is allowed do not vary much for inclinations between 60% up to 140%; even at a 40% inclination, the average cost is still less than 4% above the least cost solution. It can thus be concluded that other inclinations than the cost-optimised solution could be taken, in view of other objectives and of the fact that the cost variation remains limited. Indeed, the earlier Communication on CO_2 and cars endorsed a wide-ranging notion of cost-effectiveness that accounts notably for security of energy supply, sensitivity to international competition, affordability for consumers and positive rebound effects, effects that could not be modelled completely in such cost-optimisation.

In terms of net present value and cost effectiveness, Table 2 provides an indication of the cost-effectiveness of the options, based on the two methods described above

Table 2 - Cost-effectiveness of the three options over the 2006-2020 period (source Supporting study and TREMOVE)

	Cost effectiveness in €/t CO_2	**TREMOVE**			Supporting study (ex-ante)
		NPV Cost to society 2006-2020 (M€)	**WtW CO2eq Abatement 2006-2020 (Mt)**	**€/t CO2**	
Option 1	Uniform target per manufacturer with trading	9.746	-624	15.6	45.6
Option 2	40% slope – Footprint	22.159	-638	34.7	39.8
	80% slope – Footprint	21.008	-634	33.1	36.4
	40% slope – Mass	21.674	-638	34.0	38.7
	80% slope - Mass	20.523	-634	32.4	34.8
Option 3	Percentage reduction per manufacturer	17.922	-626	28.6	34.3

As described later in the report, the TREMOVE runs suggest a substantial change in the sales structure, which triggers a much better cost-effectiveness of the scenario with respect to the static ex-ante estimates. This effect is even stronger in the case of Option 1, for which the changes in relative price structure (expressed in lifetime cost for car driver) are bigger. This is why the range of cost-effectiveness values - between the static ex-ante simulation and the dynamic TREMOVE runs – is the widest for this scenario.

As regards the ex-ante calculation, the calculation is based at vehicle level for each vehicle category and aggregated using 2012 TREMOVE 2.52 baseline sales structure per vehicle category. The variation in vehicle purchase price (excluding taxes) is added to the fuel savings (average current 2006-07 average price excluding taxes) over the lifetime of the vehicle, using a 4% discount rate (inline with the IA guidelines). This is why for this calculation, only cost effectiveness results are provided, and neither total costs nor CO2 savings. The accuracy of the ex-ante calculation is function of the distance between the static approach taken and how market trends will actually evolve. It can be considered that both TREMOVE and ex-ante approaches provide respectively a lower and an upper boundary of the cost effectiveness of the legislation.

The output of the [supporting study] can be further exploited to provide useful insights on cost-effectiveness. A sensitivity analysis presented in Table 3 has been performed on two key parameters:

(1) **Autonomous weight increase (a.w.i.)**. The central calculation is based on 0.82% annual increase. Two additional sets of value are provided for respectively 0% and 1.5% a.w.i.

(2) **Fuel price.** The central estimates are based on an average fuel price before tax of respectively 0.50 and 0.40 for petrol and diesel, based on average prices in the period 2006-2007. A modulation of +/- 30% has been performed.

Table 3 – Sensitivity analysis on ex-ante Cost-effectiveness of the three options, based on alternative autonomous weight increases and fuel prices (source Supporting study)

	Cost effectiveness in €/t CO_2	Alternative Autonomous weight increase		Alternative fuel price	
		0.00%	1.50%	-30%	+30%
Option 1	Uniform target per manufacturer with trading	19.6	70.4	82.8	8.4
Option 2	40% slope – Footprint	14.3	64.2	77.1	2.5
	80% slope – Footprint	11.1	60.8	73.8	-1.0
	40% slope – Mass	13.3	63.2	76.0	1.4
	80% slope - Mass	9.6	59.2	72.1	-2.6
Option 3	Percentage reduction per manufacturer	8.4	59.2	71.5	-3.0

Clearly, the way in which the target is delivered, and in particular the burden sharing amongst car manufacturers, will also influence the economic impacts, at least at the level of the automotive industry. Because of the potential distributional effects of different regulatory approaches, one of the specific objectives of the Commission (see section 3.1) is to ensure "*competitively neutral targets*" that are "*equitable to the diversity of European automobile manufacturers and avoid any unjustified distortion of competition between automobile manufacturers*".

Against this background, a thorough analysis has been carried out on the impacts at manufacturer level of Options 1, 2 (for mass and footprint and for different inclinations of the line) and 3.

5.2.2. Distributional effects in terms of relative retail price increases at the level of manufacturers and relative reduction requirements per manufacturer

Figure 9, Figure 10, Figure 11 and Figure 12 present the impacts of the three options for the achievement of the 130 g CO_2/km target expressed in terms of relative price increase and 2006-2012 reduction requirement, including different inclinations of the line for Option 2 in the case of mass (Figure 9 and Figure 11) and in the case of footprint (Figure 10 and Figure 12).

Figure 13, Figure 14, Figure 15 and Figure 16 present the absolute retail price increase and lifetime fuel savings linked to the achievement of the 130 g CO_2/km target at the

manufacturer level , including different inclinations of the line for Option 2 in the case of mass (Figure 13 and Figure 15) and footprint (Figure 14 and Figure 16).

These results confirm the intuitive result that the flatter the curve, the more advantageous for manufacturers of smaller cars, which is true for both utility parameters. The use of mass results in slightly higher relative retail price increases for those manufacturers, but the impact remains limited. However, while the same types of manufacturers follow similar patterns, the speed of their cost variation is not the same for all manufacturers. Differences in distributional effects between the different options analysed are much larger than differences in impact on average cost per vehicle.

As regards **Option 1** (represented in the subsequent figures by the 0% slope), the consequence of using a uniform target is that manufacturers of relatively smaller cars would find it substantially easier to comply with the future legislation than manufacturers of relatively bigger cars. Using a uniform target raises concerns as to the respect of the diversity of European car manufacturers and does not meet the requirement of competitive neutrality for the European car market, as it would penalise manufacturers of larger cars while not providing sufficient incentive for manufacturers of smaller cars to continue reducing their CO_2 emissions once they have reached the level of 130 g CO_2/km in the absence of a trading system. As regards trading, an operational system would have to assume that there are sufficient "credits" available on the market.

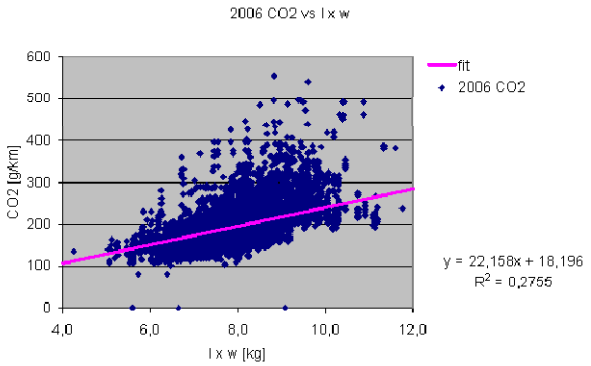
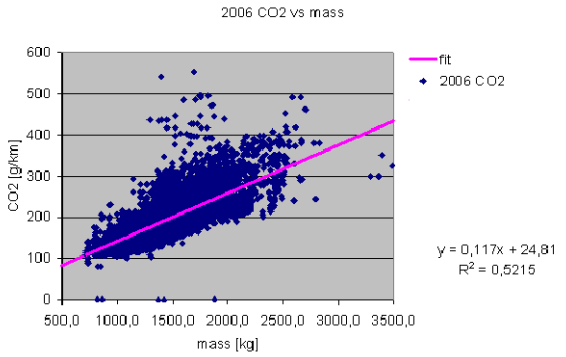
Option 2 delivers the most even *sales-weighted* distribution[24] of relative retail price increase per manufacturer, for slopes between 74% and 80% for mass as utility parameter, and between 64% and 68% for footprint (depending on the assumptions made on autonomous mass increase). The most even *un-weighted* distribution of relative retail price increase per manufacturer is delivered for slopes between 39% and 47% for mass as utility parameter, and between 18% and 27% for footprint (again, depending on the assumptions made on autonomous mass increase). The scatter of relative retail price increases per manufacturer remains quite important, at +/- 4% around the average value of 6%. It derives from this that a linear utility function cannot be tailored to fully equalise the burden per manufacturer in terms of relative retail price increase.

However, the analysis provided by the supporting study (technical note #4) has concluded that in view of the underlying factors leading to this scatter around the mean average, the use of a non-linear utility function would not improve the equalisation of relative retail price increase over the manufacturers.

In Figure 8 below, scatter diagrams show the distribution of CO_2 emissions in relation to the two principal utility parameters currently available as listed above. A sales weighted regression line also illustrates that either of these parameters is at first sight a suitable choice. That is, they show a reasonably close correlation to CO_2 emissions, but also have a significant R^2 value, ie there is a significant 'bandwidth' which suggests that there is room for improvement in relation to either parameter. Both also exhibit a significant number of 'outlier' models towards the top or right-hand side of the cloud. These figures are based on the complete database of vehicles available on the market in 2006.

[24] Excluding Porsche and Subaru in view of the specificities of their fleet – high emitting petrol cars – which would make the optimisation meaningless

Figure 8 - distribution of CO2 emissions in relation to the two principal utility parameters

Vehicle pan area [l x w]	Vehicle mass (empty)
	

Source: Supporting study

Regarding **Option 3**, the % reduction target leads to a lower average cost per car than for Option 1 or 2, and to a seemingly even distribution of the relative retail price increase per car over all manufacturers (see Figure 9, Figure 10, Figure 11 and Figure 12). However the relative retail price increase per car is higher for manufacturers of small/light/low CO_2 emitting cars than for manufacturers of large/heavy/high CO_2 emitting cars and thus raises affordability and fairness concerns. Furthermore, in terms of competitiveness and market strategies, an important drawback of Option 3 is that it locks the manufacturers of small/efficient vehicles in their present market position, while manufacturers of large/inefficient vehicles can meet their target by widening their market offering towards smaller segments. Finally, Option 3 leads to higher costs for early movers as they have to climb further on the cost curve to meet the target.

5.2.3. Impacts of the flexibility (trading and pooling)

As explained in section 4.2.3, three forms of flexibility will be addressed: fleet averaging, pooling and trading between manufacturers. Introducing flexibility is partly indented to provide manufacturers with a broader range of options to meet their emission targets, but the extent to which flexibility is used could also have important implications for the overall cost-effectiveness of the system. The cost of reducing CO_2 emissions is vehicle specific and consequently the cost-effectiveness of the system would not be optimised if every vehicle would have to comply with specific emission targets. The differences in abatement costs at the vehicle level are independent of the way the targets are set and the three flexibility options would improve cost-effectiveness under all target-setting options.

Applying the target to manufacturers' average fleet rather than individual vehicles would allow manufacturers to decide for themselves how and in which segments to reduce their average emissions. Reduction of average emissions may be achieved by reducing the emissions of the models where such reductions cost the least although manufacturers are also likely to take portfolio and market considerations into account. The average retail price increase is approximately 6% if the target is applied to manufacturer averages (see Figure 9 and Figure 10), while it increases to 8 % (depending on the way the target is set)

if the targets are applied to individual vehicles. The fleet averaging option consequently reduces the overall cost of meeting the targets.

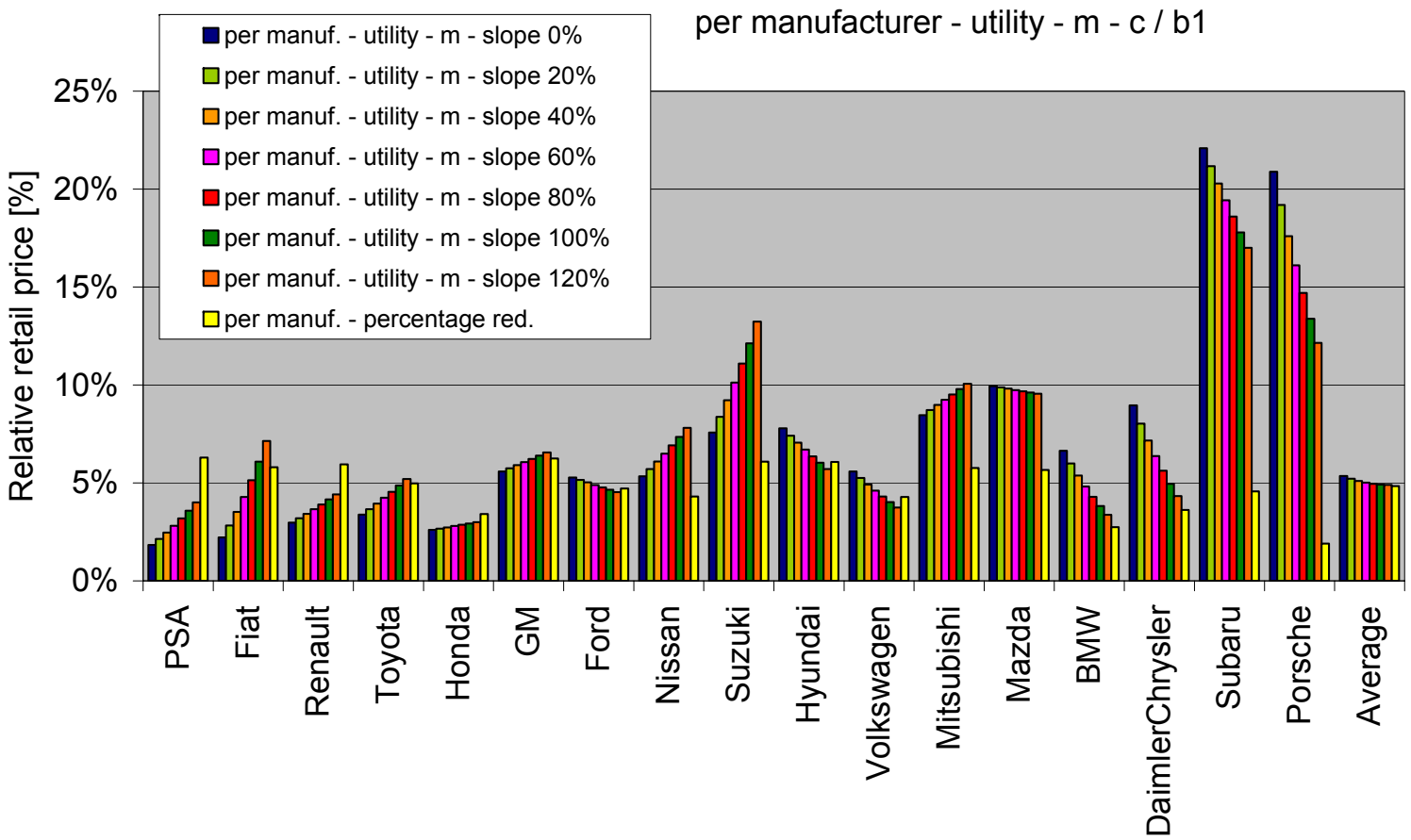
Pooling between two or several manufacturers is in essence a continuation of fleet averaging applied to several manufacturers. Similarly to different vehicles being subject to different abatement costs, different manufacturers are also faced with varying costs of abatement. By allowing pooling, the abatement costs of different manufacturers could theoretically move towards averaging costs, which would result in increased cost-effectiveness. In addition, pooling would allow for niche producers to combine their portfolios with mainstream producers hence helping to address the problem of outliers within the overall system. While the precise impact of pooling on cost-effectiveness will depend on the extent to which manufacturers use this possibility and the nature of the agreements they reach between one another, it is likely that it will take place in practice and has been supported by representatives of the automotive industry during the consultation process.

As regards the effects of trading on the costs of abatement, this flexibility leads to a more even distribution of relative price increases, and sensitivities of manufacturers to the inclination of the line in the case of Option 2 is reduced. At the segment level, the trading option promotes small diesel vehicles, for which additional reductions would not be cost effective without the trading incentive. The supporting study shows that trading does not greatly influence costs for the mainstream manufacturers, but that it could significantly reduce costs for niche/high-emitting manufacturers (an effect that could be achieved with pooling as well). The assessment shows that Option 1 leads to the highest trading activity ($5{,}63.10^7$ g CO_2/km or an average of nearly 4 g CO_2/km traded for each car sold), with three times more credits exchanged than with Option 3. Option 2, depending on the inclination used for the curve but irrespective of the parameter lies between these two extremes. The fact that traded volumes represent a significant share (10-20%) of the total costs of reaching 130 g CO_2/km could justify setting up a trading system although of course the modelling assumes that the overall 2012 target will be met on average and that the market will behave perfectly, and thus trading results in an optimal solution. However, liquidity of the market is not certain (in a worst case scenario if the overall target is missed in 2012 there will not be enough credits to trade) and transaction costs entailed by flexibility mechanisms have not been estimated, although it is very likely that pooling would induce lower transaction costs than implementing a separate, formal sector-wide trading scheme within the timeframe applicable to the future legislation. The outcome of the public consultation has shown that the car industry would rather be in favour of a voluntary "pooling" scheme than of a full scale industry wide scheme. Pooling would thus appear to be the most promising option, especially if sufficient time is offered to manufacturers to assess their potential offer/demand for credits during a given year. In addition, in fact if pooling works perfectly, it could achieve similar result to trading. Consequently, fleet averaging and pooling appear to be the most promising flexibility options at this time to help maximise cost-effectiveness.

It is not expected that the option of pooling or trading would significantly influence decisions on mergers and take overs, as drivers for such operations go far beyond the impacts of a future CO2 legislation. In this respect, Ford has recently announced that it would sell Land Rover and Jaguar, two high emitting brands, without assurances regarding the future regulatory system regarding CO2 and possible flexibilities.

Figure 9 - Relative retail price increase at the manufacturer level for options 1, 2 (incl. variations) and 3, using mass as utility (a) assuming 0% AMI and (b) assuming 0.82% AMI (without prejudice to the AMI level eventually chosen) and allowing fleet averaging (source supporting study)

(a)



(b)

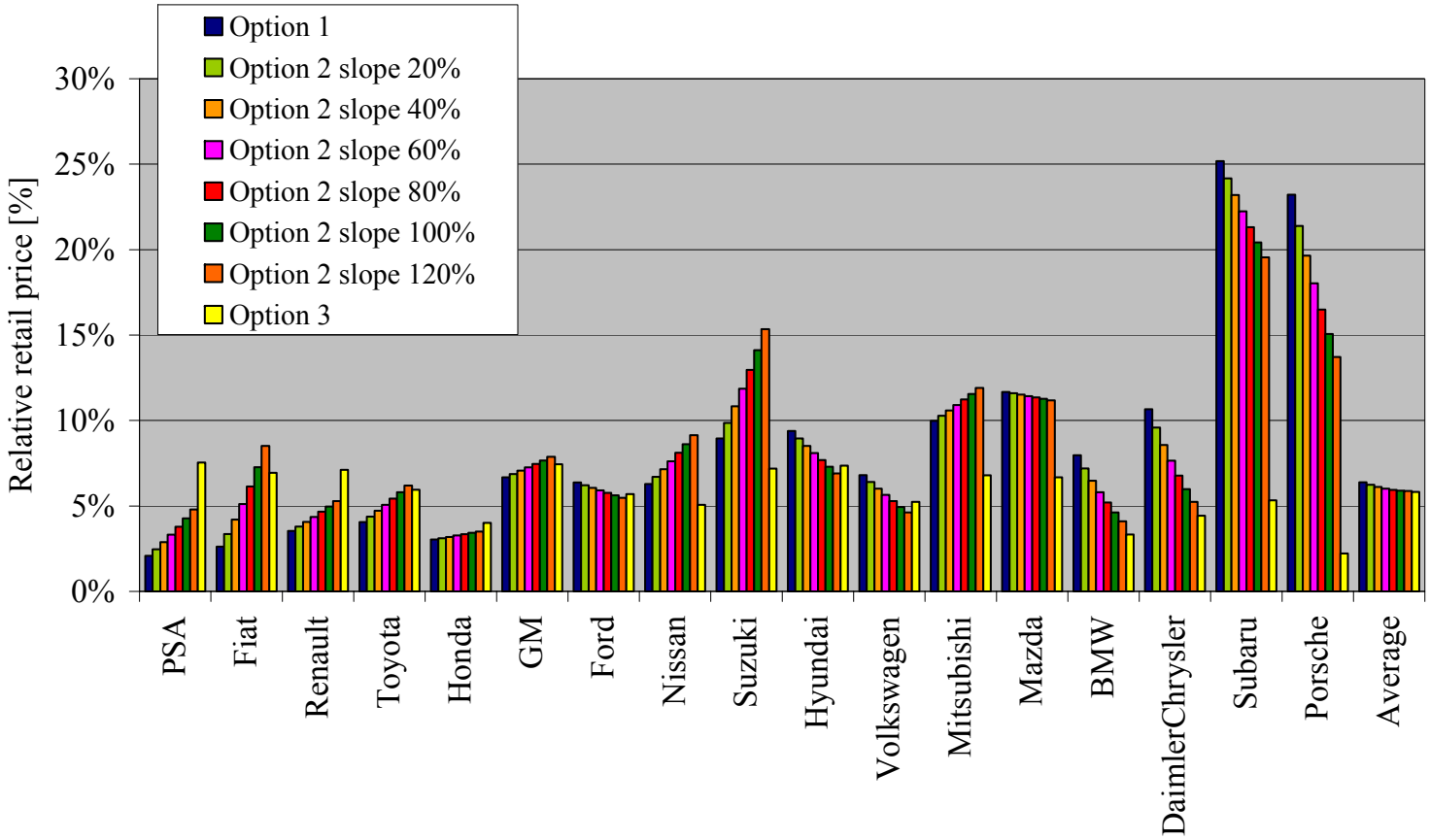
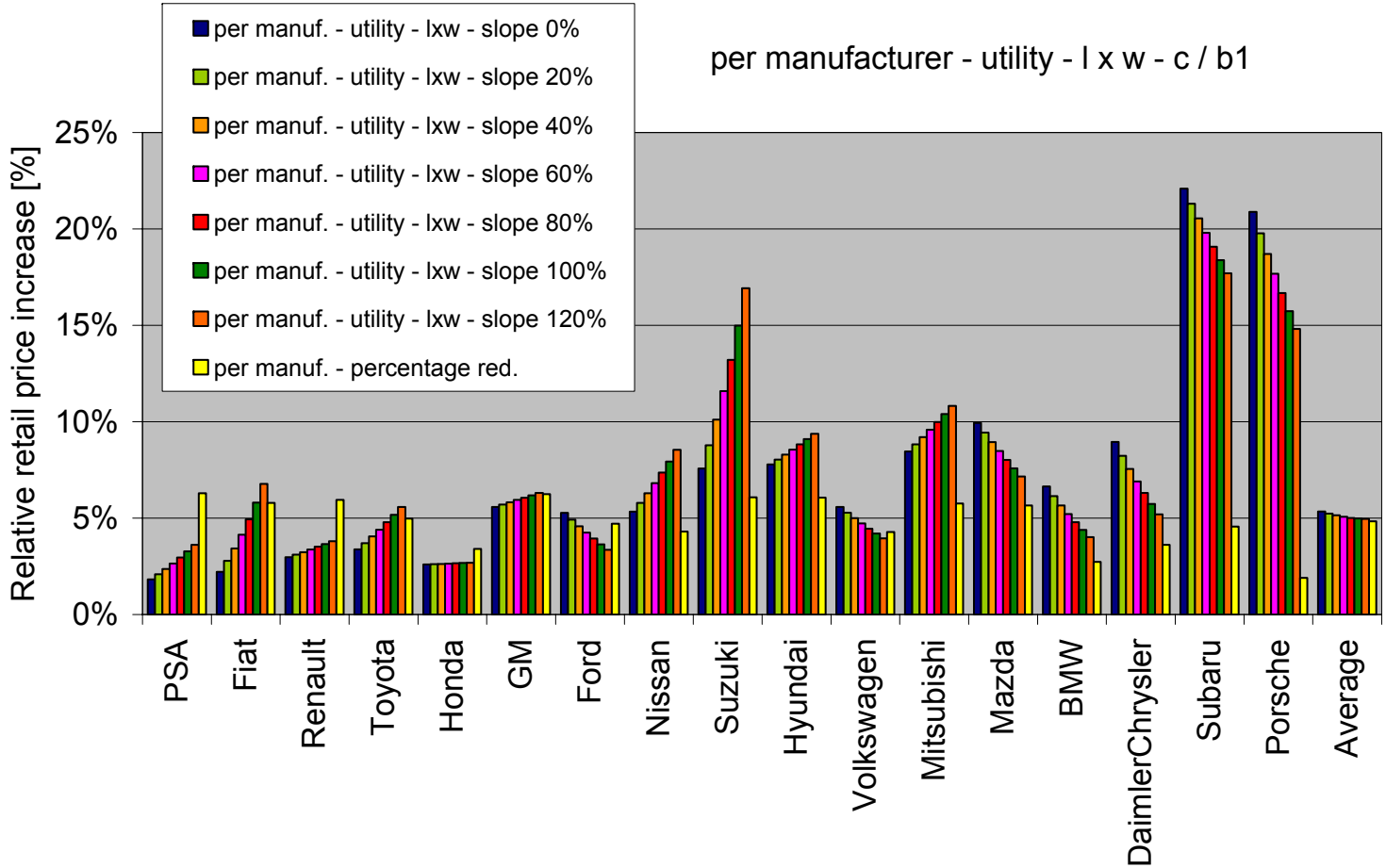

Option 1
Option 2 slope 20%
Option 2 slope 40%
Option 2 slope 60%
Option 2 slope 80%
Option 2 slope 100%
Option 2 slope 120%
Option 3
Relative retail price [%]
30%
25%
20%
15%
10%
5%
0%
PSA
Fiat
Renault
Toyota
Honda
GM
Ford
Nissan
Suzuki
Hyundai
Volkswagen
Mitsubishi
Mazda
BMW
DaimlerChrysler
Subaru
Porsche
Average

Figure 10 - Relative retail price increase at the manufacturer level for options 1, 2 (incl. variations) and 3, using footprint as utility (a) assuming 0% AMI and (b) assuming 0.82% AMI (without prejudice to the AMI level eventually chosen) and allowing fleet averaging (source supporting study)

(a)



(b)

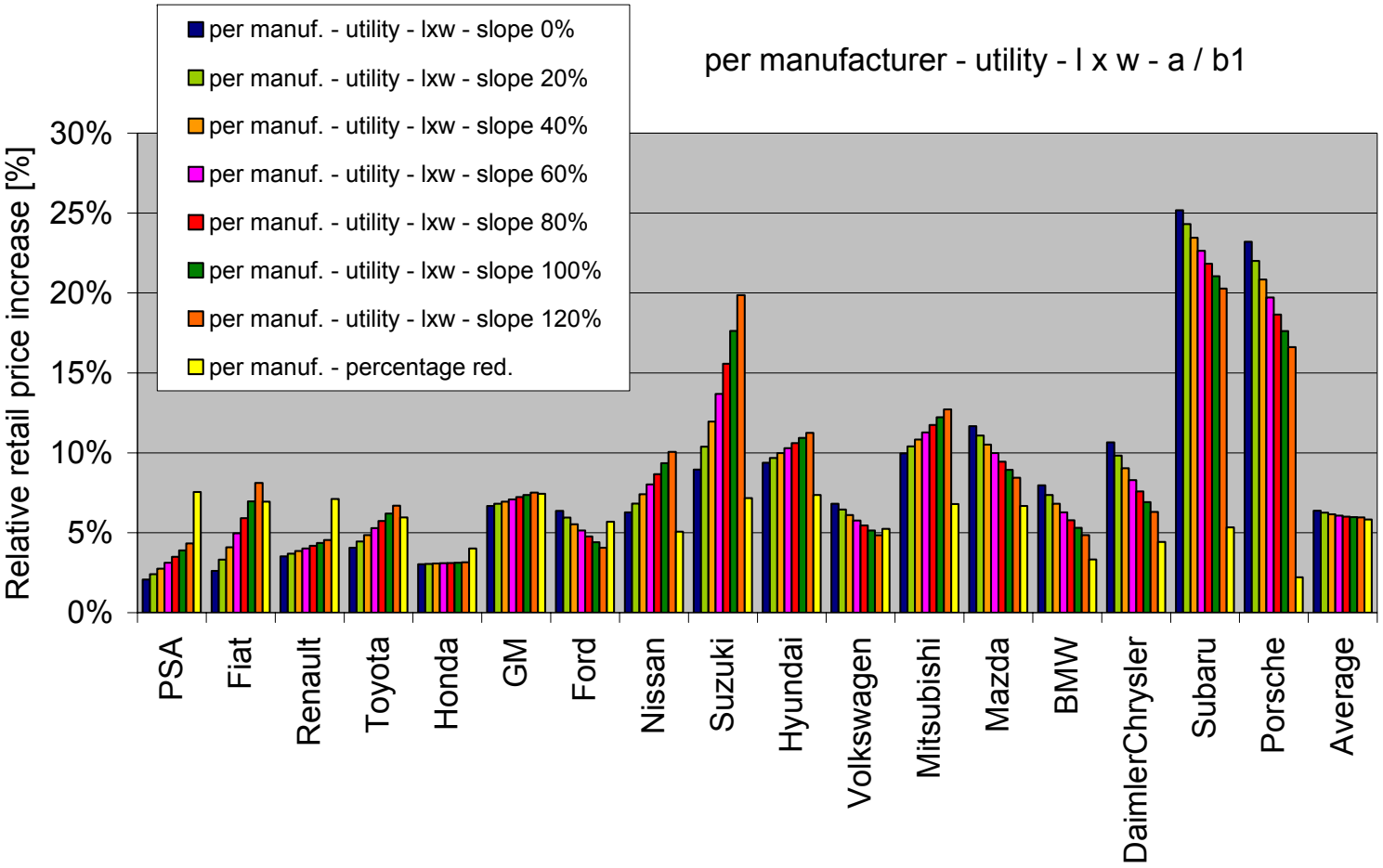
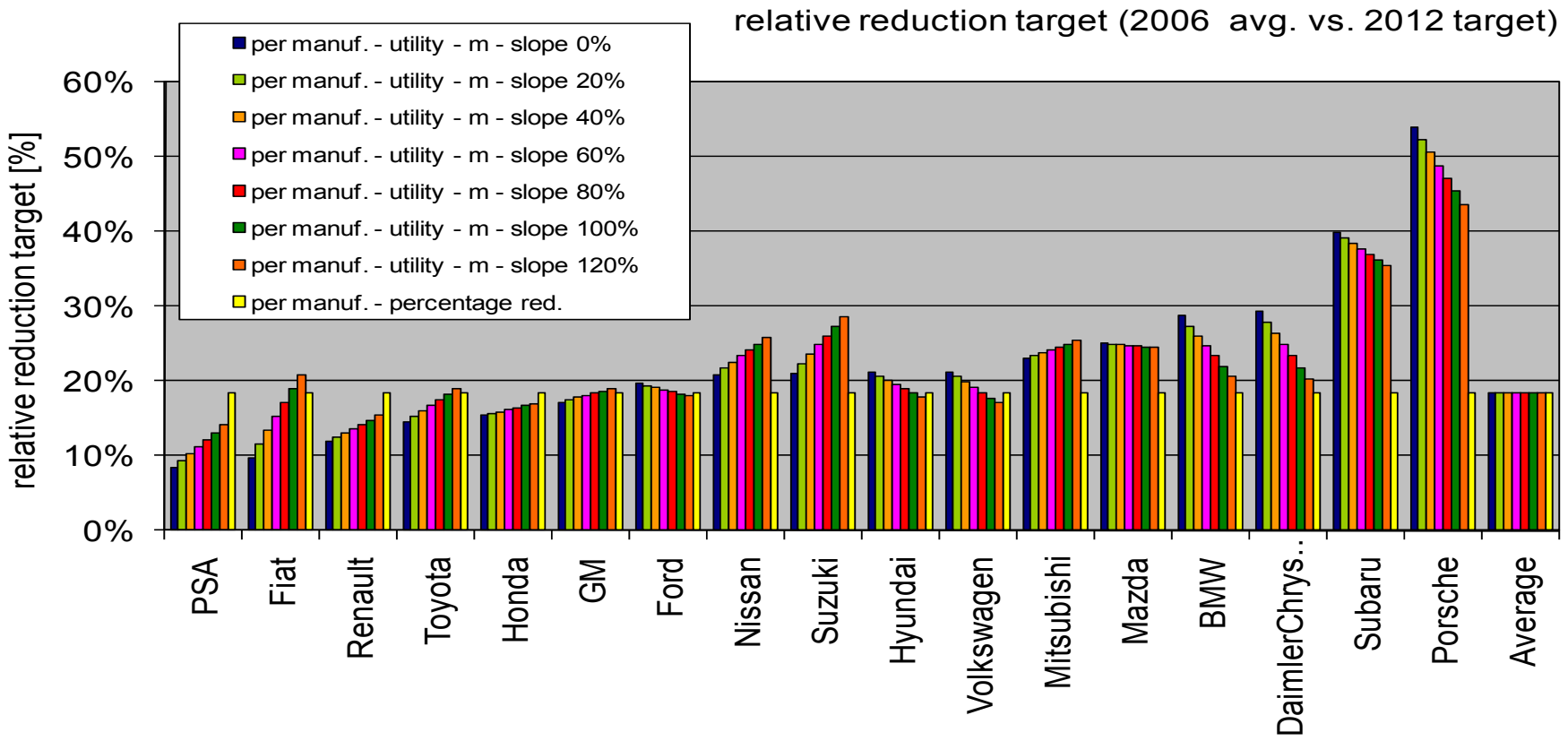

per manufacturer - utility - l x w - a / b1
per manuf. - utility - lxw - slope 0%
per manuf. - utility - lxw - slope 20%
per manuf. - utility - lxw - slope 40%
per manuf. - utility - lxw - slope 60%
per manuf. - utility - lxw - slope 80%
per manuf. - utility - lxw - slope 100%
per manuf. - utility - lxw - slope 120%
per manuf. - percentage red.
Relative retail price increase [%]
30%
25%
20%
15%
10%
5%
0%
PSA
Fiat
Renault
Toyota
Honda
GM
Ford
Nissan
Suzuki
Hyundai
Volkswagen
Mitsubishi
Mazda
BMW
DaimlerChrysler
Subaru
Porsche
Average

Figure 11 - Relative reduction target expressed as % of 2006 emissions using mass as utility (a) assuming 0% AMI and (b) assuming 0.82% AMI (without prejudice to the AMI level eventually chosen) and allowing fleet averaging (based on supporting study)

(a)



(b)

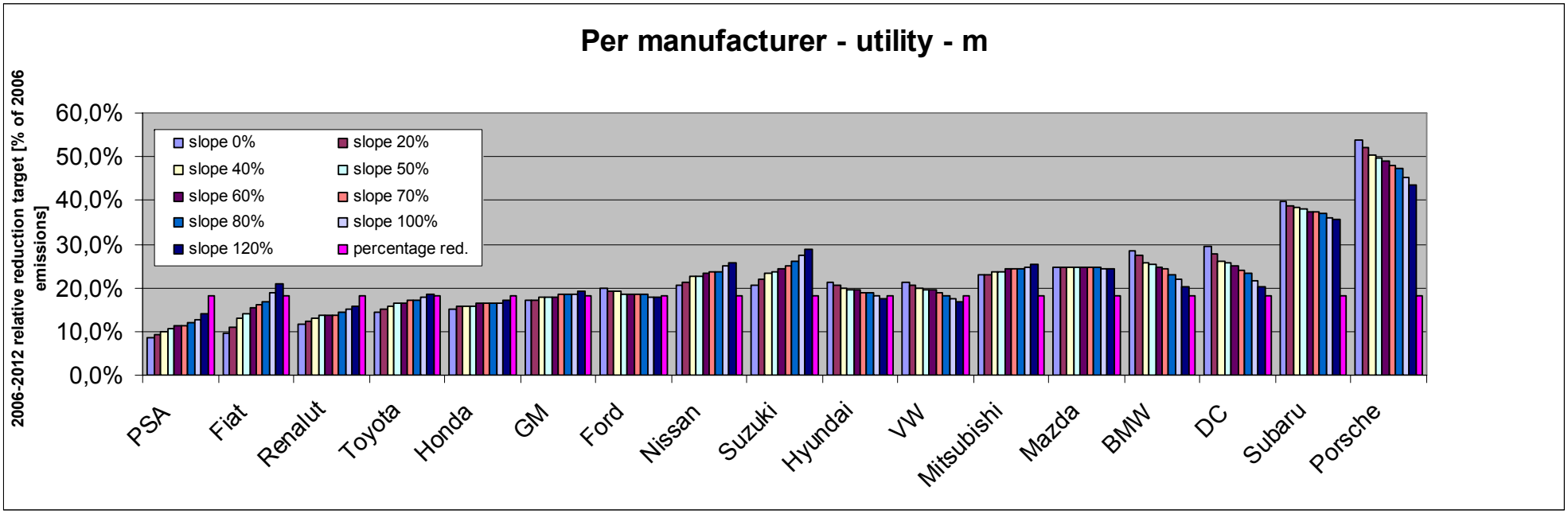
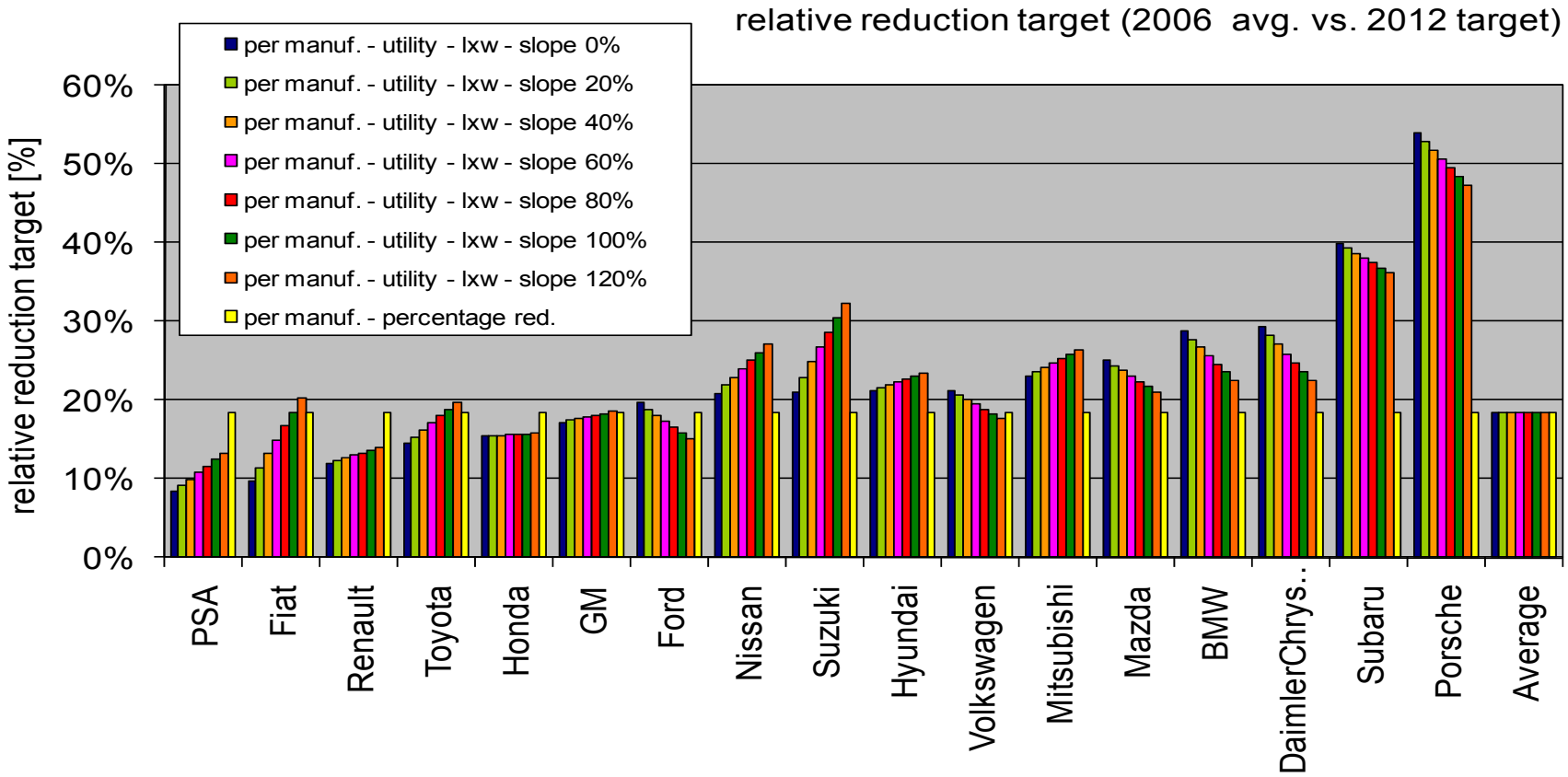

Per manufacturer - utility - m
2006-2012 relative reduction target [% of 2006 emissions]
60,0%
50,0%
40,0%
30,0%
20,0%
10,0%
0,0%
slope 0%
slope 20%
slope 40%
slope 50%
slope 60%
slope 70%
slope 80%
slope 100%
slope 120%
percentage red.
PSA
Fiat
Renalut
Toyota
Honda
GM
Ford
Nissan
Suzuki
Hyundai
VW
Mitsubishi
Mazda
BMW
DC
Subaru
Porsche

Figure 12 - Relative reduction target expressed as % of 2006 emissions using footprint as parameter (a) assuming 0% AMI and (b) assuming 0.82% AMI (without prejudice to the AMI level eventually chosen) and allowing fleet averaging (based on supporting study)

(a)



(b)

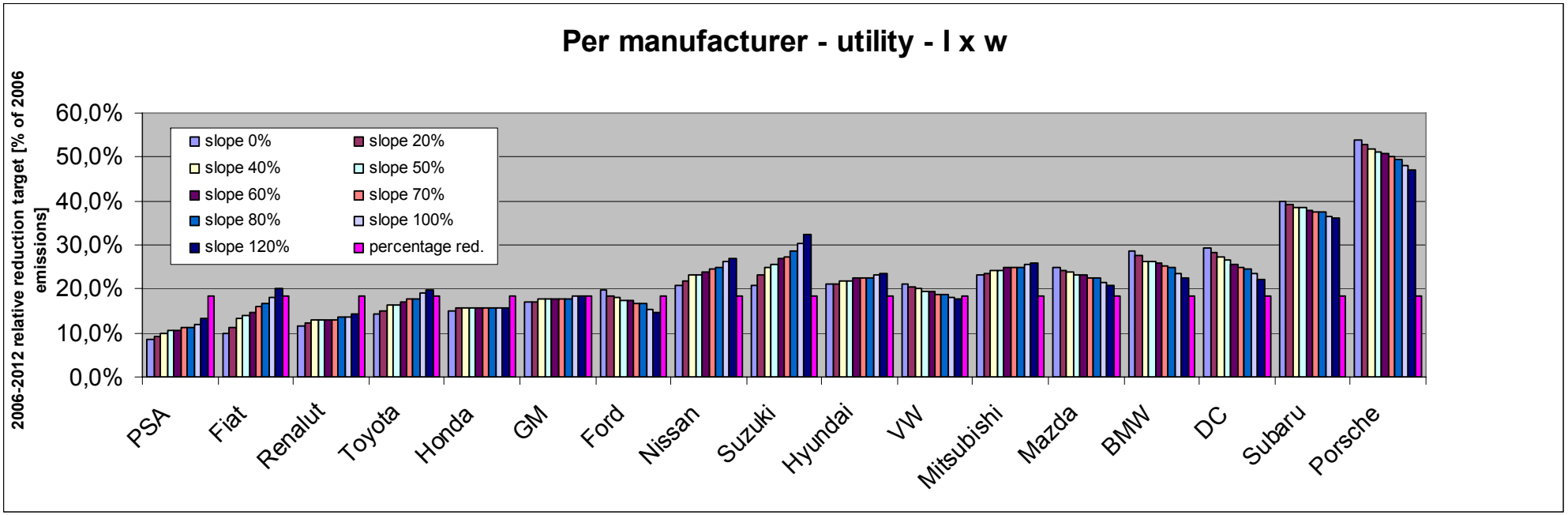
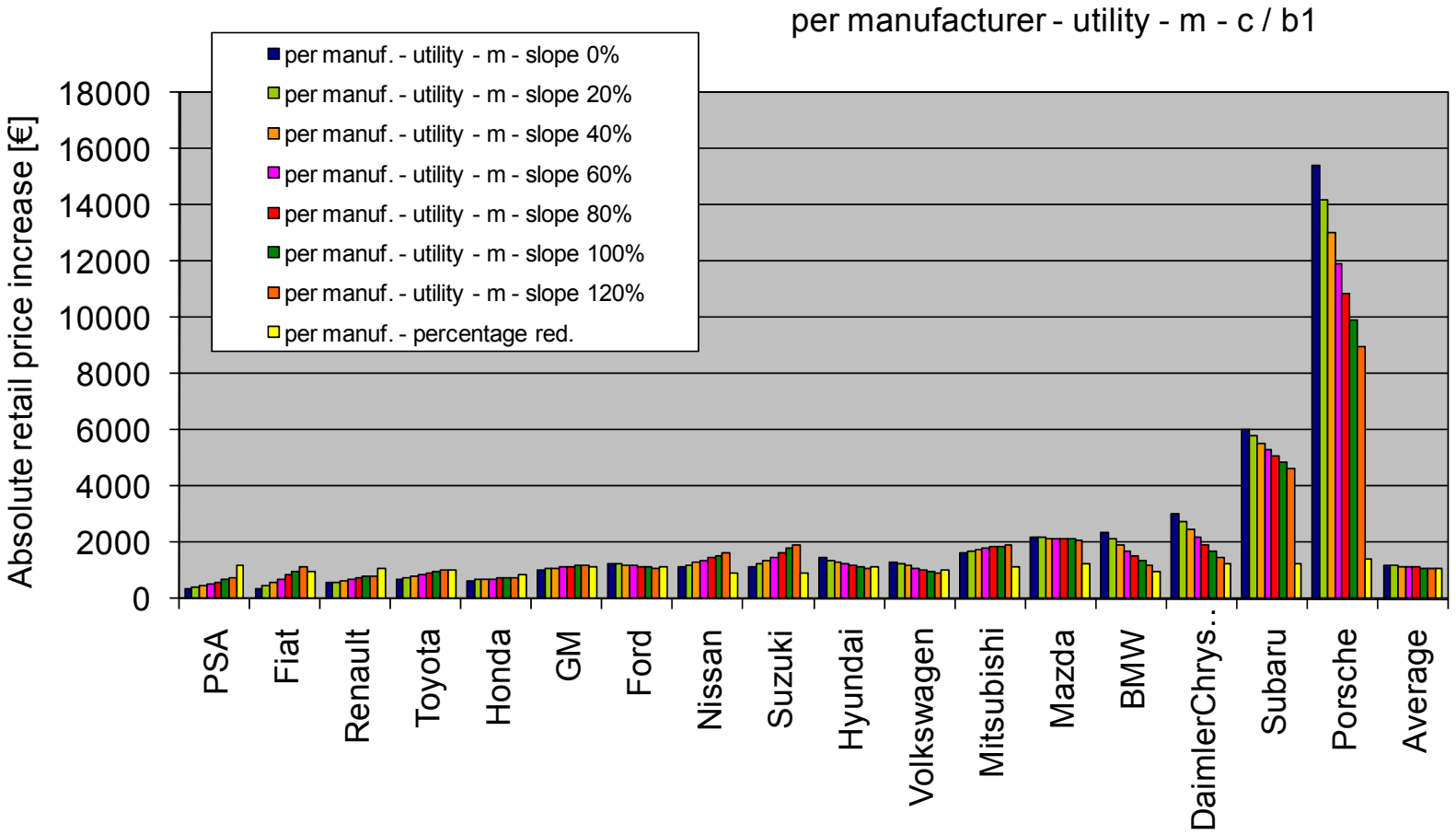

Per manufacturer - utility - l x w
2006-2012 relative reduction target [% of 2006 emissions]
60,0%
50,0%
40,0%
30,0%
20,0%
10,0%
0,0%
slope 0%
slope 20%
slope 40%
slope 50%
slope 60%
slope 70%
slope 80%
slope 100%
slope 120%
percentage red.
PSA
Fiat
Renalut
Toyota
Honda
GM
Ford
Nissan
Suzuki
Hyundai
VW
Mitsubishi
Mazda
BMW
DC
Subaru
Porsche

Figure 13 - Absolute retail price increase at the manufacturer level for options 1, 2 (incl. variations) and 3, using mass as utility (a) assuming 0% AMI and (b) assuming 0.82% AMI (without prejudice to the AMI level eventually chosen) and allowing fleet averaging (source supporting study)

(a)



(b)

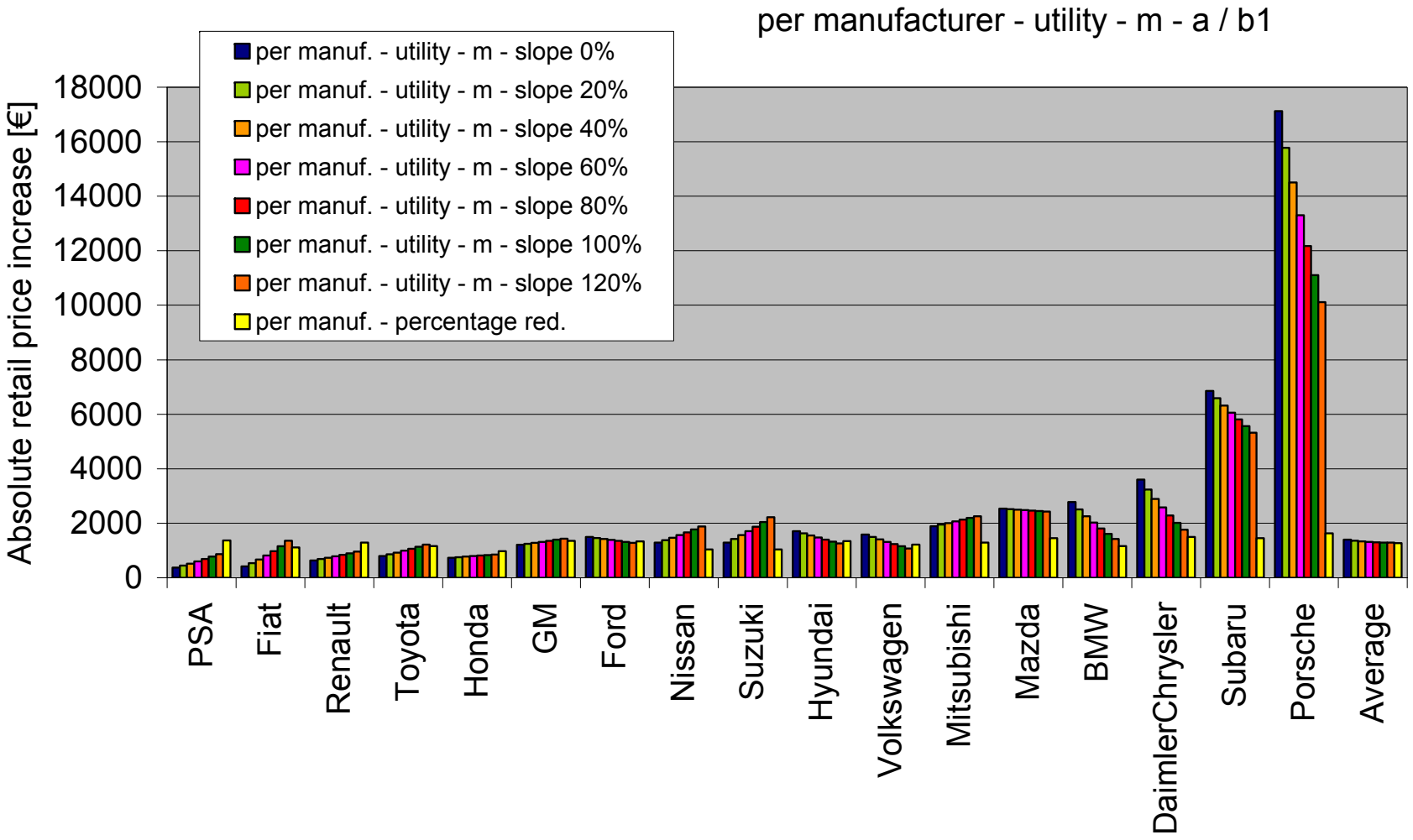
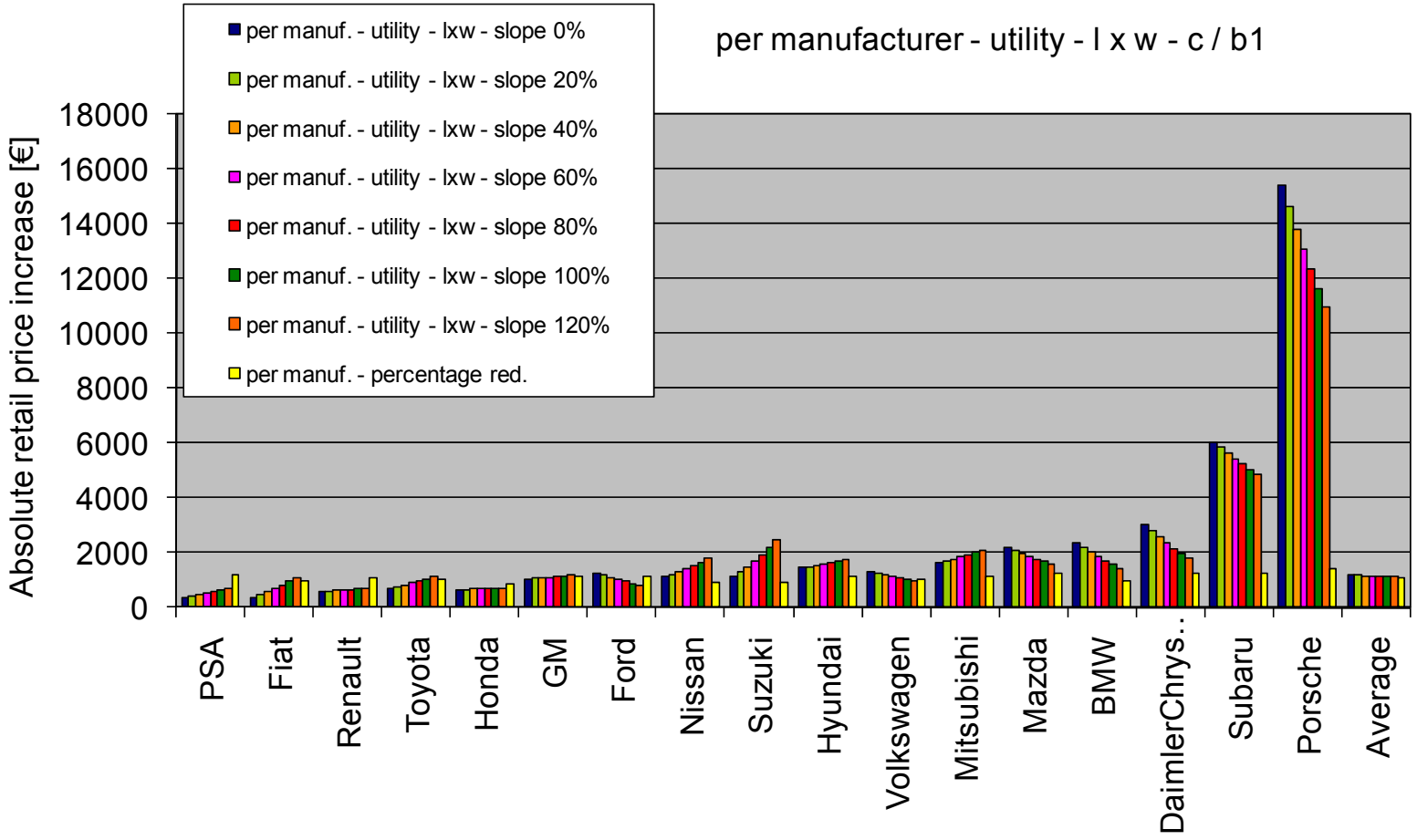

per manufacturer - utility - m - a / b1
per manuf. - utility - m - slope 0%
per manuf. - utility - m - slope 20%
per manuf. - utility - m - slope 40%
per manuf. - utility - m - slope 60%
per manuf. - utility - m - slope 80%
per manuf. - utility - m - slope 100%
per manuf. - utility - m - slope 120%
per manuf. - percentage red.
Absolute retail price increase [€]
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
PSA
Fiat
Renault
Toyota
Honda
GM
Ford
Nissan
Suzuki
Hyundai
Volkswagen
Mitsubishi
Mazda
BMW
DaimlerChrysler
Subaru
Porsche
Average

Figure 14 - Absolute retail price increase at the manufacturer level for options 1, 2 (incl. variations) and 3, using footprint as utility (a) assuming 0% AMI and (b) assuming 0.82% AMI (without prejudice to the AMI level eventually chosen) and allowing fleet averaging (source supporting study)

(a)



(b)

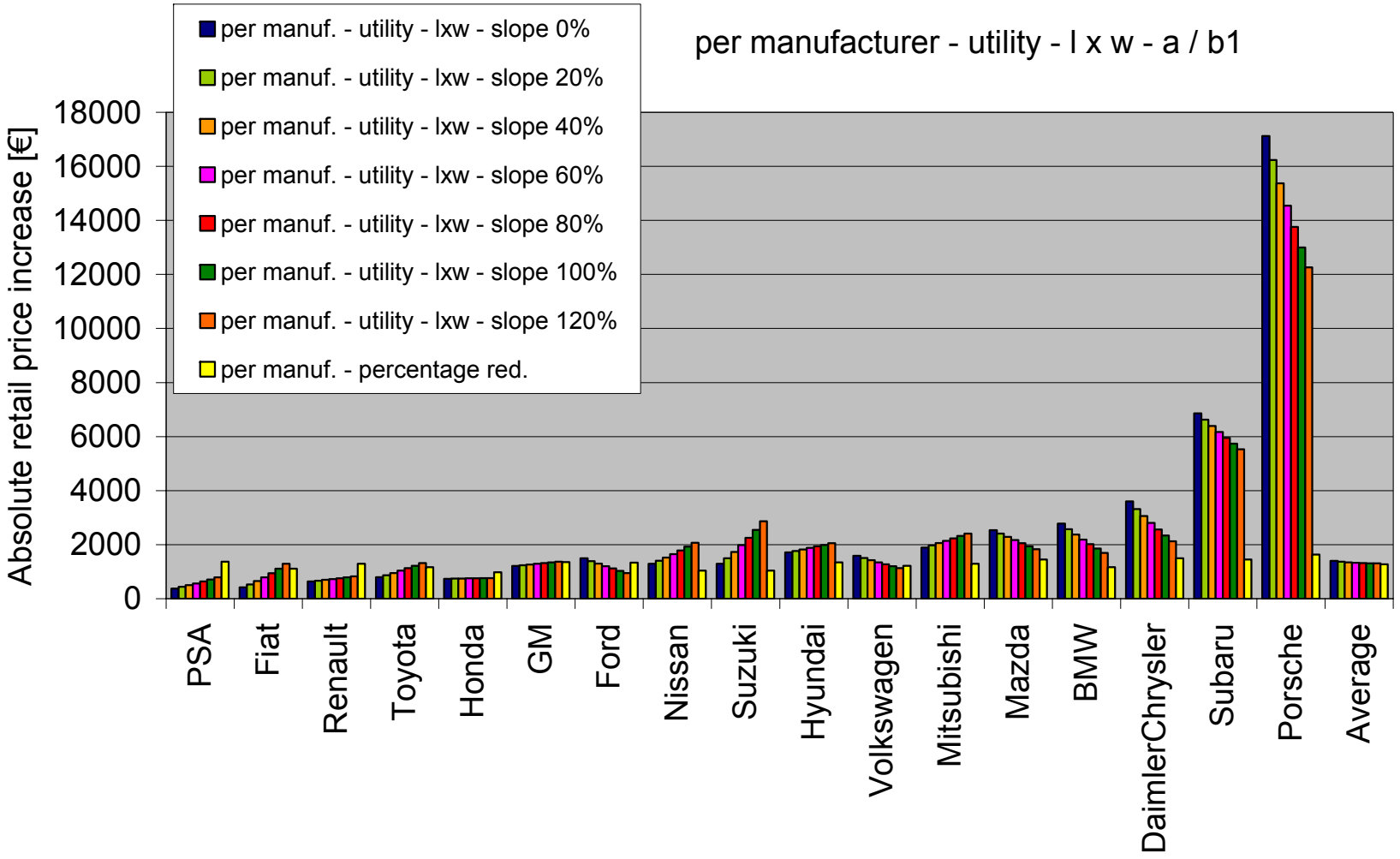
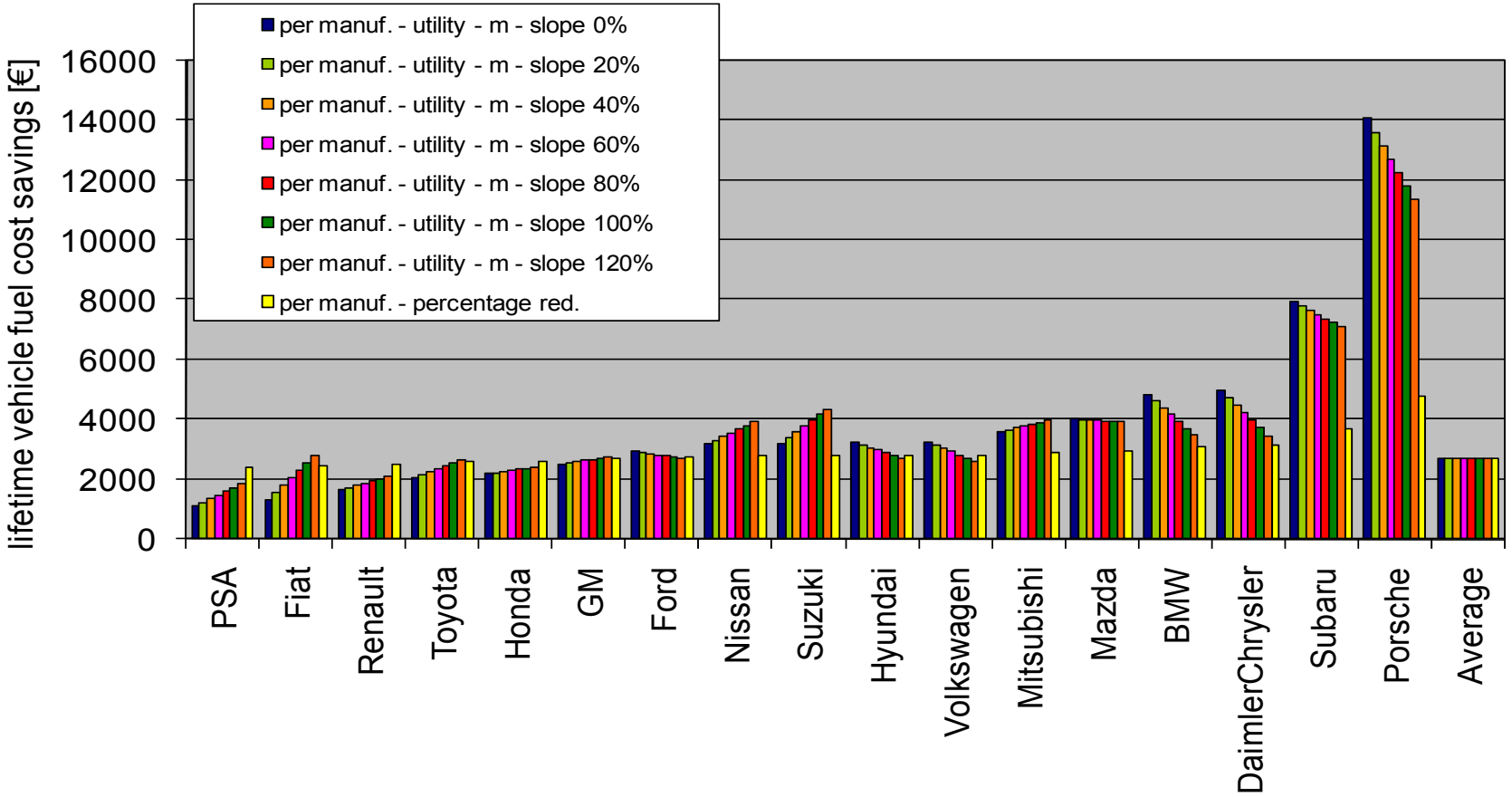

per manufacturer - utility - l x w - a / b1
per manuf. - utility - lxw - slope 0%
per manuf. - utility - lxw - slope 20%
per manuf. - utility - lxw - slope 40%
per manuf. - utility - lxw - slope 60%
per manuf. - utility - lxw - slope 80%
per manuf. - utility - lxw - slope 100%
per manuf. - utility - lxw - slope 120%
per manuf. - percentage red.
Absolute retail price increase [€]
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
PSA
Fiat
Renault
Toyota
Honda
GM
Ford
Nissan
Suzuki
Hyundai
Volkswagen
Mitsubishi
Mazda
BMW
DaimlerChrysler
Subaru
Porsche
Average

Figure 15 - Absolute fuel savings at the manufacturer level for options 1, 2 (incl. variations) and 3, using mass as utility (a) assuming 0% AMI and (b) assuming 0.82% AMI (without prejudice to the AMI level eventually chosen) and allowing fleet averaging (source supporting study with lifetime mileage of 208.000 km and 4% discount rate)

(a)



(b)

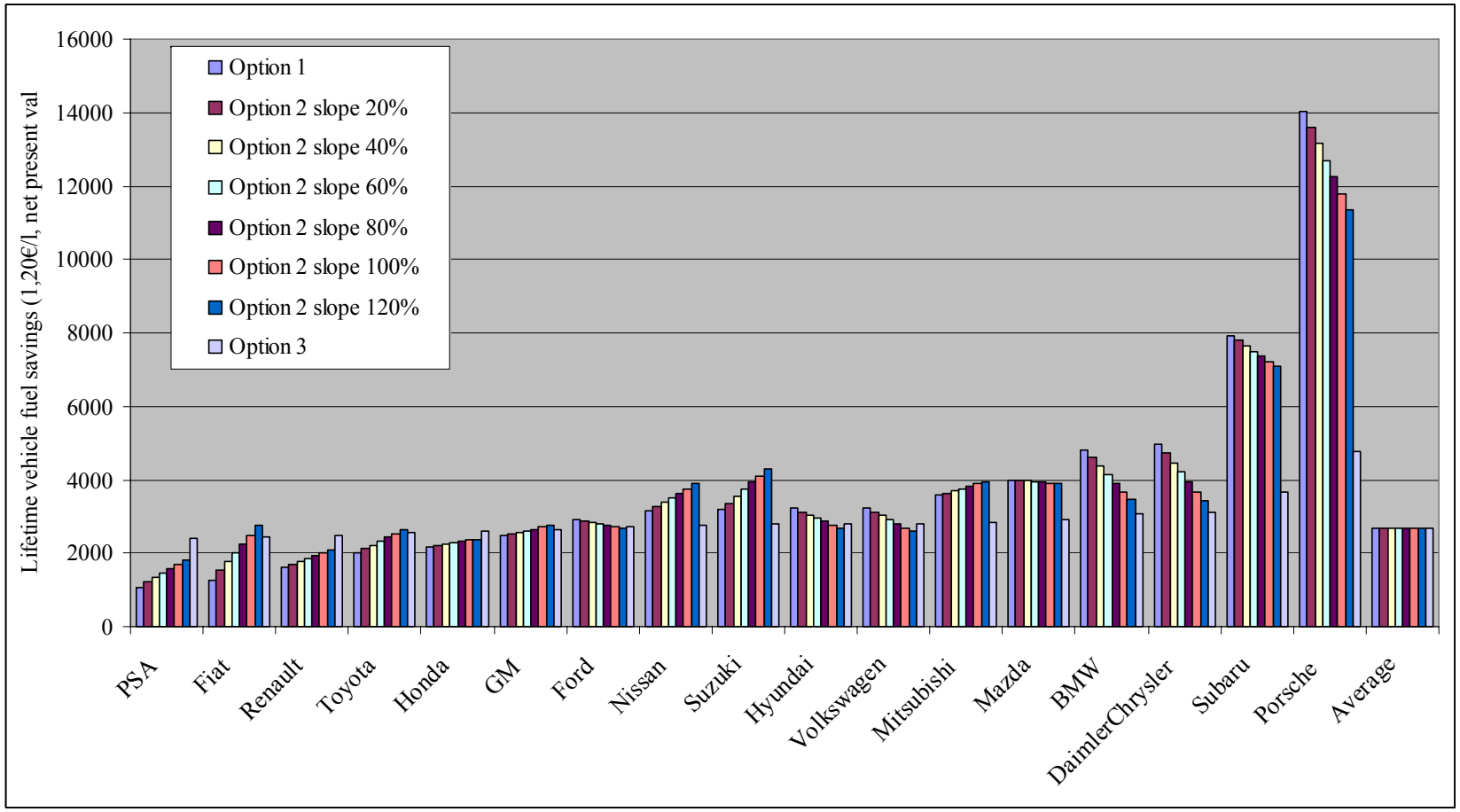
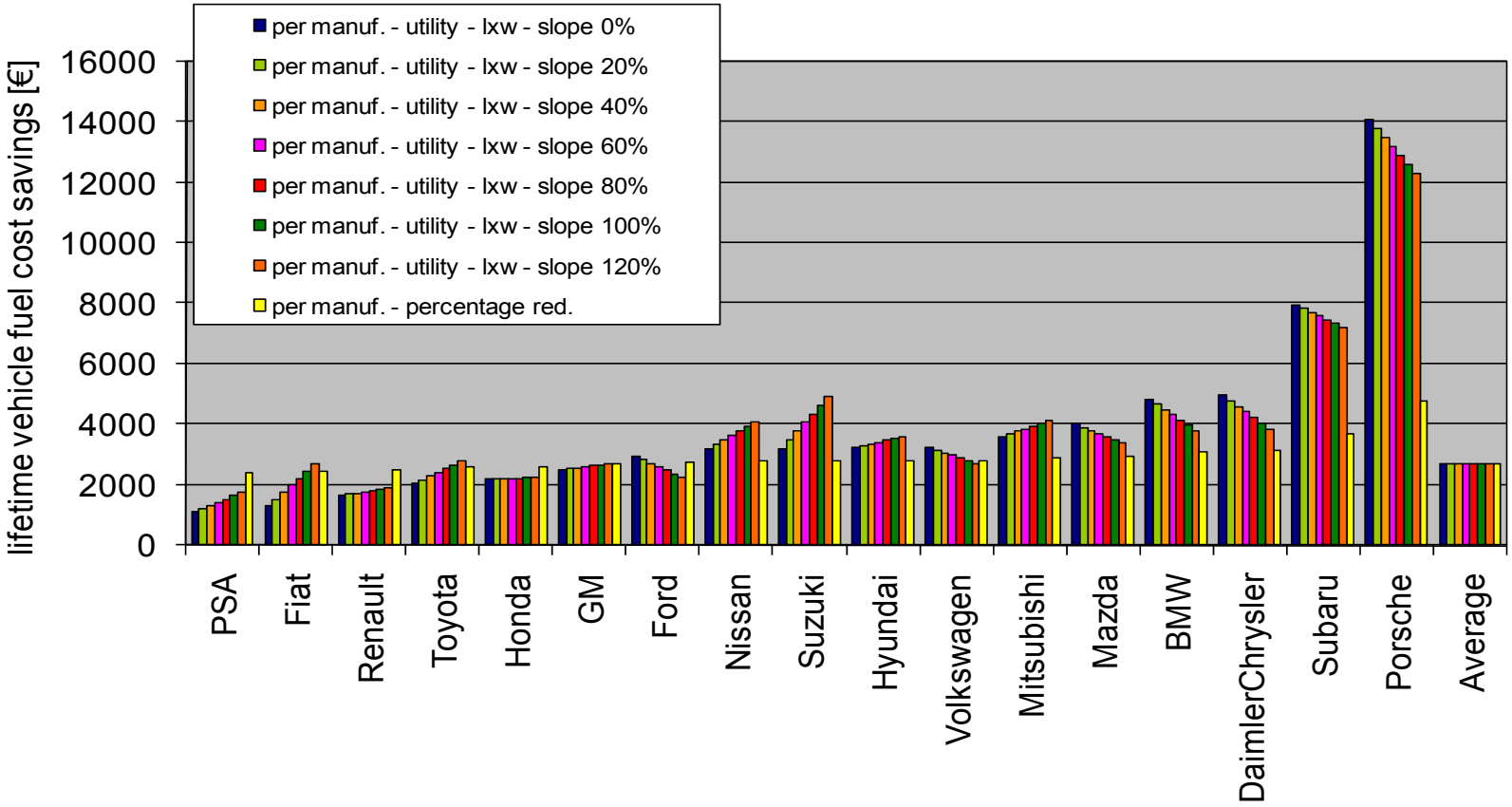
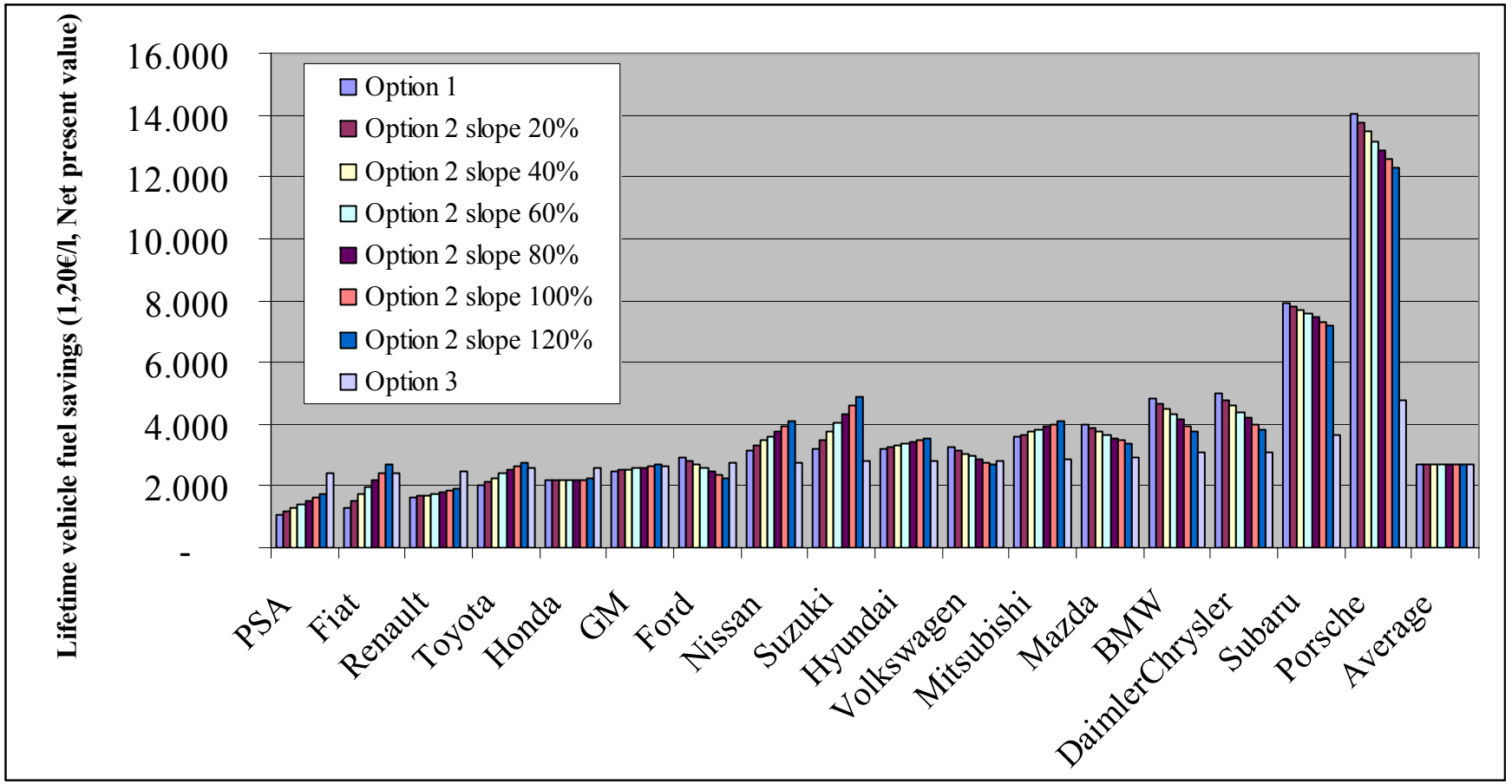

Lifetime vehicle fuel savings (1,20€/l, net present val
16000
14000
12000
10000
8000
6000
4000
2000
0
Option 1
Option 2 slope 20%
Option 2 slope 40%
Option 2 slope 60%
Option 2 slope 80%
Option 2 slope 100%
Option 2 slope 120%
Option 3
PSA
Fiat
Renault
Toyota
Honda
GM
Ford
Nissan
Suzuki
Hyundai
Volkswagen
Mitsubishi
Mazda
BMW
DaimlerChrysler
Subaru
Porsche
Average

Figure 16 - Absolute fuel savings at the manufacturer level for options 1, 2 (incl. variations) and 3, using footprint as utility (a) assuming 0% AMI and (b) assuming 0.82% AMI (without prejudice to the AMI level eventually chosen) and allowing fleet averaging (source supporting study with lifetime mileage of 208.000 km and 4% discount rate)

(a)



(b)


Lifetime vehicle fuel savings (1,20€/l, Net present value)
16.000
14.000
12.000
10.000
8.000
6.000
4.000
2.000
-
Option 1
Option 2 slope 20%
Option 2 slope 40%
Option 2 slope 60%
Option 2 slope 80%
Option 2 slope 100%
Option 2 slope 120%
Option 3
PSA
Fiat
Renault
Toyota
Honda
GM
Ford
Nissan
Suzuki
Hyundai
Volkswagen
Mitsubishi
Mazda
BMW
DaimlerChrysler
Subaru
Porsche
Average

5.2.4. Innovation and trade aspects

The possible effects of legislation on areas such as research and development and external trade should also be considered.

The automotive industry accounts for approximatively 20% of manufacturing R&D in Europe and is one of the most important R&D investors in Europe.

Table 4 - Top 20 industrial R&D investors in Europe, 2005

Rank	Company	ICB Sector	Country	R&D Investment 2005 €m
			Top 1000 Companies	**112 876,47**
			number of companies for calculation	*1000*
1	DaimlerChrysler	Automobiles & parts (335)	Germany	5 649,00
2	Siemens	Electrical components & equipment (2733)	Germany	5 155,00
3	GlaxoSmithKline	Pharmaceuticals (4577)	UK	4 564,13
4	Volkswagen	Automobiles & parts (335)	Germany	4 075,00
5	Sanofi-Aventis	Pharmaceuticals (4577)	France	4 044,00
6	Nokia	Telecommunications equipment (9578)	Finland	3 978,00
7	BMW	Automobiles & parts (335)	Germany	3 115,00
8	Robert Bosch	Automobiles & parts (335)	Germany	2 931,00
9	AstraZeneca	Pharmaceuticals (4577)	UK	2 864,51
10	Ericsson	Telecommunications equipment (9578)	Sweden	2 729,95
11	EADS	Aerospace & defence (271)	The Netherlands	2 367,00
12	Philips Electronics	Leisure goods (374)	The Netherlands	2 337,00
13	Renault	Automobiles & parts (335)	France	2 264,00
14	Peugeot (PSA)	Automobiles & parts (335)	France	2 151,00
15	BAE Systems	Aerospace & defence (271)	UK	2 108,88
16	Bayer	Chemicals (135)	Germany	1 886,00
17	Alcatel	Telecommunications equipment (9578)	France	1 792,00
18	Finmeccanica	Aerospace & defence (271)	Italy	1 746,00
19	Boehringer Ingelheim	Pharmaceuticals (4577)	Germany	1 360,00
20	Fiat	Automobiles & parts (335)	Italy	1 318,00

The 130 g CO2/km target as set out in earlier Communications provides the main stimulus for impacts in the area of **research**. The ambition level set out by the Commission can be expected to speed up the development and market introduction of more fuel efficient vehicles in the future. Although there are already technologies available to deliver the 130 g CO_2/km target by 2012, the entry into force of the legislation will promote further technological advances in this field, foster research and development and accelerate the market penetration of advanced combustion and power-train technologies as manufacturers seek to achieve scale production effects.

It is worth briefly considering whether the way in which the achievement of the target may affect particular technologies or segments of the market. It is not expected that there will be a strong shift in the segmentation of vehicles, at least in the short-term. It is probable that the proposed legislation will limit possible vehicle upsizing and that the design of cars will take vehicle mass into consideration significantly more than previously. The use of diesel technology has played an important role in past CO_2 reductions and it is expected that the diesel penetration rate will continue increasing in the short term. Other specific improvements are likely to include a speedier introduction of elements such as hybrid powertrains, stop-start systems and gasoline direct injection systems.

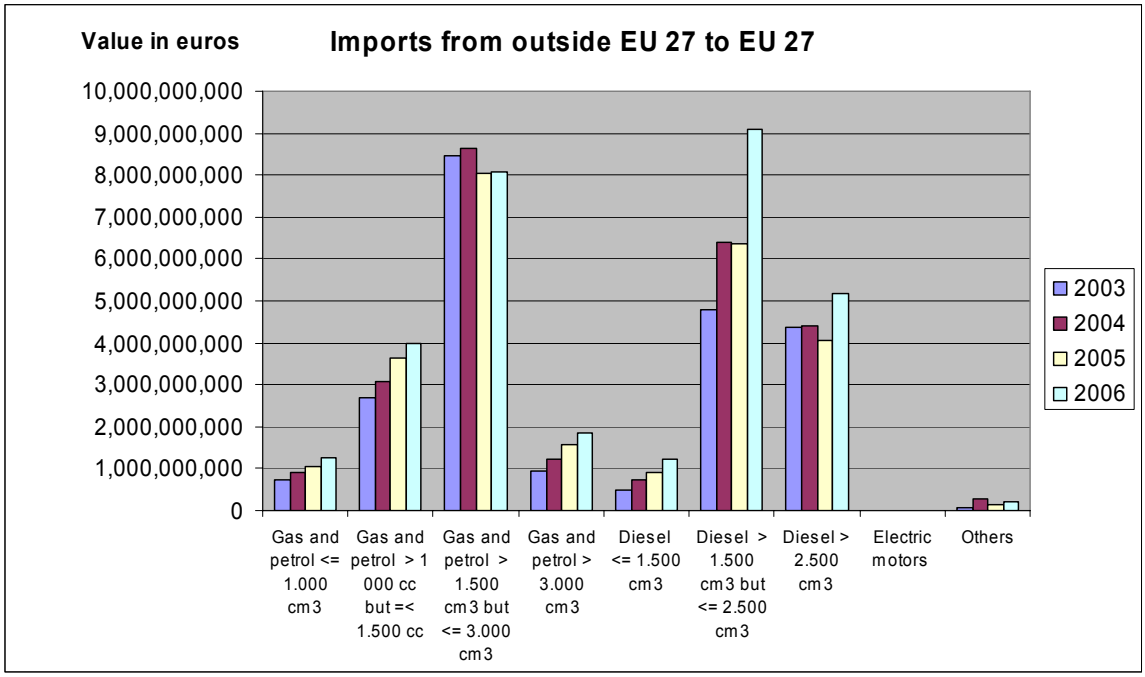
Automotive suppliers account for circa 2/3 of the final product and over 50% of research in this sector. Effective supply chain management is one of the key competitive advantages of the European industry while production of advanced components is an important strength of the European supply industry.

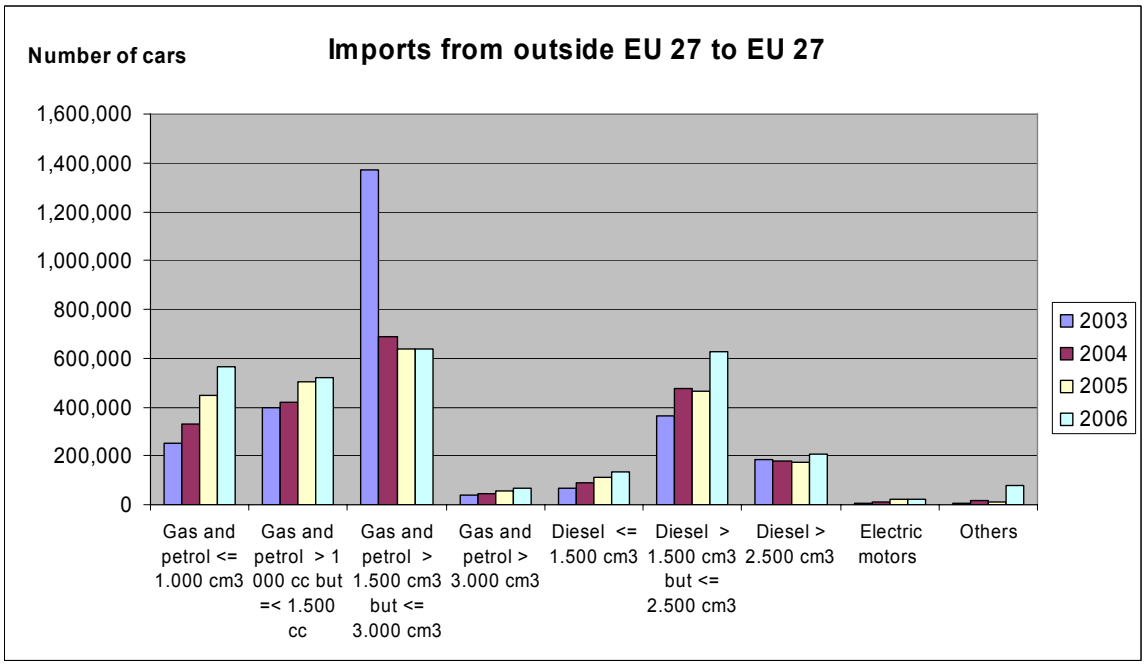
The worldwide demand for vehicles is set to grow significantly in the medium term with most of the global demand increases for vehicles projected to come from rapidly developing economies (e.g. China, India, Russia etc.). The 2004 Competitiveness Report also concludes that "*worldwide demands for safer and more environment-friendly vehicles will continue*" and that these demands will have a role in driving research and innovation. In the global perspective, research and innovation are seen as strengths of the European market and it is not likely that the above trends will have a damaging effect on the competitive position of EU manufacturers. As regards mature non-EU markets where EU manufacturers are already present (e.g. US, Canada), there is general trend towards the reinforcement of fuel efficiency/greenhouse gas emission standards. Because requirements on these markets are so far less ambitious than those in the EU, the proposed EU legislation will allow European carmakers to provide vehicles that are competitive and meet the reinforced standards to come into force in the coming years. As regards emerging car markets such as China, there is a growing recognition that ambitious fuel efficiency standards for light vehicles are needed if consumers in those countries are to be able to access mobility in an affordable and sustainable manner (in view notably of the reliance of those countries on energy imports).

On the other hand, 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 (to both vehicle and fuel prices) while the buyers of "mass market" vehicles tend to be very price-conscious, which suggests that significant added cost to mass-produced vehicles is unlikely to give European producers a competitive advantage in those segments. It should be noted, however, 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, which should reduce the scope of any disadvantage. On the other hand, it should also be noted that the competitive advantage which more fuel efficient vehicles could provide on mature markets is also likely to become more relevant in emerging markets with the passage of time and the creation of a larger middle-class customer base.

The automotive industry in Europe contributes nearly EUR 60 billion to the European **trade** balance and from the trade perspective it is worth assessing the role that the proposal may have on both the European market, which accounts for a major share of European manufacturers' sales, as well as on international markets from which most future demand growth is likely to come.

Figure 17 - Overview of the evolution of vehicle imports (in value and number of cars) into the EU-27

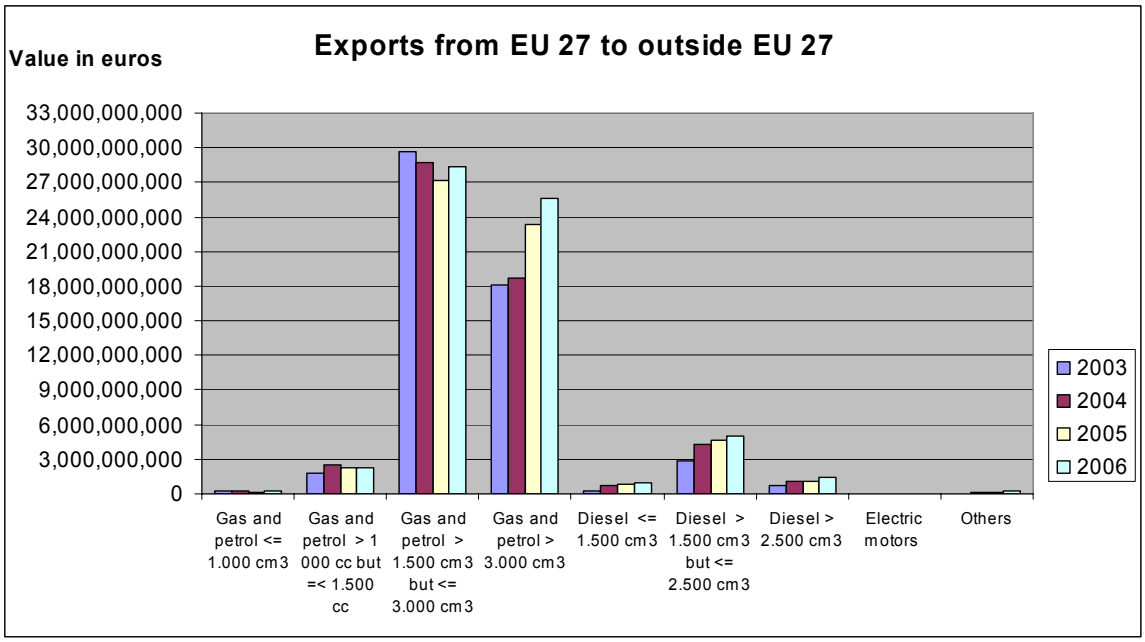


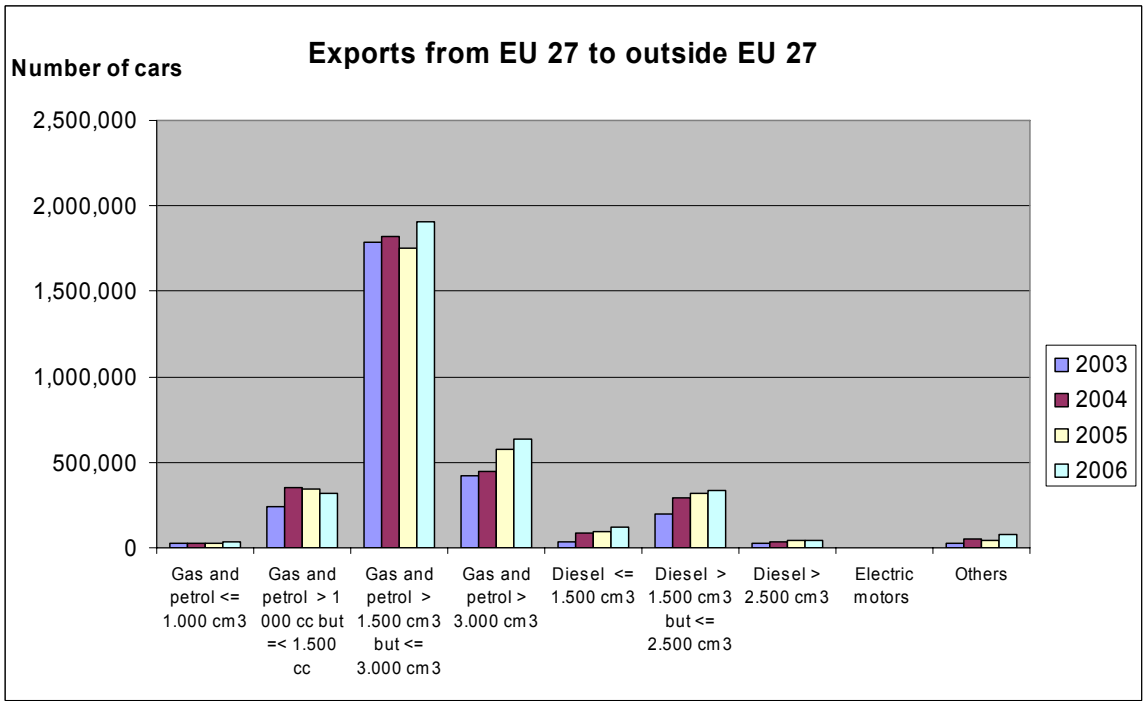


All manufacturers (from the EU and outside) will have to comply with the same legislative framework when placing cars on the European market. If the legislation distributes the burden of compliance relatively evenly (i.e. legislation is designed so as not to discriminate arbitrarily between two manufacturers in a similar position) there should in principle be no significant change in the competitive positions of those manufacturers who produce primarily in Europe and those who produce outside. In reality, however, the general competitive position of European manufacturers on the home market is likely to improve when compared to overseas manufacturers.

It can be argued that the recent EU enlargements will be an important driver of aggregate demand, as car ownership levels in the EU12 are currently relatively low and often met through second-hand car sales. Thus new car sales in EU12 are projected to increase, whereas the market in EU15 is mature and largely saturated. Owing to their strong position in manufacture and sales in EU12 as well as in EU-15, it is the manufacturers present on the European market that should be best placed to exploit this developing new car market.

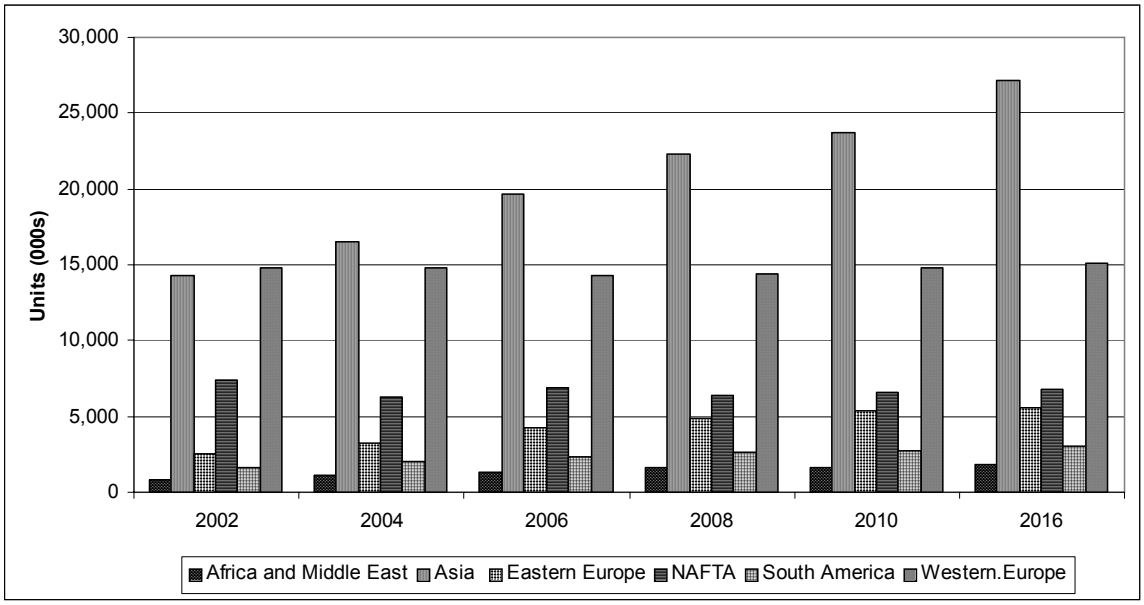
Figure 18 - Overview of the export position of the automotive industry in Europe (source Eurostat)





The graphs above suggest that Europe primarily exports medium and large petrol vehicles. This is mainly due 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. It would appear that exported vehicles are generally those with above-average CO_2 emissions and raise the question of whether the obligation to significantly reduce CO_2 could have an adverse effect on the ability of European manufacturers to maintain their export performance[25]. In the light of the price level reached by oil prices and the predicted increase in the number of vehicles globally (see Figure 19 below), it is difficult to conclude that the export ability of European industry would be significantly impaired as a consequence of CO_2 legislation despite the fact that purchasers of luxury cars tend to remain more insensitive to the price of fuel.

Figure 19 - Global production of passenger cars (2002 – 2005) and forecast of future passenger car production trends (2006 – 2016): Source: Global Insight



An important parameter in assessing the competitive position of EU manufacturers in other major markets is the size of their sales outside the EU. If a manufacturer has relatively low sales on non-EU markets then it is probably too expensive for that manufacturer to differentiate models for the different markets. On the other hand most global car makers already produce different models or different model versions for different markets.

Japanese brands completely dominate the Japanese markets, so it cannot be foreseen that a change in regulation will have a significant impact (positive or negative) on sales in this market, and hence on employment opportunities.

In contrast, however, the US market is more diverse. Home grown brands still dominate, but here the German brands hold the third-largest market share and US sales make an important contribution to their total sales and income. Specifically Porsche, BMW, Mercedes and to a lesser extent Volkswagen have large sales in the US, especially in the

[25] Obviously the EU CO_2 obligation would only apply to vehicles sold in EU27, not to vehicles built for export purposes

high end part of the market (with high margins), and this trend is not expected to change. The 2004 Competitiveness Report notes that demand in the domestic market also tends to translate into success abroad, in that purchasers of European cars in the US tend to be of significantly higher average income than buyers of Asian or American brands, reflecting the "luxury" status of many of the European cars sold there.

A further question, however, is whether selling more fuel efficient vehicles in e.g. California may give European carmakers a competitive advantage. It can be argued that fuel price rises in the US have damaged sales of the largest gas guzzling vehicles. This in turn has adversely affected the profitability of the three big US car makers, all of which are in serious financial difficulties, while Japanese and European manufacturers have benefited from the rise. Thus fuel economy has given imported models an important competitive advantage in recent years.

The Chinese market is growing rapidly, and some European manufacturers are already positioning themselves there. China is one of the countries that already has fuel economy standards owing to its concerns over oil imports. Already most European car models are capable of meeting future Chinese standards, and will in future have a competitive advantage over US companies, many of whom will have models not complying.

The Russian car market is also expanding. While much of the market in Russia is based on second-hand cars, the market for new cars is likely to increase, and European manufacturers will be well placed owing to their proximity and long land borders.

Although some manufacturers are present in other markets in South America, Middle East, Asia and Africa, the models sold in these markets are generally not as advanced as those sold in the EU (older models or older Euro-standard) and that these vehicles are usually assembled in local factories to reduce costs and be near the destination market. Furthermore these markets are still small compared with the others discussed above. In this case the CO_2 legislation for the EU market does not directly influence the competitive position of European manufacturers in these markets.

5.3. Social impacts

5.3.1. Employment aspects

In term of **supply and demand**, the net effect of a higher price of vehicles on employment in the EU is determined by the increase of the amount of labour within the EU per vehicle, due to the application of additional or more expensive components, and the change in vehicle sales, linked to the higher price and related fuel savings. The latter is determined by the price elasticity. The balance of these two elements is critical to the direct impacts on employment in the automotive sector.

The price elasticity for new car sales with regard to the price of new cars is a very specific type of elasticity. Precise values are not well known because data on the "real" price trend of new cars are difficult to derive, and other variables such as income are very important. In general, however, price elasticities for car ownership as function of fuel price, income etc. are between 0 and -1 (i.e. fairly inelastic), so that one can expect that this is also the case for price elasticity for new car sales with regard to the price of new cars. In that case, a 6% price increase (reflecting the average cost increase, which is valid

for all three options under consideration, and assuming a full pass-through to the consumer which gives the biggest price effect) will lead to less than 6% reduction in sales - i.e. the total value of sales will rise slightly. Therefore, lower vehicle sales within the EU will not necessarily lead to loss of jobs in the automobile industry within the EU, and could easily lead to a rise in direct employment depending on what share of extra costs were to go into extra labour. In either case, the direct impact seems likely to be relatively marginal.

In addition to volume considerations, the **upstream and downstream** impacts triggered by the upcoming legislation also need to be taken into account. The net effect for the society will not only be function of the impact on carmakers, but also on possible job creations in other sectors, in particular in the supply chain but also in other areas such as for example the development of public transport. As far as the supply chain is concerned, the automotive industry itself can be conceived as having four levels, although definitions vary slightly: Original Equipment Manufacturers (OEMs)[26], Tier 1 Suppliers[27], Tier 2 Suppliers[28] and Tier 3 Suppliers[29]. Suppliers play an increasing role in the value chain over time, often accounting for "the lion's share" of added value. In Germany, the share of manufacturers in total added value declined from 18% in 1995 to 12.1% in 2001 as a result of pressures of innovation and more sophisticated vehicle design, and similar declines were witnessed in most EU manufacturing countries. Increased vehicle value, e.g. through innovation in electronics, is cited as a key avenue for future growth in the supplier industry. This is a key possible growth area in relation to reducing CO_2, and Europe is well represented with specialist suppliers. Thus a focus on carmakers can mask the vital contribution of domestic upstream inputs to the industry, which is estimated to provide significantly more value added in addition to that which is added within the automotive industry itself. A further 25% of the added value is accounted for by imports to the EU – i.e. a further Euro is added elsewhere. Combining this with the calculation above, it seems clear that higher prices should produce a strong positive multiplier effect higher up the supply chain, and some at least of this should be translated into extra employment.

However, the following considerations should be borne in mind in the context of the present proposal:

- The main challenge in achieving the 130 g/km target is not related to the need to introduce revolutionary new technologies but rather to the cost of proliferating already available technologies throughout large parts of the fleet. Consequently, it is not expected that this proposal will create a dramatic technological shift leading to numerous components becoming obsolete. It is usually via redesign, addition and integration that environmental improvements are brought into vehicles.

- During the stakeholder consultation process, representatives of component suppliers were significantly more optimistic about the introduction of the 130 g/km target than

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26 major manufacturers

27 work closely with manufacturers to deliver major component elements of the vehicle, such as drive train assemblies. They in turn purchase components from Tier 2 and Tier 3 suppliers

28 manufacture minor subassemblies that are supplied to and assembled by the Tier 1 suppliers

29 supply the raw materials to the component manufacturers

vehicle manufacturers themselves due to the fact that they see it as creating new potential opportunities to market high-value added, innovative technologies.

- 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[30]. As discussed above, however, reasons for this process are mainly not related to increased environmental requirements.

For all three options under consideration, if the cars on the European market become on average 6% more expensive compared to 2006, the additional costs to manufacturers are built up from material costs for own production of CO_2 reducing technologies and purchase costs for components purchased from suppliers, tooling costs and labour costs. Tooling costs and purchase costs are again built up from the same three costs types but then at the level of suppliers. Overall therefore a large share of the additional costs can be translated into labour costs. Remaining costs are costs of materials and components imported from outside the EU. Except maybe for electric motors and batteries used in hybrids the share of these import costs is expected to be limited.

Downstream services also comprise a very substantial component of the automotive industry as a whole, as they are required throughout the lifetime of a vehicle. These include accessories and spare parts, repairs and maintenance, in-service testing, fuel and other consumable supplies, finance and insurance, etc. In the context of the upcoming legislation, improved fuel consumption would lead to a decrease in the aggregate demand for fuel. Against this, higher prices could lead to an increase in turnover for finance and insurance industries, while the use of more complex technologies could lead to more activities in relation to parts and maintenance.

In a global market, relocation of manufacturing capacity outside Europe in response to higher costs could be a concern from the employment perspective. However, car manufacturers tend to locate new production facilities on the markets for which the vehicles are destined (Figure 20). Besides, the fact that all manufacturers, domestic and foreign will have to respect the legislation will further limit its competitiveness impacts. Finally, the 2004 Competitiveness Report[31] reflects evidence that when German automotive suppliers sought new manufacturing locations during the 1997-2002, only 17.3% of new sites were in Germany, but 60% remained within the EU. Of the

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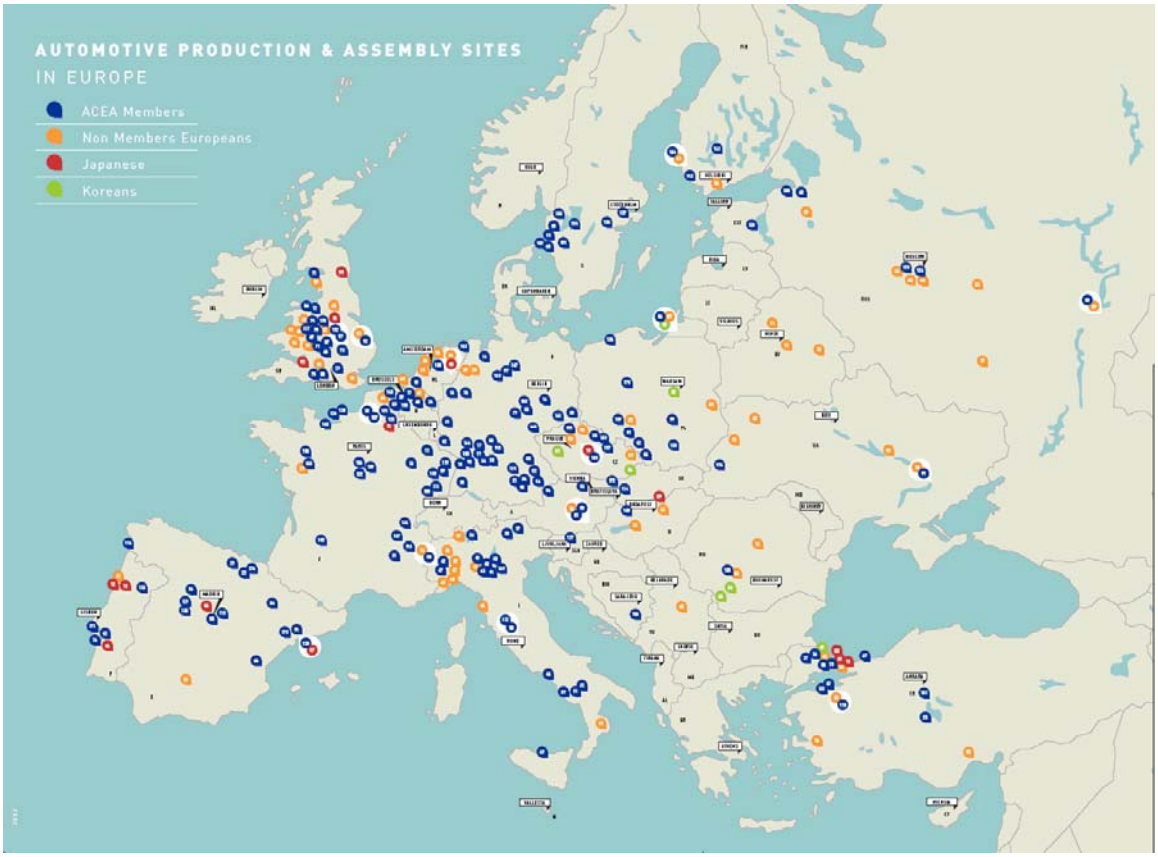
30 A study by Mercer Management Consulting and Fraunhofer Gesellschaft foresees that despite the expected substantial expansion in production and added value in the industry, the number of independent component manufacturers worldwide will decrease from 5,600 in 2000 to 2,800 in 2015

31 SEC(2004) 1397, 8.11.2004

remainder, South America was the most favoured choice, followed by the US and Asia[32]. Although legislation is among many factors which impact manufacturers' and suppliers' production location decisions, it could be argued that there is an increased likelihood that advanced component production for fuel efficient vehicles would continue to be European-based. It could also act as an inhibiting factor to the relocation of parts of the supply chain out of Europe. As part of the public consultation, trade unions have shown support for ambitious CO_2 reductions in the automotive sector as part of an overall energy efficient industrial policy, and provided all vehicle types/manufacturers would be subject to requirements recognising the diversity of the market and the need to maintain car manufacturers competitiveness.

Figure 20 - Automotive production locations on the European continent - Source: European Automobile Manufacturers Association (ACEA)



In terms of competitiveness impacts and related employment effects, the three options under consideration have different impacts upon the average costs of the various manufacturers. Depending on how these costs will be passed on to consumers, this could have an impact on the sales or profitability of the manufacturers, and there could be "winners" and "losers". While such effects will be limited by the achievement of the operational objectives listed in Section 3.1, in a first approximation it can be expected that aggregate employment levels should not be affected if some sales switch from one manufacturer to the other. More important impacts could be felt if either the total volume

[32] but sites outside of the EU were chosen for the purpose of selling cars in the EU with cheaper production costs, but rather to have production nearer the market targeted

of sales changes significantly or if European manufacturers as a whole lose out significantly to third country manufacturers in terms of future sales. The analysis of the three options at the manufacturer level does not point towards such a worst case scenario.

5.3.2. Social aspects: social equity and distributional effects within the fleet

One of the specific objectives set by the Commission in preparing the legislation is to design the legislative instrument on the basis of targets that are "*socially equitable*".

The comparison of figures Figure 13 and Figure 15 (Figure 14 and Figure 16 respectively) show that overall, the retail price increase of vehicles will be more than compensated by the fuel savings (net present value) over the lifetime of the vehicle. However, in view of consumer purchasing patterns (i.e. how far consumers take life-time operating costs into account when buying a car, which is further complicated by the fact that many buyers do not own the same vehicle throughout its lifetime), there also needs to be an analysis of the affordability of the measures i.e. can people who will benefit from the fuel savings afford to buy the vehicle in the first place.

At the vehicle level, the assumption that manufacturers will fully apply fleet averaging to deliver the CO_2 savings required leads to lower retail price increases for large petrol vehicles than for small petrol vehicles (because these vehicles, and in particular small and medium ones, are the vehicles that present the most cost-effective solutions for overall CO_2 reductions). For **Option 1**, the relative retail price increase for small vehicles is about the same as that for large vehicles, but still larger than that for medium-sized vehicles. Obviously this raises affordability concerns and it can be expected that manufacturers will seek a middle ground between a full fleet averaging (i.e. equalisation of marginal abatement costs across all segments) and an approach based on vehicles only. While it is not possible to assess to what extent manufacturers will cross subsidise the CO_2 reductions amongst segments, an analysis at the vehicle level has been carried out in the supporting study for the three options under consideration assuming that reductions would need to be delivered at the segment level (i.e. no fleet averaging). In this case (see Figure 21 and Figure 22), relative retail price increases are smaller for small petrol vehicles than for larger petrol vehicles for **Option 1** and for **Option 2**[33] for slopes up to 60% (both for mass and footprint). For diesel vehicles this condition is met for **Option 1** and for **Option 2** with inclinations up to 120%, with cost increases more pronounced with vehicle size class for the lower slope values.

Figure 21 - Relative retail price increase per segment for utility based limits applied per car for mass and AMI=0.82% (source supporting study)

[33] As explained in Section 0, Option 3 cannot be applied at the vehicle level

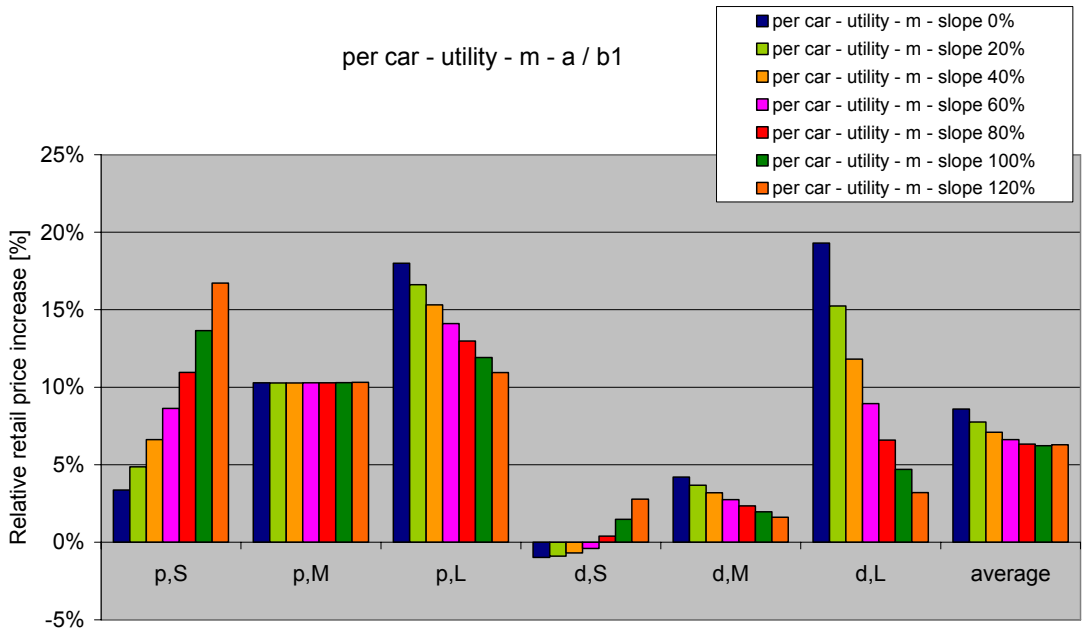
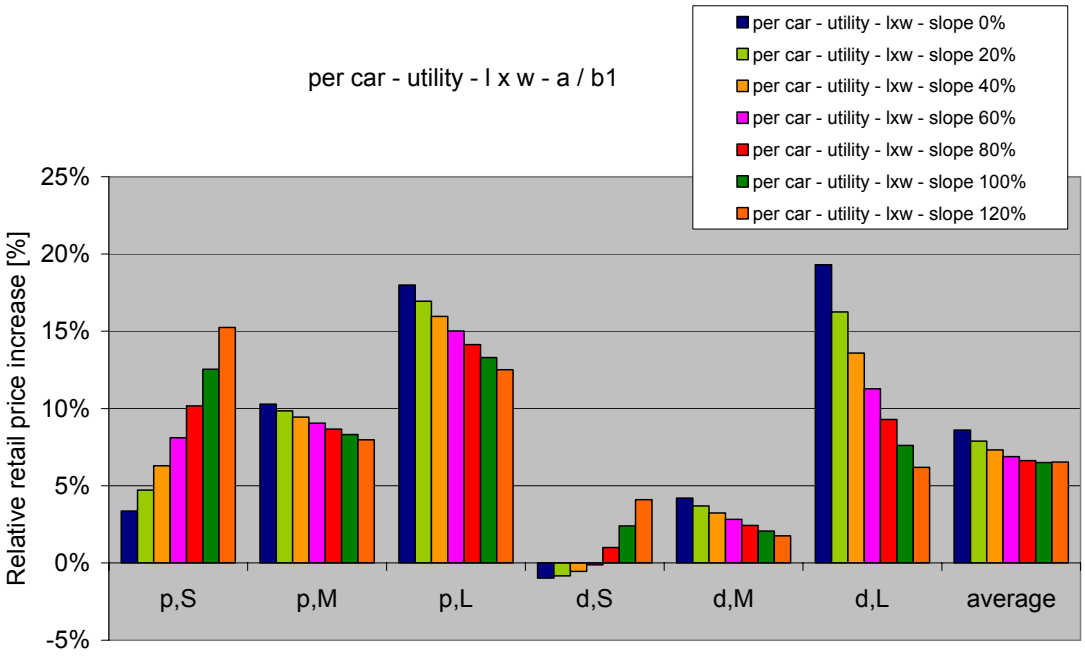


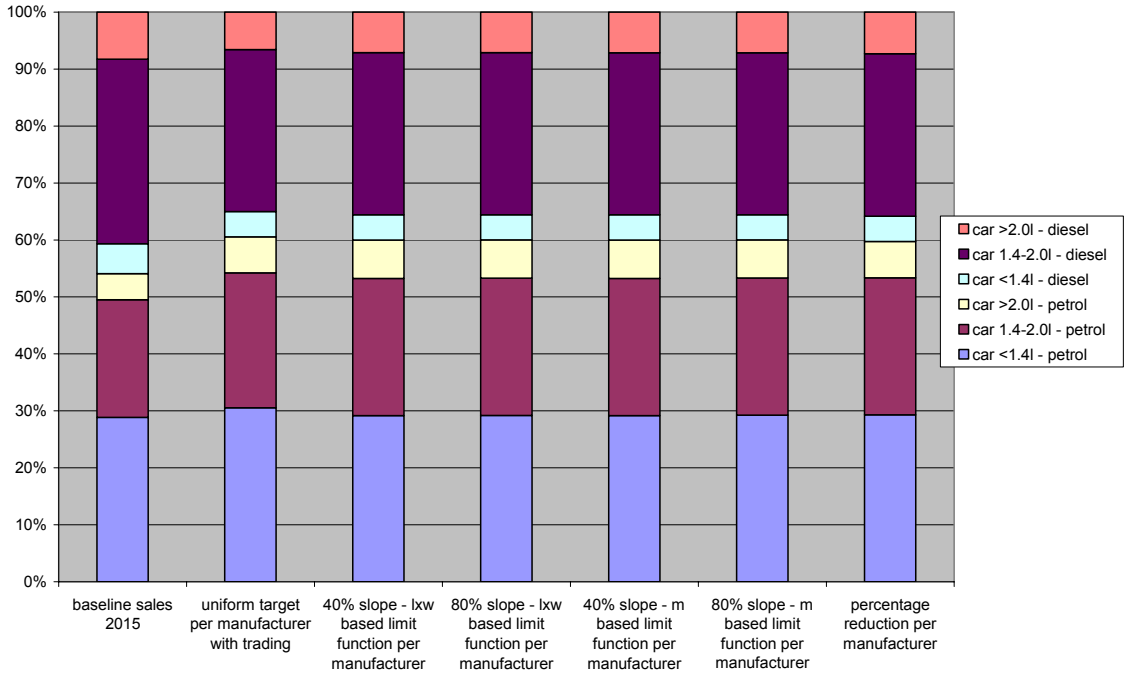
Figure 22 - Relative retail price increase per segment for utility based limits applied per car for footprint and AMI=0.82% (source supporting study)



As a result the changes in the structure of the sales by fuel type and size could potentially be more substantial. Sales of diesel cars would decrease, while sales of medium and large petrol cars would increase, in all scenarios. Again this is explained by the findings of the supporting study, which point to the higher potential for cost-effective CO_2 savings on petrol cars. Consequently, the expected fuel savings will be larger for petrol cars. Depending on the extent to which such savings are taken into consideration by

consumers, this could increase the demand for petrol vehicles. Sales of small petrol cars would increase in **Option 1**, and slightly decrease in **Options 2 and 3** (see Figure 23**)**.

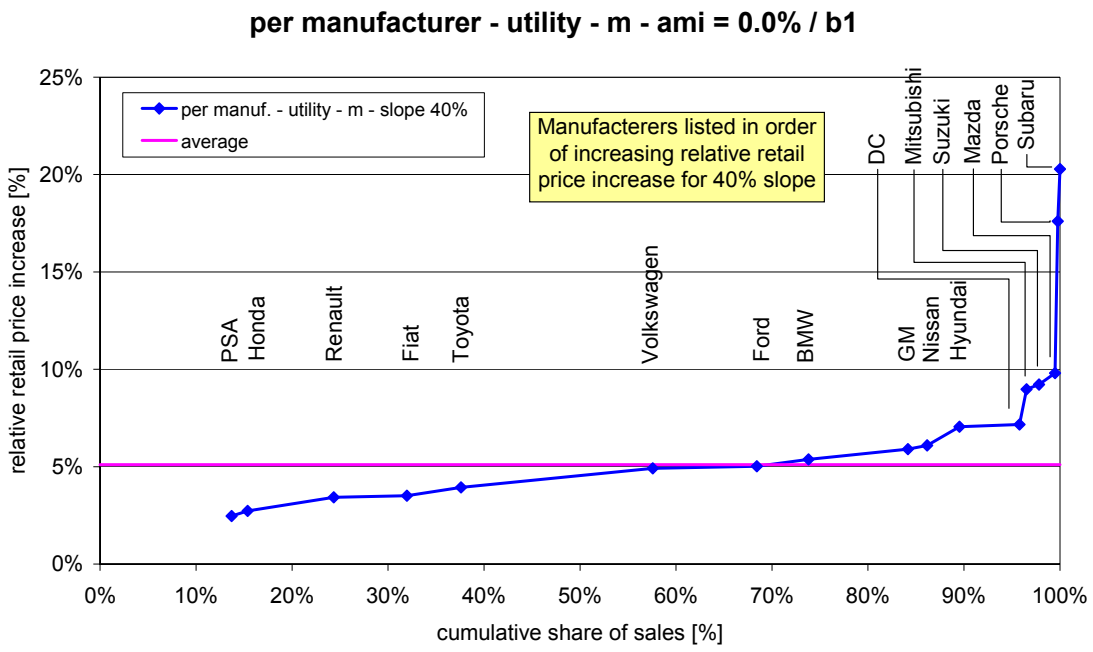
Figure 23 - Impact on Passenger Cars sales, 2015 (source TREMOVE)



Furthermore, at the manufacturer level, the supporting study has concluded that for **Option 2** (both for mass and footprint, and for 40% and 80% inclinations), around 80% or more of the vehicles sold in Europe would be exposed to an average relative retail price increase per manufacturer that was below or around the average value – see Figure 24. Due to modelling limitations, it was not possible to assess whether this conclusion was valid for the 80% most sold vehicle models in Europe. For the 40% inclination, the 80% market share at the manufacturer level includes all European "mainstream" manufacturers (PSA, Renault, Fiat, Ford, Volkswagen and GM), as well as Japanese manufacturers Toyota and Honda, which seems to point towards a relatively equitable distribution of costs, whereby the mainstream carmakers would face on average lower cost increases than more specific producers selling vehicles that emit higher CO_2 levels. However for a 80% inclination, Fiat is faced with relative retail price increases above the average, while BMW falls below average since Fiat is presently producing cars with relatively high CO_2 emissions compared with average utility. For Porsche the relative retail price increase is a factor of 2 to 3 times the average depending on the option and the utility parameter.

Figure 24 - Relative retail price increase of manufacturers ordered by market share for 40, 50, 60, 70 and 80% inclinations and for the following cases: (a) mass as utility parameter, assuming 0% AMI (without prejudice to the AMI level eventually chosen); (b) mass, assuming 0.82% AMI; and (c) footprint, assuming 0.82% AMI (source supporting study)

(a)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average
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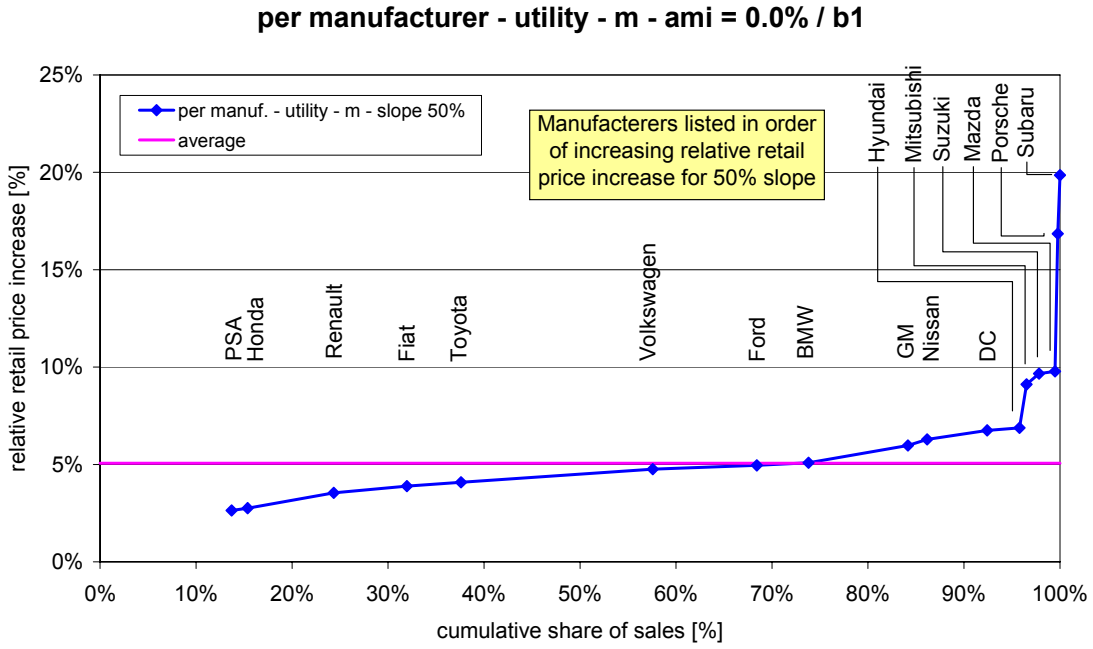
relative retail price increase [%]
cumulative share of sales [%]
PSA
Honda
Renault
Fiat
Toyota
Volkswagen
Ford
BMW
GM
Nissan
Hyundai
DC
Mitsubishi
Suzuki
Mazda
Porsche
Subaru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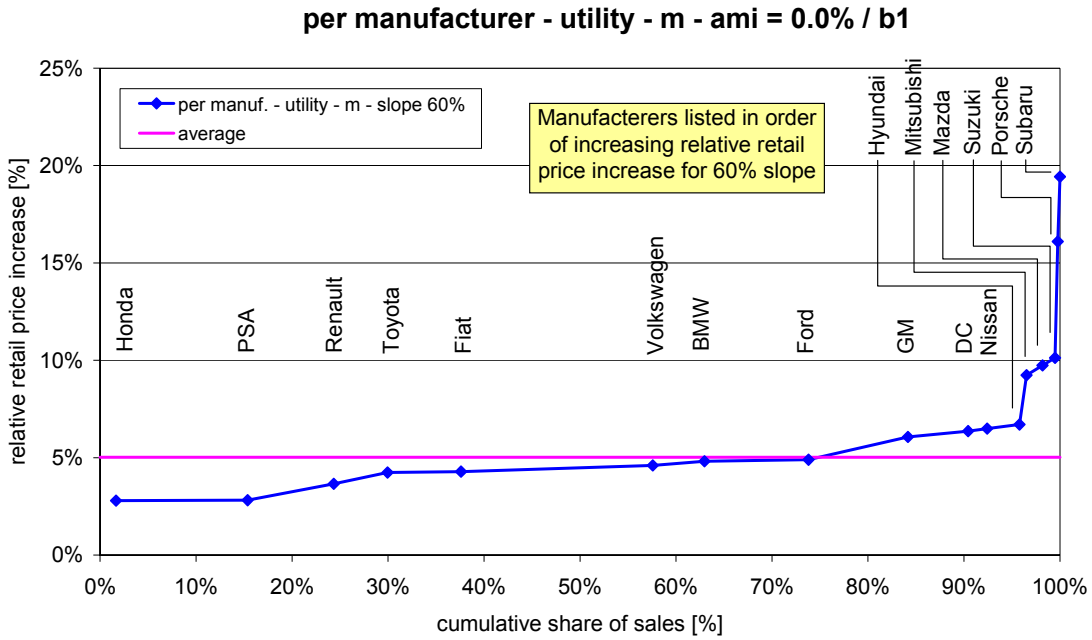
relative retail price increase [%]
cumulative share of sales [%]
PSA
Honda
Renault
Fiat
Toyota
Volkswagen
Ford
BMW
GM
Nissan
DC
Hyundai
Mitsubishi
Suzuki
Mazda
Porsche
Subaru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average
Manufacterers listed in order of increasing relative retail price increase for 60% slope
relative retail price increase [%]
cumulative share of sales [%]
Honda
PSA
Renault
Toyota
Fiat
Volkswagen
BMW
Ford
GM
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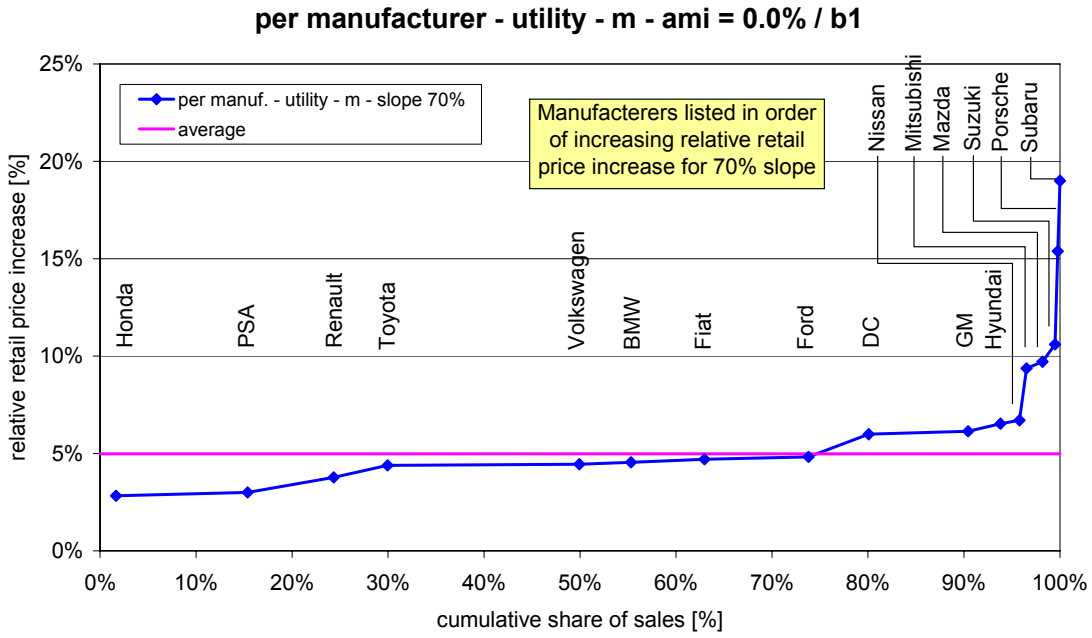
Mazda
Suzuki
Porsche
Subaru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average
Manufacterers listed in order of increasing relative retail price increase for 70% slope
relative retail price increase [%]
cumulative share of sales [%]
Honda
PSA
Renault
Toyota
Volkswagen
BMW
Fiat
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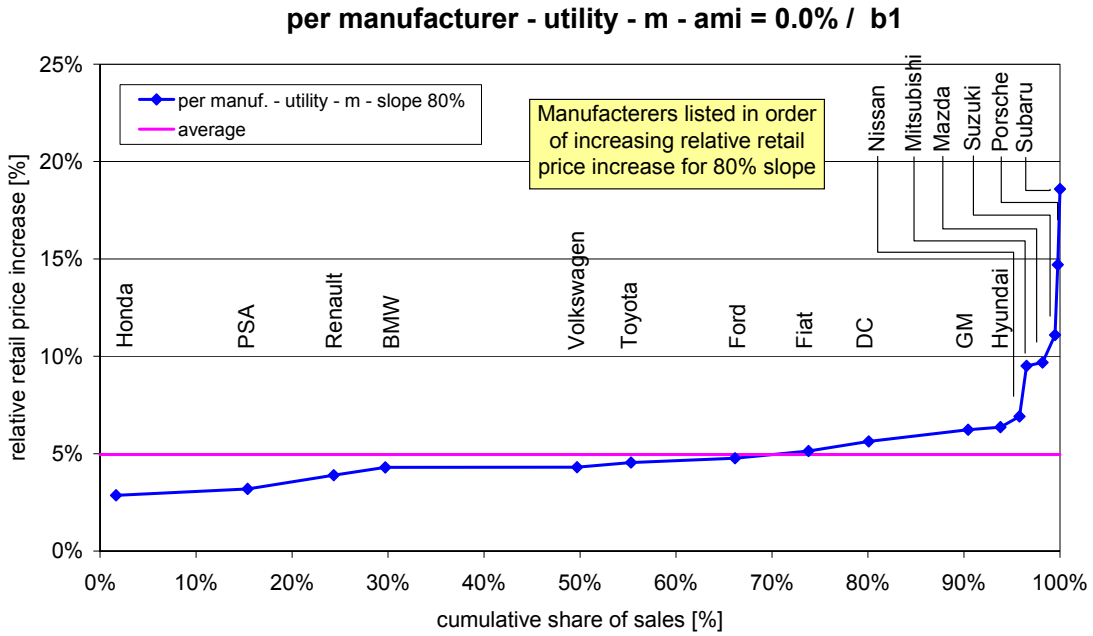
Mitsubishi
Mazda
Suzuki
Porsche
Subaru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average
Manufacterers listed in order of increasing relative retail price increase for 80% slope
Honda
PSA
Renault
BMW
Volkswagen
Toyota
Ford
Fiat
DC
GM
Hyundai
Nissan
Mitsubishi
Mazda
Suzuki
Porsche
Subaru
relative retail price increase [%]
cumulative share of sales [%]
0%
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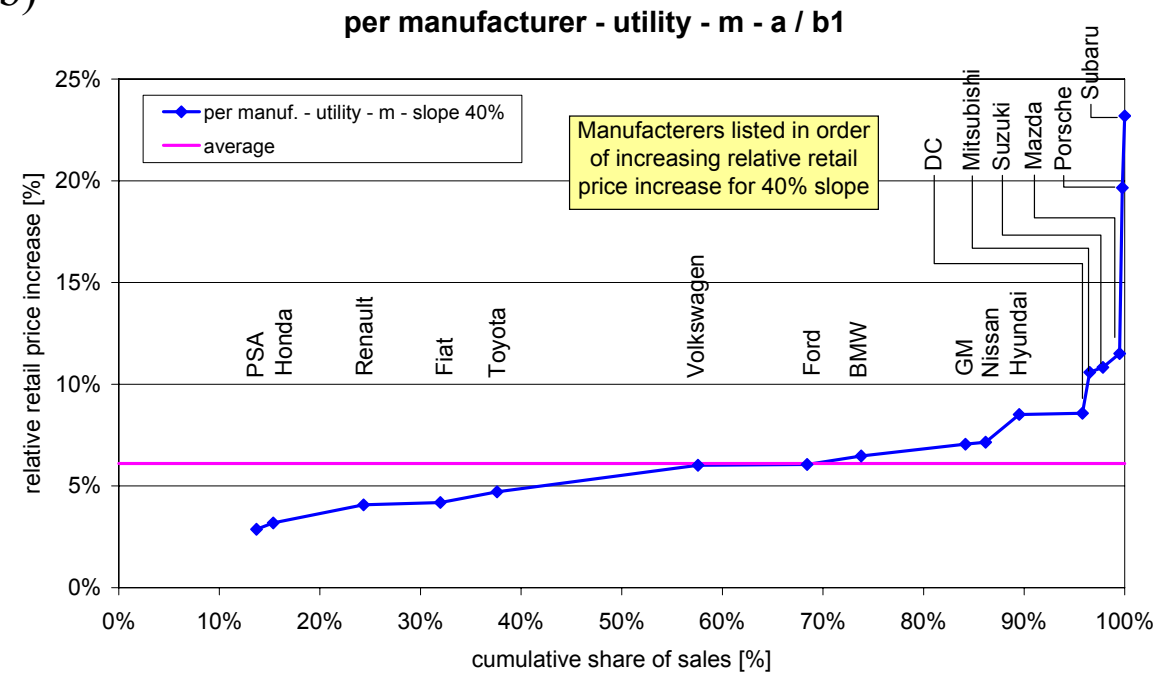
(b)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Manufacterers listed in order of increasing relative retail price increase for 40% slope
PSA
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Renault
Fiat
Toyota
Volkswagen
Ford
BMW
GM
Nissan
Hyundai
DC
Mitsubishi
Suzuki
Mazda
Porsche
Subaru
relative retail price increase [%]
cumulative share of sales [%]
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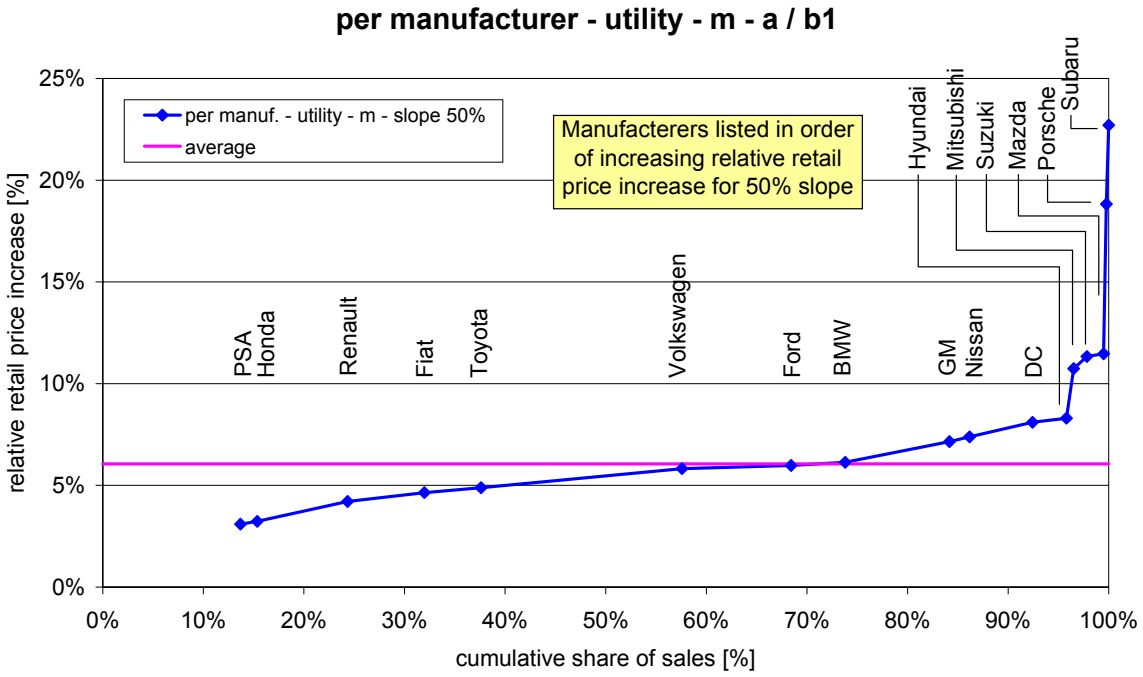
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Manufacterers listed in order of increasing relative retail price increase for 50% slope
relative retail price increase [%]
cumulative share of sales [%]
PSA
Honda
Renault
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Volkswagen
Ford
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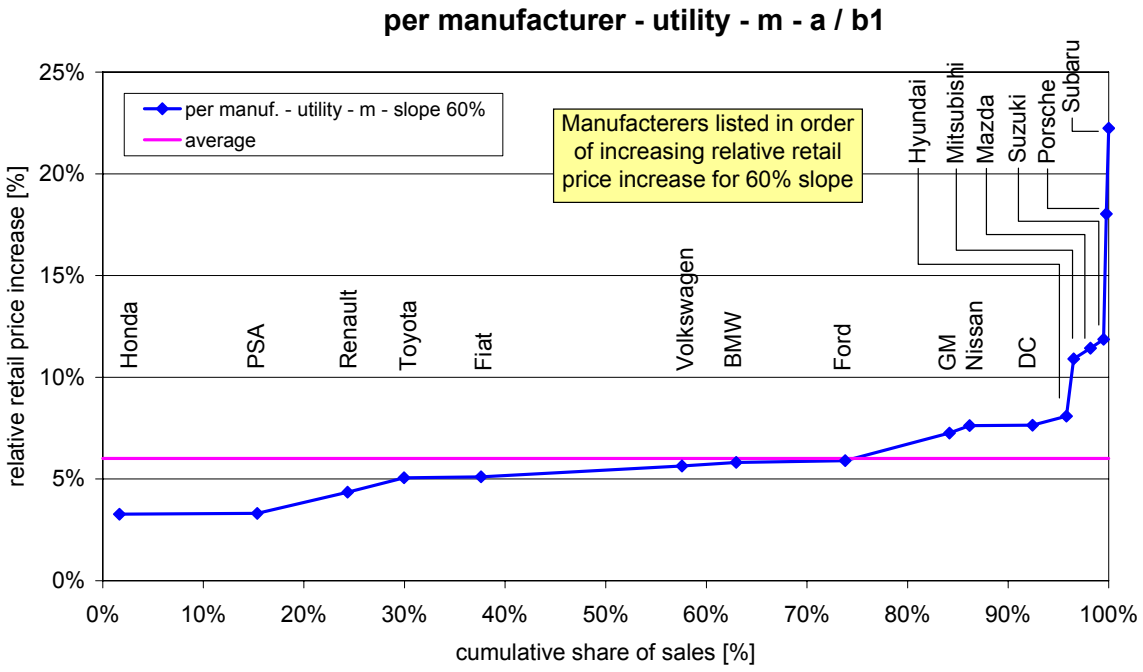
DC
Hyundai
Mitsubishi
Suzuki
Mazda
Porsche
Subaru


per manufacturer - utility - m - a / b1
per manuf. - utility - m - slope 60%
average
Manufacterers listed in order of increasing relative retail price increase for 60% slope
relative retail price increase [%]
cumulative share of sales [%]
Honda
PSA
Renault
Toyota
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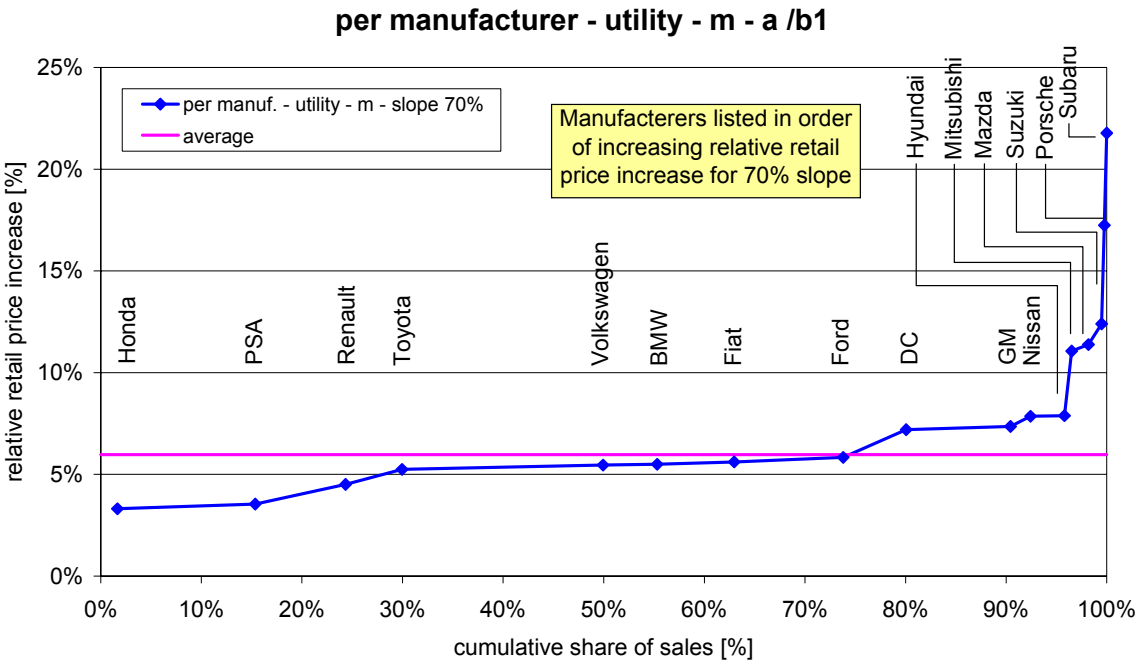
Suzuki
Porsche
Subaru


per manufacturer - utility - m - a /b1
per manuf. - utility - m - slope 70%
average
Manufacterers listed in order of increasing relative retail price increase for 70% slope
Honda
PSA
Renault
Toyota
Volkswagen
BMW
Fiat
Ford
DC
GM
Nissan
Hyundai
Mitsubishi
Mazda
Suzuki
Porsche
Subaru
relative retail price increase [%]
cumulative share of sales [%]
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5%
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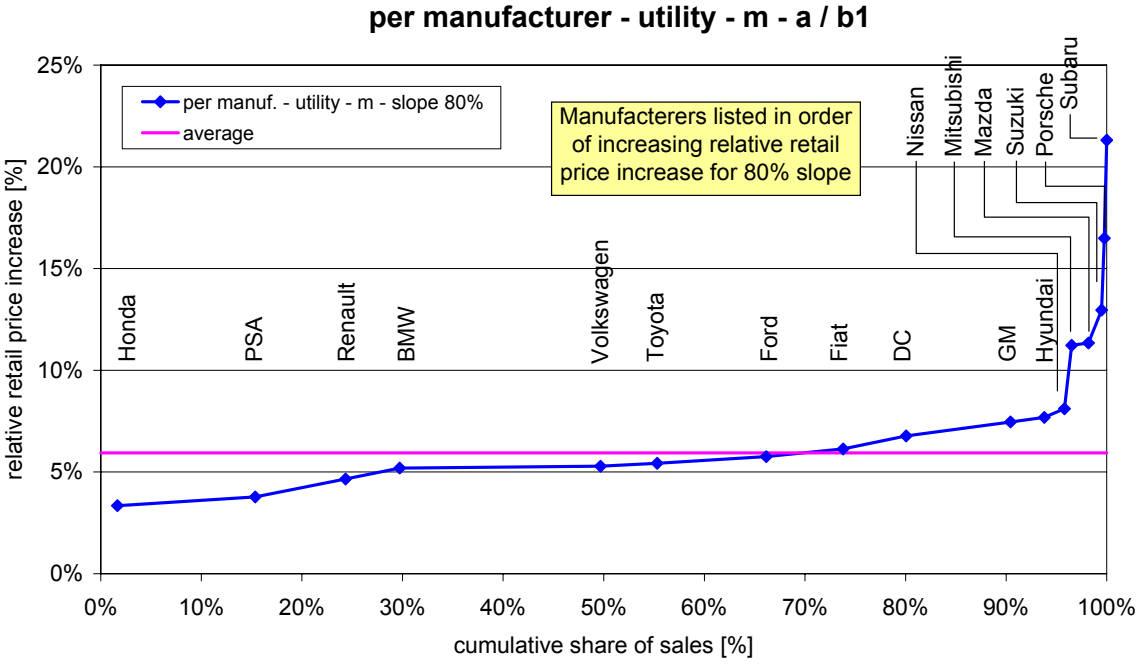
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per manuf. - utility - m - slope 80%
average
Manufacterers listed in order of increasing relative retail price increase for 80% slope
Honda
PSA
Renault
BMW
Volkswagen
Toyota
Ford
Fiat
DC
GM
Hyundai
Nissan
Mitsubishi
Mazda
Suzuki
Porsche
Subaru
relative retail price increase [%]
cumulative share of sales [%]
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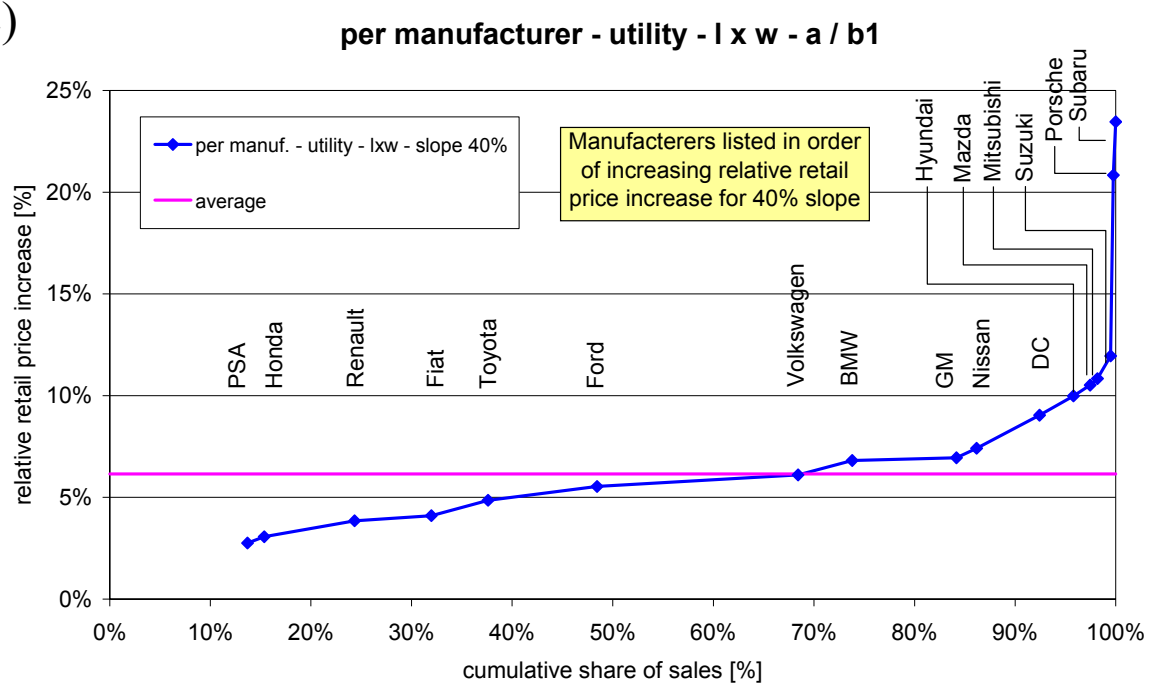
(c)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average
Manufacterers listed in order of increasing relative retail price increase for 40% slope
Hyundai
Mazda
Mitsubishi
Suzuki
Porsche
Subaru
PSA
Honda
Renault
Fiat
Toyota
Ford
Volkswagen
BMW
GM
Nissan
DC
relative retail price increase [%]
cumulative share of sales [%]
25%
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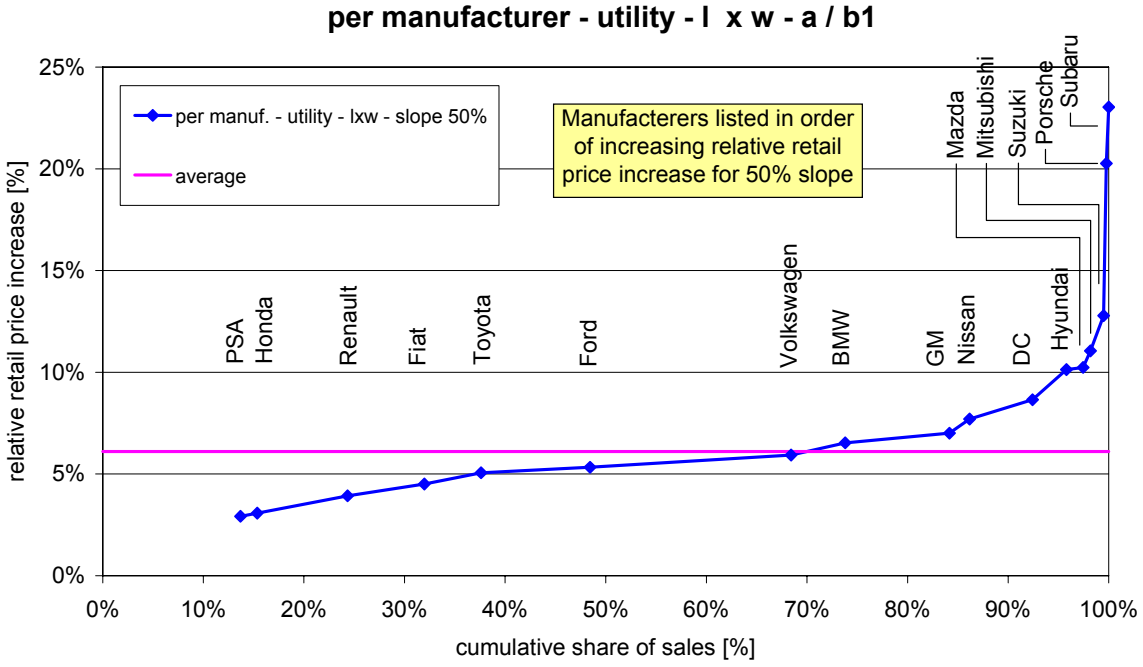
per manufacturer - utility - l x w - a / b1
per manuf. - utility - lxw - slope 50%
average
Manufacterers listed in order of increasing relative retail price increase for 50% slope
Mazda
Mitsubishi
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Porsche
Subaru
Hyundai
PSA
Honda
Renault
Fiat
Toyota
Ford
Volkswagen
BMW
GM
Nissan
DC
relative retail price increase [%]
cumulative share of sales [%]
25%
20%
15%
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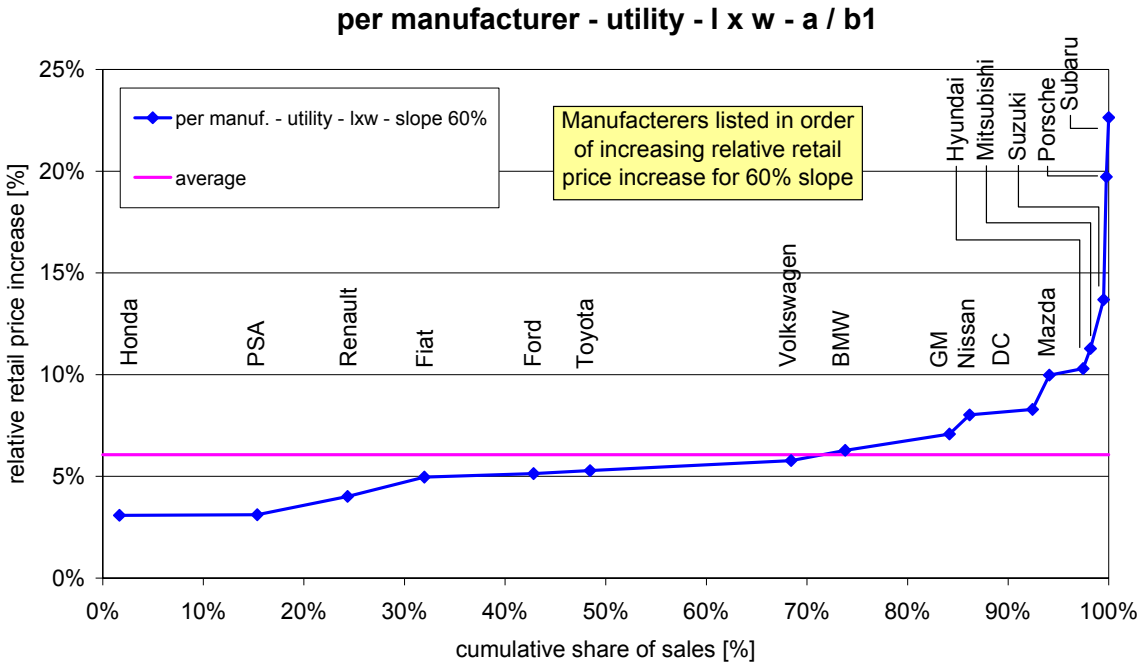
per manufacturer - utility - l x w - a / b1
per manuf. - utility - lxw - slope 60%
average
Manufacterers listed in order of increasing relative retail price increase for 60% slope
relative retail price increase [%]
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BMW
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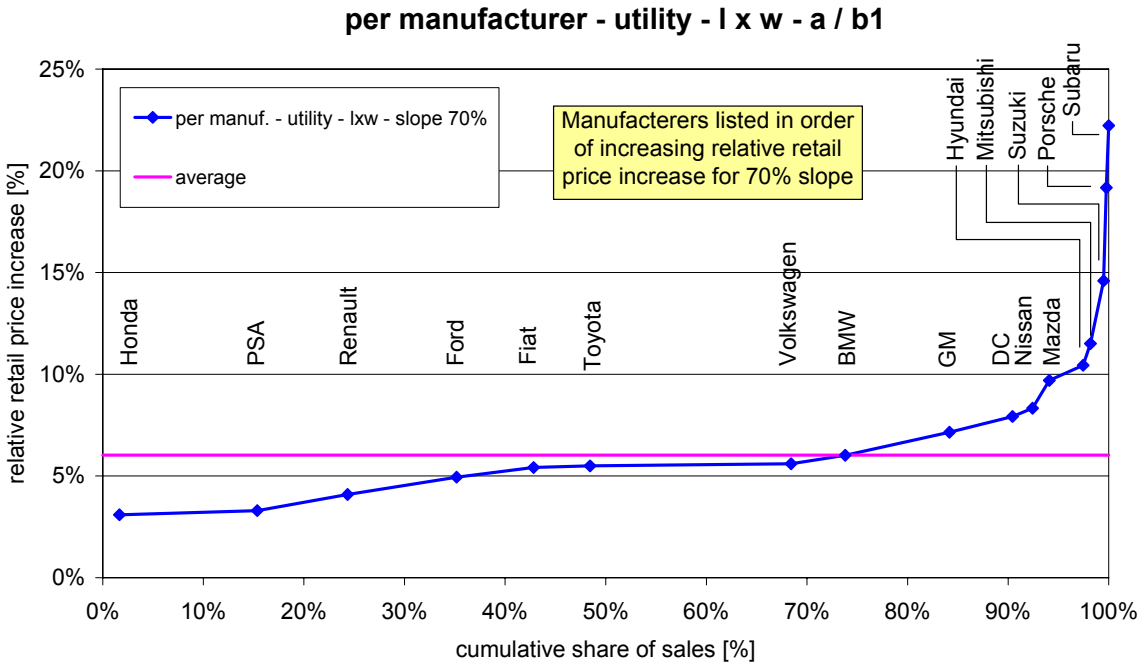
Mazda
Hyundai
Mitsubishi
Suzuki
Porsche
Subaru


per manufacturer - utility - l x w - a / b1
per manuf. - utility - lxw - slope 70%
average
Manufacterers listed in order of increasing relative retail price increase for 70% slope
relative retail price increase [%]
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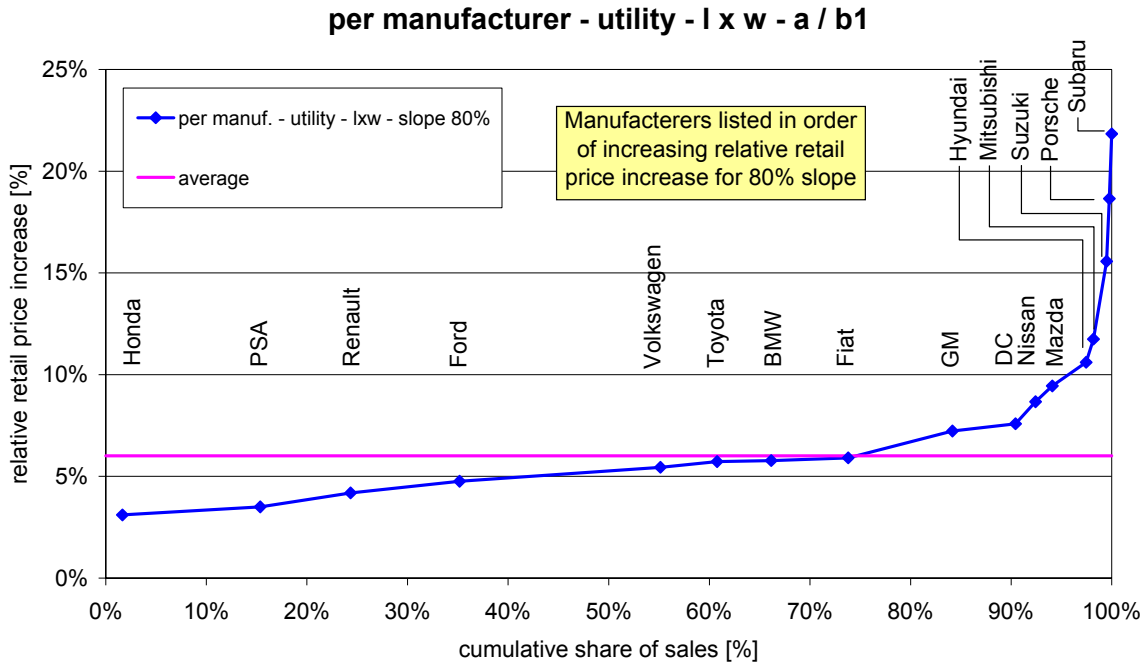
Porsche
Subaru



5.4. Environmental impacts

5.4.1. Discussion on the environmental outcome against the various Options

For **Option 1**, because by definition the target is the same for all manufacturers (130 grams), the environmental outcome is linked to the availability of credits to trade amongst manufacturers and to the efficiency of the compliance mechanism (see section 5.4.2). As mentioned in Section 5.2.2 the quantity of credits traded could potentially be significant in the order of 10 to 20% of the total costs for delivering the 130 g CO_2/km target. However it is unclear whether the market would function effectively i.e. whether there would be enough credits to trade considering that manufacturers who would potentially have the possibility to go beyond 130 g CO_2/km might not see an advantage in selling the credits to competitors rather than letting them pay the premiums. A trading scheme could also lead to substantial administrative costs. Going beyond these market strategies, the level of the premiums will be crucial in the effectiveness of the scheme, since it will de facto define the upper limit for the value of the credits traded amongst carmakers.

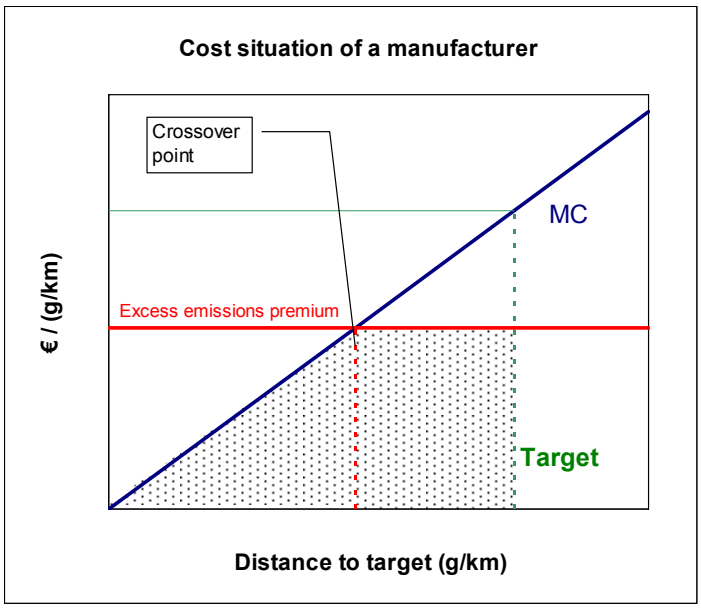
In the case of **Option 2** "Utility parameter", as discussed in Section 4.2.2, assumptions on the Autonomous Mass Increase (AMI) are crucial in the definition of the linear function in order to ensure that the 130 g CO_2/km target will be delivered and not under or over achieved. In addition, in the case of mass as utility parameter, depending on the slope of the curve, there could be an incentive to increase mass for manufacturers: if the mass increases faster than the CO_2 obligation, increasing mass will bring a vehicle/manufacturer closer to its CO_2 obligation. Based on the supporting study, to avoid stimulation of perverse effects or market trends which cause the 2012 average CO_2 emissions to increase above 130 g/km the inclination of a mass-based limit function for Option 2 should thus be below 80%.

In the case of **Option 3** "% reduction", all manufacturers are attributed a fixed reduction to be achieved against their 2006 performance. Under the hypothesis that the market position of the various manufacturers remain the same both in terms of segmentation and of market share, then the delivery of the environmental outcome will mainly be linked to the level of the financial penalties. However, in case the market is subject to profound changes, carmakers could be in a situation where they meet their CO_2 obligation but the overall target of 130 g CO_2/km is not delivered (for example if the sales of a big or small emitter significantly increase, its relative mass in the overall EU average would increase, and shift the average either above or below the 130 g CO_2/km target). The fact that newcomers would not have a baseline against which to set the target would equally lead to uncertainty in the delivery of the environmental objective.

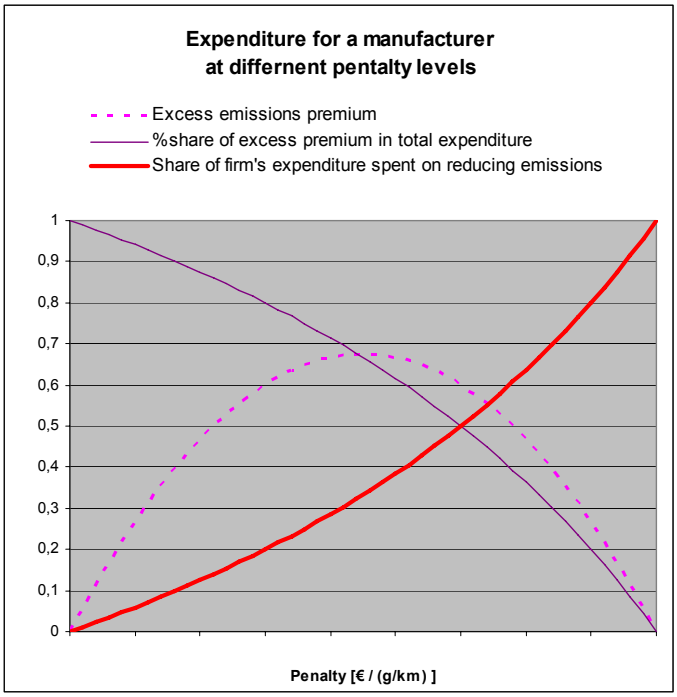
In the public consultation, the question of the impact of vehicle price increase on the fleet renewal rate has been raised. It is however a question more linked to the level of ambition of the strategy, and in particular the 130 g CO_2/km target, than to the distributive effects of the various options under consideration. Meeting the operational objectives laid down by the Commission (see section 3.1) should in any case minimize such impacts.

5.4.2. Compliance mechanism: influence of the financial penalties on the environmental outcome

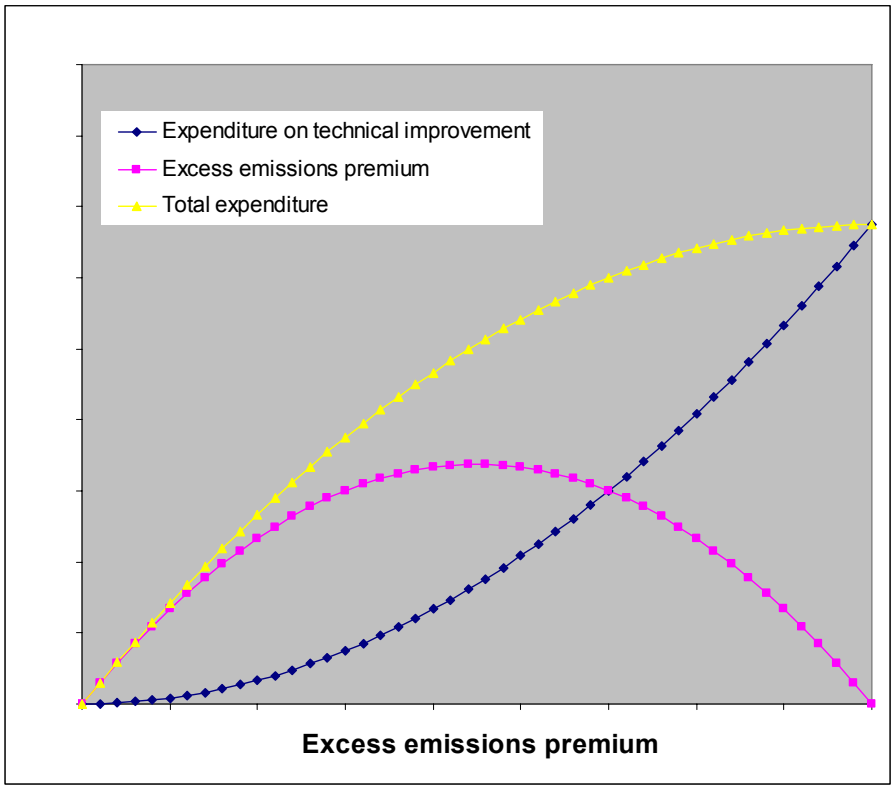
The environmental outcome is influenced by the level of the financial premium because firms will adapt their behaviour in response to it. The figure below illustrates the situation of a firm that faces rising marginal costs (MC) in improving its average car fleet. The firm will keep on improving its fleet until the marginal cost exceeds the level of the emissions premium. From that crossover point onwards, the firm will opt to pay the fine. The total expenditure of the firm is given by the shaded area in the graph. Within that area, the triangular part to the left of the crossover point indicates the expenditure on technological improvement, whereas the rectangular part to the right of the crossover point shows the total amount of premium that has to be paid.



This has consequences as illustrated in the following figure. For small levels of the excess emissions premium, the majority of the payment made by a manufacturer would be spent on the emissions premium, without spending much on improving the CO2 emissions. In a sense, a low penalty would have the characteristics of an additional tax on the manufacturer with little environmental benefit. For a high premium, on the other hand, the largest proportion of the money spent by the manufacturer would be spent on improving the vehicles in order to reduce their emissions. Only a small portion would go into paying the premium. Above a certain level of the premium, no premium would be paid and full compliance would be ensured.

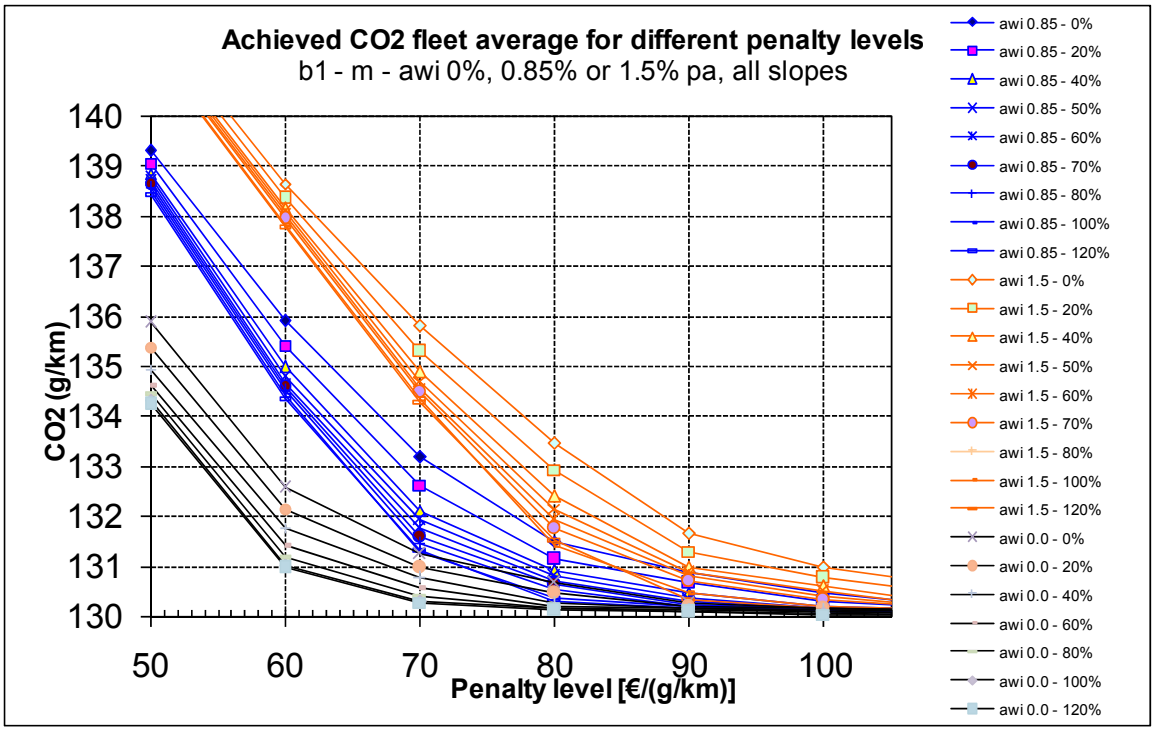


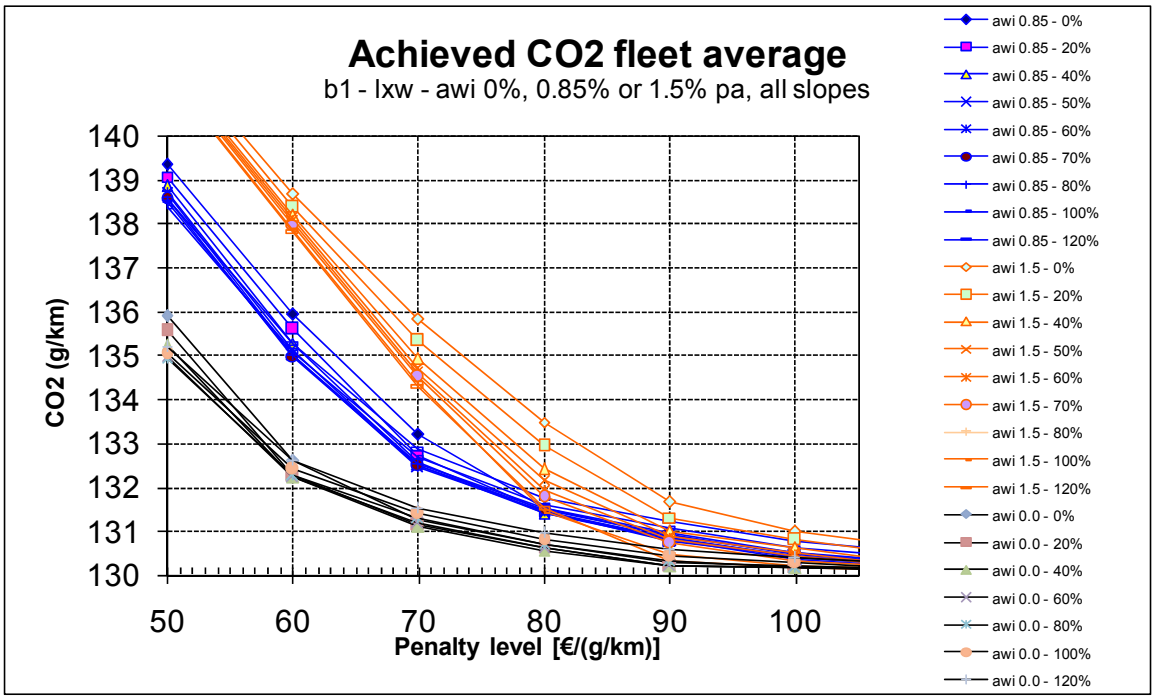
The total expenditure of the manufacturer is rising as the penalty increases (see yellow line in the next figure). At levels close to full compliance, the total expenditure curve becomes flat. Thus, the last few grams before compliance cause a small additional expenditure because the rising technology cost is compensated by the falling penalty cost. Therefore, a premium level that is somewhat below full compliance would cause almost the same cost to the manufacturer as one that ensures full compliance, but it would lead to a correspondingly smaller improvement in CO_2 emissions (which vary in a linear fashion with the level of the premium).



It is important to note that these considerations apply to a situation where the manufacturer is technically capable of reaching its target value, so its decision on how far to improve its fleet is taken on purely financial grounds. On the basis of the [Task A] study, this appears to be a safe assumption for targets as considered in this impact assessment, although the cost may be high for some manufacturers.

For a given level of the premium, the achieved fleet average CO_2 level can be estimated for each manufacturer as above, based on its 2006 mix of car models and the cost curves of the supporting study. The resulting fleet average CO_2 level is shown in the two graphs below for mass as the utility parameter (top) and for footprint (bottom) and for a variety of cases each (slopes of the limit value curve and assumptions on autonomous weight increase). There is not much difference between the two types of utility parameters used. It can be seen that for a higher assumed autonomous weight increase, the sanctions also have to be correspondingly higher. It becomes apparent that in order to exceed the target by no more than 5g/km, the premium level would have to be in the order of 50-70 €/gram depending on the autonomous weight increase. For a target exceedance of maximum 2g/km, the required premium level is ca 60-90 €/gram. For a target exceedance of maximum 1g/km, the required premium level is ca 60-100 €/gram.





Following the discussion on premium levels in Section 4, it was decided that premiums[34] set at 7€/gram, 10€/gram, 25€/gram, 95€/gram and 150 €/gram would be investigated further and placed into the perspective of gradually increasing premium levels through time (e.g. 2012 – 2015).

[34] The final wording penalties/compensation will be decided at the stage of the final political decision

Manufacturer specific elements also have to be taken into account. Given that the most transparent way of setting penalties/compensation is to express them in €/gram terms, it has to be noted that the potential premium levels are likely to have a bigger impact on those manufacturers required to deliver the most in terms of absolute (cumulated grams) reductions. As has been noted previously, however, this is to a degree offset by the fact that producers of bigger vehicles have higher margins which makes it easier for them to pass costs (including premiums) to their customers. Figure 25 and Figure 26 below provide an overview of the absolute reductions required from individual manufacturers under different target setting methods and using mass and footprint as utility parameters.

Figure 25 - Absolute reduction needed between 2006 and 2012, using mass as parameter and allowing fleet averaging (based on supporting study)

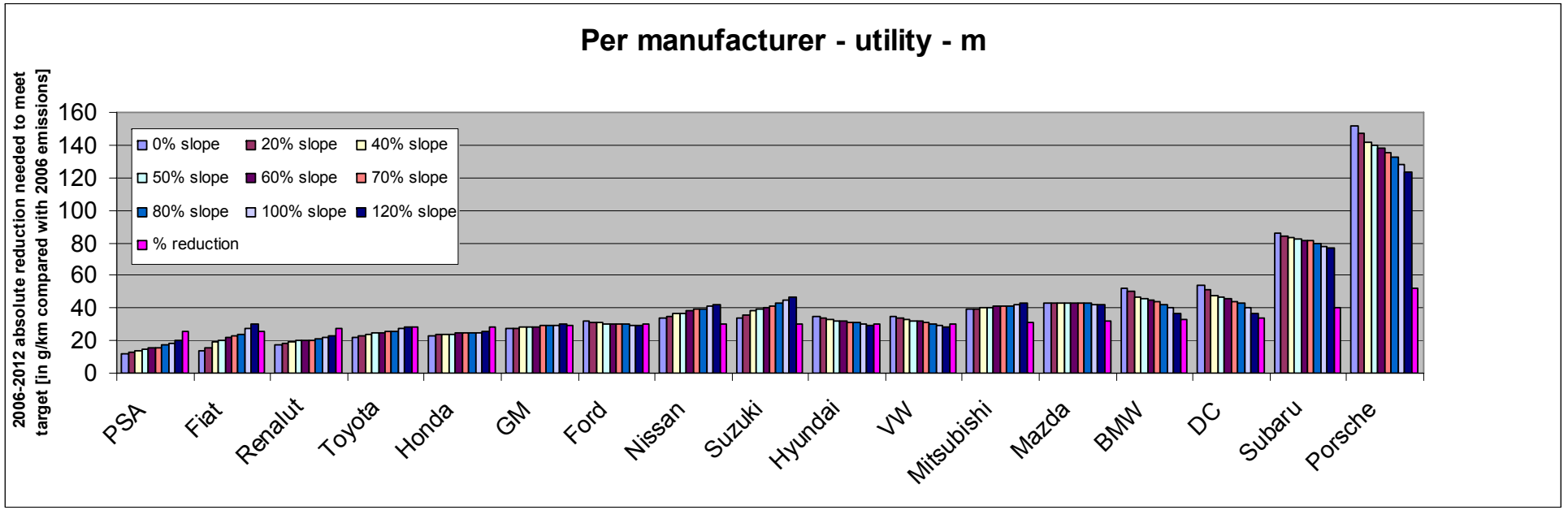


Figure 26 - Absolute reduction needed between 2006 and 2012, using footprint as parameter and allowing fleet averaging (based on supporting study)

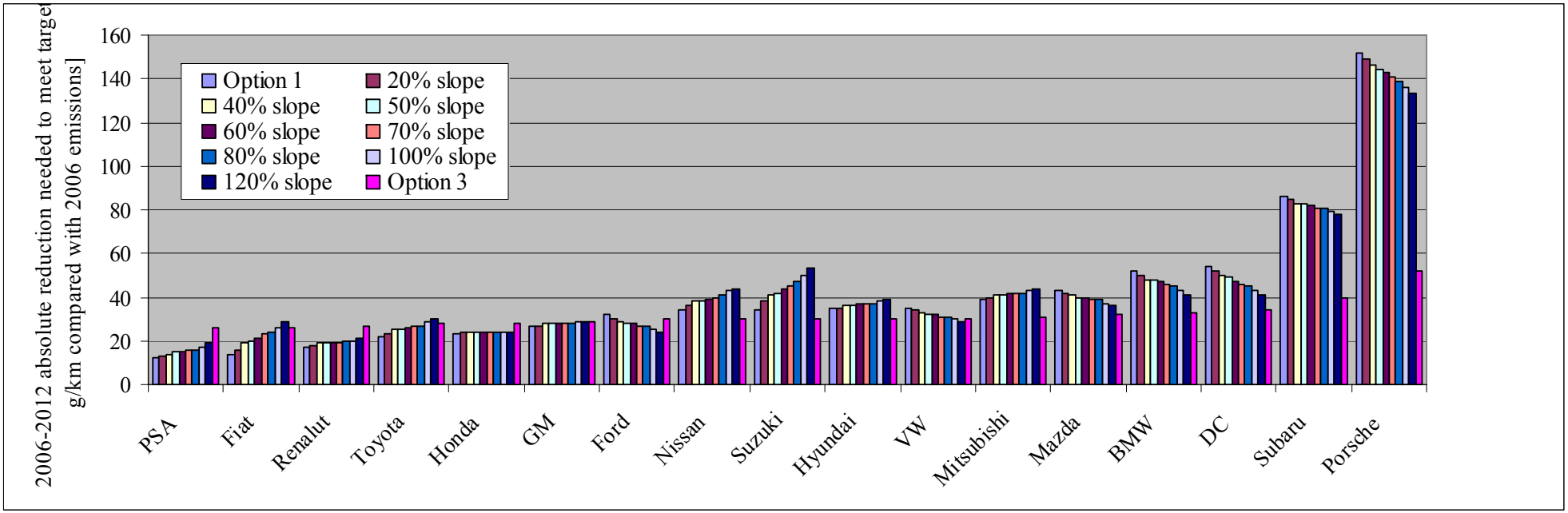


Figure 27 below presents the possible impact of the chosen premium scenario levels on the automotive industry as a whole under the assumption that the target is missed in a range of 1 to 10 g CO_2/km. The figure also puts these premium levels into the perspective of gross profits earned by globally by both the European vehicle manufacturers as well as the global automotive industry as a whole. It should be borne in mind (a) that the profit margins presented are not confined to sales of vehicles, in view of the significant role of post-sales revenue made by the industry, and are "before tax", and (b) that expenditure caused by the premium can be passed through to consumers in the same way as investment costs needed to ensure compliance and is therefore unlikely to be paid fully out of profits.

Figure 27 - Cumulated annual payments for five levels of premiums (source for profit figures: Aggregate, global, group income before taxes for the financial year ending 31 December 2006 (Nissan and Mazda financial year ending Q1 2006), based on consolidated income statements according to annual reports. Group income from all activities. Fuji Heavy Industries (Subaru) is not included since only a smaller portion of its income before taxes is generated from automotive related products and services)

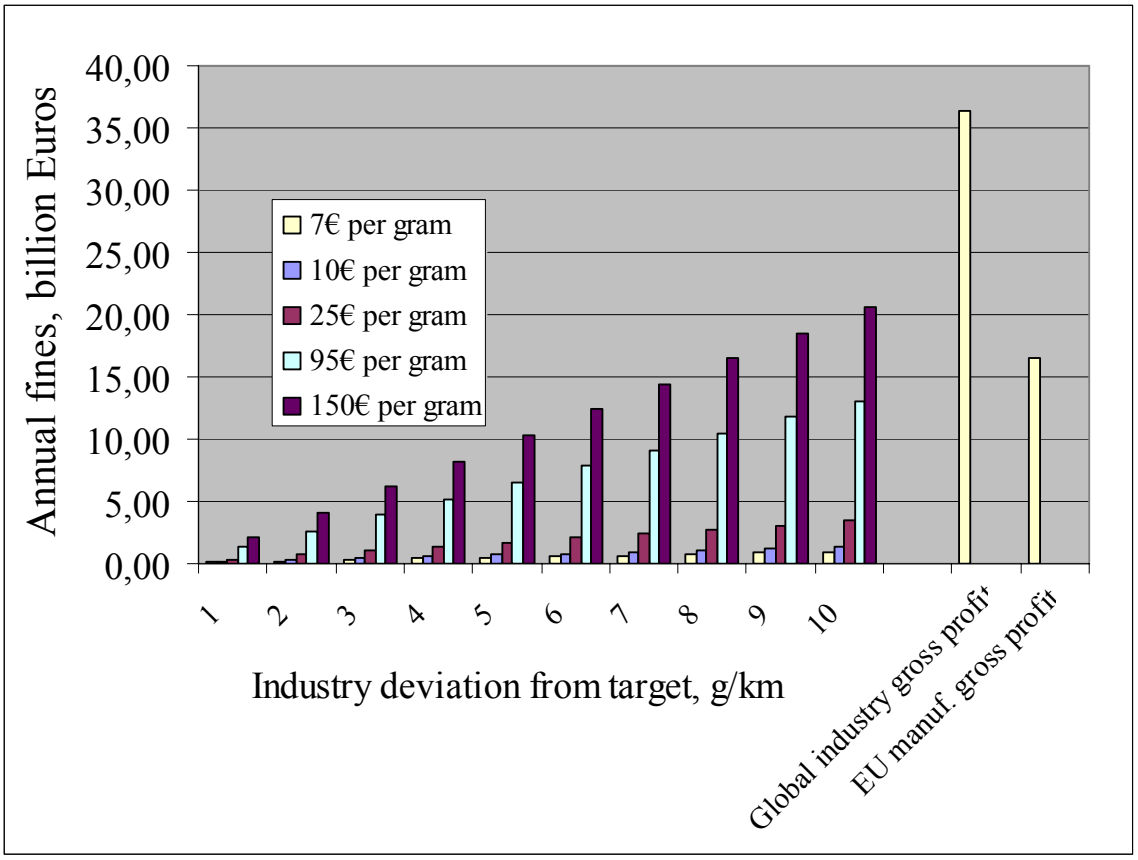


Figure 28 presents the same premium scenarios in "per car" terms. It should be noted that this figure is based on manufacturers' costs and does not show the effect on the retail price.

Figure 28 - Annual payments per car for five levels of premium

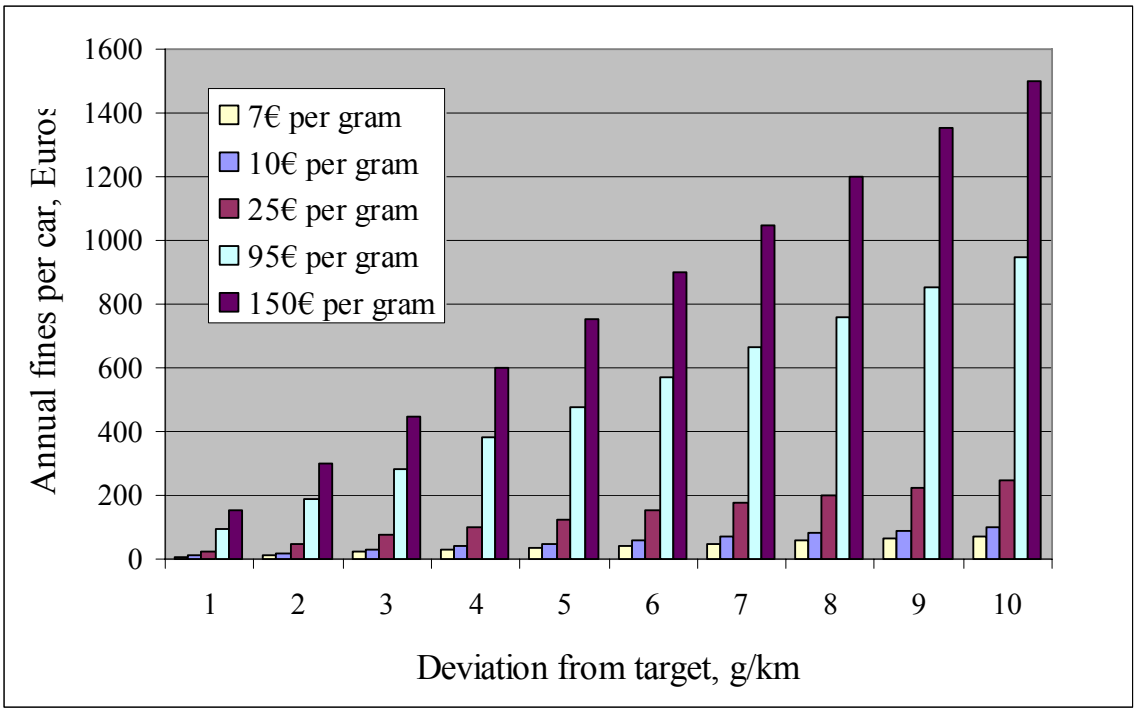


Figure 29 below presents the different premium levels when compared to a possible future carbon market price as well as the current ETS penalty levels[35].

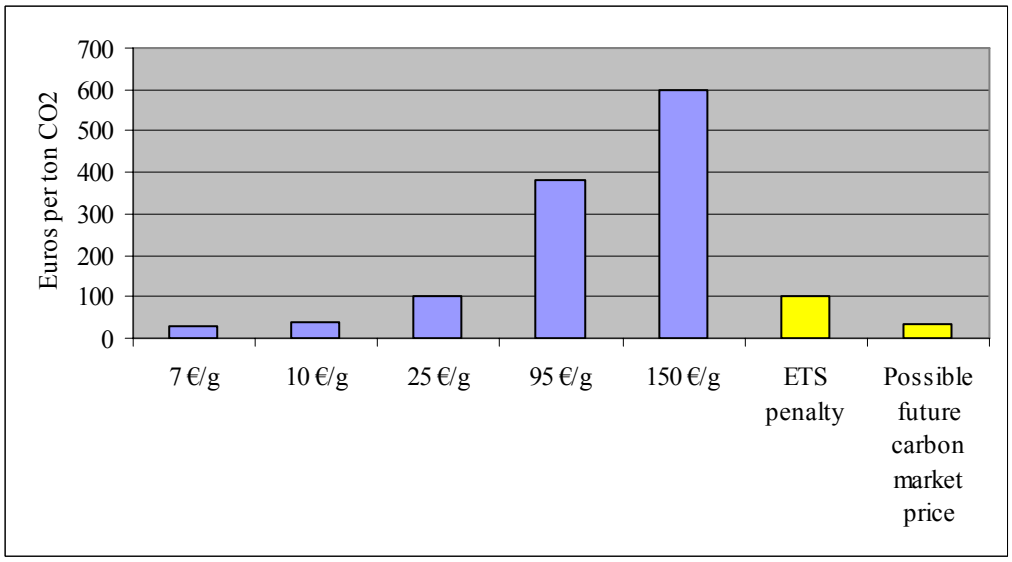
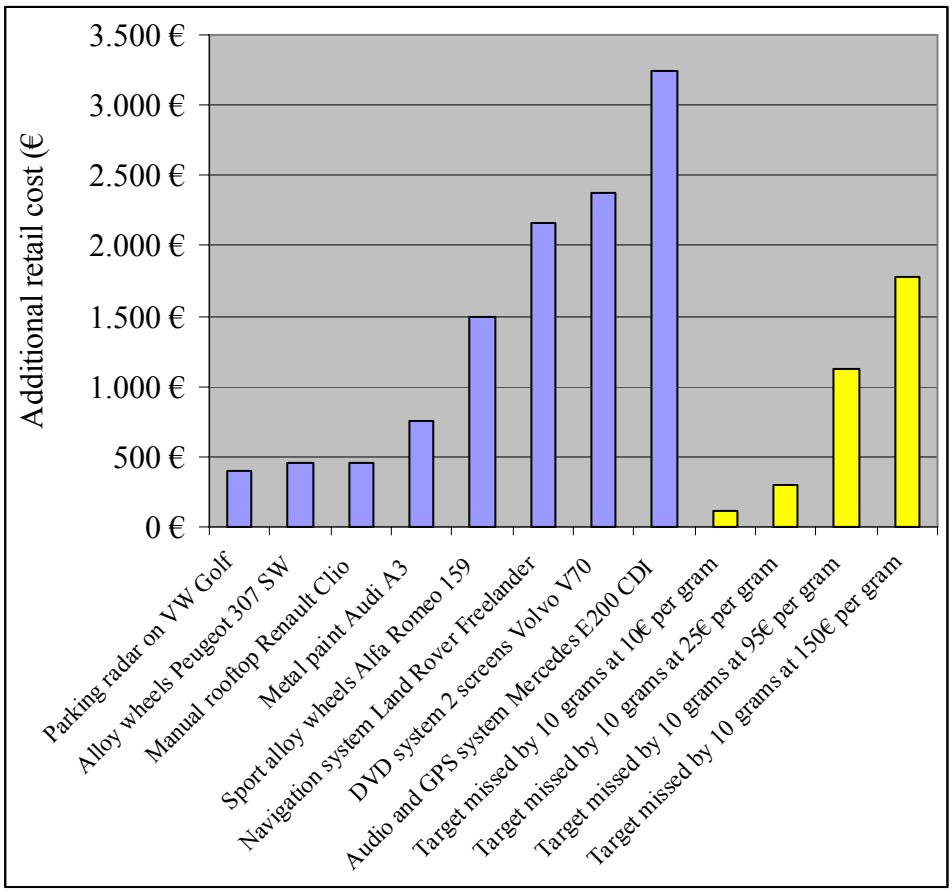


Figure 30 presents the comparison of the retail prices of vehicle optional equipments with the additional cost linked to different levels of premium for a target missed by 10 grams at the vehicle level assuming full pass-through of the premium to consumers and an average tax level of 19% (source: http://www.aramisauto.com and www.mercedes.be, January 2007)

[35] This does not take into account the obligation for operators covered by the ETS to surrender additional allowances in the following period in case of non-compliance in the current period, which raises the cost of non-compliance above the level shown



5.4.3. Overall impacts in terms of emissions

The three options lead to cumulated CO_2 equivalent savings for the 2010-2020 period superior to 600 Mt, as shown in Table 5.

Table 5 - Cumulated CO_2 savings for the three options (source TREMOVE)

		WtW CO2eq Abatement 2006-2020 (Mt)
Option 1	Uniform target per manufacturer with trading	624
Option 2	40% slope – Footprint	638
	80% slope – Footprint	634
	40% slope – Mass	638
	80% slope – Mass	634
Option 3	Percentage reduction per manufacturer	626

According to TREMOVE simulations, the changes in vehicle sales with respect to the baseline would some positive impact on the actual effectiveness of the scenarios with respect to ex-ante simulations: the ex-post type-approval average by 2012 would be 129 for option 1, and around 129.5 for options 2 and 3.

Regarding air pollution aspects, all three options lead to somewhat comparable impacts in terms of emissions of conventional pollutants. Reductions in SO_2, NO_x and PM are expected, as shown in table Table 6 below. VOC emissions however increase slightly compared to the baseline for all three options, due to the increasing market share of petrol vehicles.

Table 6 - Impact on pollutant exhaust emissions from passenger cars in 2020 compared to the baseline (source TREMOVE)

% abatement with respect to the baseline by 2020	Option 1	Option 2				Option 3
	uniform target per manufacturer with trading	40% slope - lxw based limit function per manufacturer	80% slope - lxw based limit function per manufacturer	40% slope - m based limit function per manufacturer	80% slope - m based limit function per manufacturer	percentage reduction per manufacturer
NO_X exhaust	-4.5%	-4.6%	-4.6%	-4.5%	-4.5%	-4.3%
PM exhaust	-3.0%	-3.2%	-3.1%	-3.2%	-3.1%	-3.0%
SO_2 exhaust	-14.2%	-14.6%	-14.5%	-14.6%	-14.5%	-14.2%
VOC exhaust	2.9%	2.3%	2.4%	2.3%	2.4%	2.4%

6. COMPARING THE OPTIONS

6.1. Tradeoffs between the three options

Section 5 shows that there is a trade-off between the different policy options with regard to operational objectives such as social equity, competitive neutrality, cost-effectiveness and environmental outcome. No single option is optimal from the perspective of all the objectives and hence a balance involving comparative value judgements has to be struck between the different considerations.

6.1.1. Social equity

Option 1 would result in targets which would be very difficult to meet for manufacturers of relatively bigger cars and easier to meet for manufacturers of smaller cars. This would in turn translate into substantially higher cost increases (technology costs) and premiums for producers with a larger proportion of premium vehicles in their portfolio while these would be lower for small-car producers. It could be argued 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 and hence that a flat curve would be most appropriate to ensure mobility and affordability of cars for such households. While this may hold true partially, it 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). Option 2, on the other hand, could lead to more balanced cost increases for cars of all sizes although it should be borne in mind that the distribution of price increases across segments depends on the slope of the target function (% of the curve as explained in Figure 6). Relatively flatter slopes will on average result in relative price increases which are higher for manufacturers of heavier cars. As shown in section

5.2.2. the relative price increases are on average higher for manufacturers of bigger cars for all slopes below 80%, although in the case of mass impacts on certain small car manufacturers can be seen above a 70% inclination. Consequently (again taking car size as the proxy for social equity), Option 2 is also capable of ensuring social equity although a judgement has to be made at which slope this would be optimal when compared to considerations under other criteria. Finally, **Option 3** would result in the least socially equitable approach since it would require producers of smaller cars to deliver the same proportional CO_2 reductions as those producing bigger vehicles.

6.1.2. Competitive neutrality

Option 1 is the least competitively neutral option as it sets the same average target for all manufacturers without taking the diversity of European car manufacturers into consideration. As such, it fails to account for the fact that different manufacturers have varying commercial strategies and product portfolios and consequently operate in different segments of the automotive market. **Option 2** provides differentiated targets based on the characteristics of the vehicles placed on the market, and provides for a more neutral approach while still requiring higher relative and absolute (grams to be delivered) emission reductions from producers of bigger vehicles. Once again, however, the slope of the line has important implications on the extent to which the targets optimise competitive neutrality. Slopes between 74 and 80% for mass and 64 and 67% for footprint provides an even distribution of *sales-weighted* average retail price increases while still requiring higher relative and absolute (grams to be delivered) emission reductions from producers of bigger vehicles. The most even *un-weighted* distribution of relative retail price increase per manufacturer is delivered for slopes between 39% and 47% for mass and between 18% and 27% for footprint.. **Option 3** requires the same relative reduction effort from all manufacturers, but is not optimal from the perspective of competitive neutrality since it fails to take into account past reduction efforts and would penalise those manufacturers who have already come close to reaching the average CO_2 emissions required under the voluntary commitments.

6.1.3. Cost-effectiveness

The overall cost-effectiveness of the system is largely independent of which of the three main options that is chosen. Of greater importance for cost-effectiveness are the flexibility options which have been discussed in Sections 4 and analysed in Section 5. Applying the target to manufacturer averages rather than to individual vehicles improves cost-effectiveness significantly due to marginal abatement costs being vehicle specific. Trading between manufacturers would further improve cost-effectiveness if trading actually takes place in practice, the market operates perfectly and administrative costs are kept low. The use of pooling could in principle provide similar flexibility and cost reductions as trading by averaging abatement costs while requiring less administration and lower transaction costs.

6.1.4. Environmental outcome

Option 1 and **3** would ensure that the 2012 target is met provided that all manufacturers respect their emissions target. **Option 2** could result in either over- or under-achievement of the target if future utility values deviate from the assumptions on the evolution of the physical characteristics of the fleet (AMI) in building the curve. This risk can be reduced

by building the curve on the basis of assumptions on the evolution of the physical characteristics of the fleet (AMI), accompanied where appropriate by applying a revision mechanism which would review the real-world situation ahead of the target date (2012)[36]. More important, however, is the impact on the probability that individual manufacturers are able to meet their targets in 2012. Setting a single target level for all manufacturers (Option 1) would make it very difficult for some manufacturers to comply with the target while Options 2 and 3 would require more proportional reductions across the board hence increasing the likelihood of achieving the overall target by 2012.

6.2. Overall comparison of the three options

Table 7 – Overview of the options

	Option 1 Uniform target	**Option 2 Utility approach**	**Option 3 % reduction**
CO_2 reductions	624 Mt CO_2 eq.	634 to 638 Mt CO_2 eq.	626 Mt CO_2 eq.
Cost-effectiveness[37]	16 to 46 €/ton CO_2	32 to 40 €/ton CO_2	29 to 34 €/ton CO_2
Competitive neutrality/avoidance of unjustified distortions of competition	☹ Producers of low emitting vehicles are winners, and high emitters are losers, since the target is the same for all	😐/☺ For limit lines between 74 and 80% for mass and 64 and 67% for footprint an even distribution of *sales-weighted* average retail price increase is achieved. The most even *un-weighted* distribution of relative retail price increase per manufacturer is delivered for slopes between 39% and 47% for mass and between 18% and 27% for footprint. However for	☹ Manufacturers of small vehicles get locked in their current market segment, while producers of bigger cars can either reduce CO_2 on their current fleet or develop the sales in the small and medium segments

[36] The revision mechanism would be based on a review by the Commission in 2010 of the changes to the mass of new passenger cars in the Community. The Commission would then evaluate the necessity to amend the way of calculating specific emissions targets in Annex I taking into account the objective of reducing average CO2 emissions from new passenger cars in the Community to 130g CO2/km by means of improvements in motor technology. This approach aims at ensuring that the limit curve actually requires 130 g (see discussion on AMI in box 1) and not more or less than this objective. It would thus increase the predictability of the system for manufacturers, since their own efforts/planning would be based on the delivery of a curve delivering 130 g.

[37] The cost-effectiveness calculations are based on the period 2006-2020

	Option 1 Uniform target	Option 2 Utility approach	Option 3 % reduction
		mass, depending on the assumptions in building the curve regarding the evolution of the fleet's mass, the curve could result in reduction requirements below 130 g CO_2/km	
Social equity	😐/☺ The option rewards low emitting/small medium vehicle producers, thus maintaining the affordability of the most sold vehicles in Europe. For a high level of fleet averaging/without cross subsidisation, small petrol cars may face higher relative price increases	😐/☺ For inclinations below 80%, most mainstream manufacturers of small/medium cars representing 80% of the market sales are exposed to below average retail price increases. For mass, impacts on certain small car manufacturers can be seen above a 70% inclination. At the vehicle level, for slopes below 60% and in the absence of fleet averaging/with cross subsidisation, small petrol cars face lower relative retail price increases than medium and large petrol cars	☹ Because all manufacturers have to deliver the same relative reduction, manufacturers of small cars (which are already low emitters) face relatively high costs
Sustainability /compatibility with Kyoto targets	😐/☺ The target being 130 g CO_2/km for all manufacturer, its delivery will be function of whether the trading system will actually function smoothly, and of the level of the financial penalties	😐/☺ For inclinations below 80% the possible perverse incentives to increase mass are avoided. However for mass, depending on the assumptions in building the curve regarding the evolution of the fleet's mass, the curve could result in missing the 130	😐/☺ The achievement of the overall target depends on the respective evolution of manufacturers market shares, which cannot be controlled

	Option 1 Uniform target	Option 2 Utility approach	Option 3 % reduction
		g CO_2/km target	
Equity to the diversity of European manufacturers	☹ See comment on competitive neutrality	☺ The utility based approach reflects already the diversity of manufacturers. Pooling will further contribute to this, by providing a workable solution to small volume specialised manufacturers	☺ The approach combined with pooling recognises that different manufacturers have different emission levels, and would maintain this.

Based on this assessment, the following conclusion can be drawn: of the three options analysed, **Option 2 seems the most promising** subject to a number of caveat regarding the underlying assumptions in the establishment of the curve, its inclination and function of the utility parameter chosen.

6.3. Discussion on the utility parameter (Option 2 only)

Two possible parameters have been identified for the purpose of building a utility based system. The table below identifies the ex-ante pros and cons of both parameters:

Table 8 - Comparing mass and footprint as utility parameters for Option 2

	Mass	Footprint	Discussion
Good measure of utility	=	+	Mass is a proxy for other utility parameters such as vehicle size, special features. Footprint is directly linked to the utility (family car vs. mini town car, number of seats, trunk space)
Data availability	++	=/-	Mass is readily available and reported. Footprint defined as inner surface between the wheels is not yet reported. Footprint defined as total surface (length times width, also called pan area) is available but not reported yet. It could be used as a proxy for footprint in a first phase.
Impact on manufacturers	=	=	Both parameters result in comparable impacts in terms of relative price increase for manufacturers

			Mass provides a better distribution of burden between manufacturers overall. Footprint is slightly more favourable to small car manufacturers, but the impact is limited (less than 1% additional increase with mass)
Understandable	+	=/-	Footprint defined as the surface within the four wheels is less easy to apprehend
Avoids perverse effects/gaming	-	=	Mass increase can be used to ease the CO_2 obligation but this effect can be prevented by choosing a line inclination inferior to 80% Footprint is less likely to be manipulated to follow market trends, although if defined as pan area, bigger bumpers could be used to increase "artificially" utility (it can be expected that gaming on pan area would be more limited than on mass, in view of aesthetic considerations notably).
International compatibility	+	=	Mass is used for passenger cars in China and Japan while footprint is used the U.S. for light trucks
Allowing all relevant reduction techniques	--/-	++	Mass reduction is a prominent way to reduce CO_2. If mass is the parameter, some of its "reduction" potential will be annihilated by a mass based curve. Again this effect will be function of the inclination of the line

Preliminary conclusions regarding the utility parameter suggest a preference for a mass-based system under the condition that perverse effects are avoided. The choice of mass as utility parameter also requires assumptions on the autonomous mass increase to be made (see 4 scenarios in Box 1 of Section 4.2.2).

6.4. Assessment of different slopes on the basis of the five criteria set out in the earlier Commission Communications of February 2007

- **Least cost solution:** the least cost solution is for the 123% slope curve (same for both mass and footprint), meaning that smaller cars do more than bigger cars - because it is "overall" cheaper to do it on small cars even if there would be affordability problems. This solution cannot work. However it is noteworthy that in absolute terms the variations in price compared to the variations in slope are small. It means that other criteria could justify a different slope without going too far away from the least cost solution

- **Competitively neutral:** *sales-weighted* distribution of relative retail price increase per manufacturer, slopes between 74% and 80% have been identified for mass as utility

parameter, and between 64% and 68% for footprint (depending on the assumptions made on autonomous mass increase). The most even *un-weighted* distribution of relative retail price increase per manufacturer is delivered for slopes between 39% and 47% for mass as utility parameter, and between 18% and 27% for footprint (again, depending on the assumptions made on autonomous mass increase)

- **Sustainable:** perverse incentives linked to mass are avoided for inclinations inferior to 80%. For mass, the assumptions on the evolution of the fleet's average utility (autonomous mass increase) are crucial in order to avoid over or under shooting the 130 g CO_2/km target

- **Socially equitable:** For inclinations below 80%, most mainstream manufacturers of small/medium cars representing 80% of the market sales are exposed to below average retail price increases. For mass, impacts on certain small car manufacturers can be seen above a 70% inclination. At the vehicle level, for slopes below 60% and in the absence of fleet averaging/with cross subsidisation, small petrol cars face lower relative retail price increases than medium and large petrol cars.

- **Diversity of manufacturers:** this criteria is met to some extent by the competitive neutrality above, and by the fact that pooling would be allowed in the future legislation

The application of the criteria described above (as laid out in the earlier Communications) would, on the basis of initial analysis, suggest that in order to strike a balance between these criteria, a range between 50% and 80% should be considered further at this stage. Previous discussions on the uniform target (0% slope) and the 123% slope should be considered when justifying the exclusion of very flat and very steep slopes. Consequently, it has been decided that at this stage the 50%, 65% and 80% slopes would be considered further. In terms of flexibility, it appears that in addition to fleet averaging, the option of pooling should be offered to manufacturers in the legislation.

7. MONITORING AND EVALUATION

7.1. What are the core indicators of progress towards meeting the objectives?

The core indicators of progress are linked to the evolution of the average new car over the years, and they cover data relating to:

- specific CO_2 emissions as measured under the EU test procedure, to assess the performance of the automotive industry towards the respect of the mandatory targets,

- utility (mass or footprint), to provide an analysis of the evolution of the EU car market e.g. in case a shift in utility would require an adaptation of the regulatory curve for Option 2.

7.2. What is the broad outline for possible monitoring and evaluation arrangements?

The monitoring and evaluation arrangements could rely on two sources of data, and be administered by the Commission:

- Under the existing CO_2 and cars strategy, the European Parliament and Council have adopted a monitoring decision aimed at providing third party data to measure the progress of the car industry towards the respect of its voluntary agreements: Decision 1753/2000/EC already provides that Member States should report a number of data regarding new passenger cars placed on the EU market (including CO_2, mass, power etc.). However data relating to footprint (be it pan-area or inner wheel surface) is not yet reported. The existence of a monitoring scheme based on a third party outside of the remits of the automotive industry should be maintained in the future, and there will thus be a need to either amend Decision 1753/2000/EC, or to repeal it and introduce simplified monitoring provisions tailor made to the requirements of the upcoming legislation.

- However, because it is expected that manufacturers should be the regulated entity under the future scheme, there could be legal risks linked to relying on Member States data only. Indeed the data reported by Member States is based on the cars *registered* in a given year, which do not fully correspond to the cars *sold* in a given year – the ones on which car manufacturers have a control and can be held accountable for. For example cars sold at the end of 2012 may only be registered at the beginning of 2013 and thus not be reported in the 2012 monitoring by Member States. While the difference in the two data sets is expected to be small, there could be a benefit in setting up a separate monitoring requiring manufacturers selling cars in the EU to provide the Commission with the relevant data regarding theirs sales in a given year. Consequently this aspect will be given further consideration later.

ANNEX 1: REFERENCE DOCUMENTS AND ADDITIONAL CONSIDERATIONS ON THE MODELLING FRAMEWORK

Reference Documents

(1) [Supporting Study] Possible regulatory approaches to reducing CO2 emissions from cars 070402/2006/452236/MAR/C3: Annex on quantitative analysis of various options with updated model, September 2007

(2) [Task A] "Review and analysis of the reduction potential and costs of technological and other measures to reduce CO2 emissions from passenger cars", final report, Contract n° SI2 408212 by TNO for DG Enterprise and Industry, October 2006, available at http://ec.europa.eu/enterprise/automotive/projects/report_co2_reduction.pdf

(3) [IEEP 2004] "Service contract to carry out economic analysis and business impact assessment of CO_2 emission reduction measures in the automotive sector" Final Report http://ec.europa.eu/environment/co2/02858/sec02858_en.pdf& Annexes

(4) [Task B] "Service Contract in Support of the Impact Assessment of Various Policy Scenarios to Reduce CO2 Emissions from Passenger Cars", Contract: N° 070501/2004/392571/MAR/C1 by Centre for European Economic Research (ZEW) for European Commission (DG Environment), October 2006. (available at http://ec.europa.eu/environment/co2/co2_studies.htm)

(5) [TREMOVE] "Service contract for the further development and application of the transport and environmental TREMOVE model Lot 1 (Improvement of the data set and model structure)", Service Contract 070501/2005/420798/MAR/C1 by Transport and Mobility Leuven for European Commission (DG Environment), July 2007 (available at http://www.tremove.org/index.htm).

ANNEX II: FINAL REPORT ON THE PUBLIC HEARING

Review of the EU strategy to reduce CO_2 emissions and improve fuel efficiency from cars

Report on the Public Hearing Brussels, 11 July 2007, 9.00-13.00

The presentations (slides) that were made at the public hearing that took place on 11 July 2007 have been made public and are available on the following website: http://ec.europa.eu/reducing_co2_emissions_from_cars/presentations_en.htm.

Session 1

Agenda Item 0: Welcome and Introduction by the European Commission

Catherine Day (the Secretary General of the European Commission) welcomed the participants to the public hearing. She stressed that there was a wide range of interesting presentations on the agenda, ensuring an interesting exchange of views, and acknowledged the complexity of the topic.

In her introductory remarks, she set out the overall political background, recalling the difficult decisions made by the Heads of State and government in March 2007: a 20 % unilateral GHG emissions reduction target (30 % if developed countries join), a 20 % renewables target and a 20 % energy efficiency target. These targets are not just a political declaration, but are serious commitments based on an in-depth analysis and elaborated in the package put forward. The Commission's task is to deliver legislative and other initiatives and to turn the headline goals into reality. There is a clear need for partnership between the private and public sectors, as the public sector alone cannot effect the necessary change by itself. There is no one way to reach the objectives and the measures will have an impact on all sectors. Only by working across the board can we bring about the deep emissions cuts in the most cost-effective way. The proposal for reducing CO2 emissions from cars is one important piece of the overall jigsaw. It should not be looked in an old fashioned way, but as an opportunity to turn challenges into an advantage, such as leading the switch to a low carbon economy or taking a technological lead. The goal of limiting average emissions from passenger cars to 120 g CO2/km has existed already for a long time. The reduction should come from two sources: down to 130 g by engine technologies and the rest through other technologies. Catherine Day recalled the core principles for the design. Any future legislative framework should be competitively neutral, socially equitable and respect the diversity of the European automobile manufacturers, avoiding any unjustified distortion of competition. These principles represent the terms for reference for the debate. The Commission has to offer a sufficiently robust system of monitoring and control to ensure real implementation and to build in enough flexibility to ensure that cost-effectiveness can be maximised. There is no shortage of options as the impact assessment work has already identified 46 options. Now there is a need to look carefully at the most realistic and cost-effective options. She stressed the key questions for the debate:

How to set the target – as a uniform target, as a target modulated by a variable such as the type of car, or as a reduction from a baseline?

- On what should the target be applied – on different models, different manufacturers, on importers and dealers?

- What flexibility mechanism would work?

- What mechanisms are needed to guarantee compliance?

Whatever system is put in place, it needs to be predictable - for the citizens in terms of the emissions reduction and for the businesses for their planning.

Peter Carl (Director General for Environment) informed the hearing about the ongoing public internet consultation and encouraged all to participate in the consultation process. He recalled that the Environment Council endorsed the strategy a few weeks ago and that positive signals are coming from the European Parliament. The question is therefore not if or when, but how the reduction goal and the timetable which have been agreed will be delivered through the legislation. He outlined 6 main guiding principles:

(1) CO2/cars legislation is an essential component in the fight against climate change (passenger cars produce 12 % of overall EU GHG emissions and transport sector is the second biggest emitter). Since 1990, EU has reduced emissions by 5 % but the contribution of road transport increased by 26 %. In order to live up to the 20 % goal, it is not acceptable that the burden remains only on the other sectors. Transport emissions should also be reduced. The long-standing objective of 120g/km by 2012 will contribute as much as 20 % of the overall reduction effort still required to meet Kyoto. The Commission is proposing an integrated approach, because the requirements do not relate solely to new cars, but also on improvements to car components which could benefit the existing car fleet.

(2) The car industry plays an important role in the EU economy, but has to fight in order to remain competitive. The Commission understands their concerns and the strategy should provide for a stable and predictable environment for investments.

(3) Getting to grips with CO2 emissions from cars will help address concerns about security of energy supply by reducing reliance on imported fossil oils.

(4) All manufacturers should be treated with equal fairness and cars should be kept affordable as it does not make sense to produce clean cars that nobody can afford to buy. Legislation should be fair to all carmakers whatever their market niche and the distortions of competition should be avoided. The way the target is shared between carmakers should be sustainable and equitable.

(5) Addressing consumer's demand for fuel efficient cars would reduce compliance costs to manufacturers. Taxation is one important tool and Member States have an important responsibility in this field. Some Member states have begun to make use of this (most recently Spain). The Commission will propose an amendment to the fuel efficiency labelling directive to improve its effectiveness. Unfortunately, so far manufacturers have not replied to the Commission's invitation to sign a code of good practice.

(6) It is important to take a decision as on the legislation as early as possible in order to allow the car industry the lead-time it needs to deliver the CO2 emissions reductions required. The target dates back to 1990s and it is not a figure invented in February by the Commission. It is nonetheless important that legislators give a clear signal to the industry on how the strategy will be implemented as early as possible. We will endeavour to make a formal proposal if possible in 2007.

He concluded that:

- Moving to a low-carbon economy is a must, not an option and the Community objective of adopting an integrated approach to have a new car fleet with average emissions of 120 gram CO2/km is at the very core of the work

- There is a need to recognise the legitimate demands of consumers for better and safer cars and to inform them better about fuel consumption and its cost.

- The legislation should be equitable and respect the diversity of car manufacturers.

- The world needs clean and efficient technologies to win the battle against climate change. Those who lead the way will reap the rewards.

Heinz Zourek (Director General for Enterprise and Industry) stressed that, in line with the principles of better regulation, the Commission will try to listen to different stakeholders. The public hearing provides a good opportunity for this exchange. It is better to discuss CO2 and cars not only with the car industry, but also other interested parties, as the integrated approach involves other actors. Legislating on cars is not new. Nor is the sustainability concept. An integrated approach should result in four things:

(1) Progressively more fuel efficient cars and cleaner fuels

(2) Efforts should meet if not exceed 120 g – thus delivering on the commitment

(3) Retain the competitiveness of the industry without discrimination

(4) Set up a system, regularly improved and updated, with a need to keep lead time/instruments in place

Concerning the car industry's contribution to meeting the reduction target, it is possible to deliver on this although it should be admitted that the level of ambition is very high. The car technology pillar of the CO2 strategy has to respond to the three challenges (neutrality of competition, not favouring one over another, avoidance of unfairly biased solutions) should be socially equitable and sustainable. There is no point in delocalising the car industry and we should not behave in an irresponsible way with regard to global performance. The initiative is about a global strategy (preserving our climate). We should be equitable to the diversity of car manufacturers and should not exclude certain segments (no banning of specific models). It is important to give options – to respond to consumer wishes and to environmental necessity. On the other hand, it is important to keep in mind the costs because of the effect and unwanted social implications they might have. It may take time to renew the existing fleet. It is therefore important from this public consultation and public hearing to get ideas in order to gauge the cost impact, not

only the immediate impact, but the life-cycle impact. Contributions from other industries (outside the automotive industry) could be broadened in scope, not just measures targeting only the new fleet, but measures for the improvement of the fleet already in use. This would bring an additional benefit.

The Commission wishes to achieve two objectives:

- To rely on data brought forward to its attention by experts
- To avoid that this data is biased

The Commission is receptive, but this is only the beginning of the process to be continued in the European Parliament and the Council. The Commission will have to respond to questions on the choice of the different solutions.

Catherine Day (the Secretary General) assured participants that the Commission has not yet decided on its preferred options. Therefore the discussion is important. She introduced the next agenda item, which set the scene for further discussion with 5 different views: the automotive industry, suppliers, NGOs, consumers and the international perspective.

Agenda Item 1: Automotive industry perspective

In his presentation, **Ivan Hodáč (ACEA)** underlined that this regulation represents the most important issue for the car industry. He argued that the industry had delivered on the voluntary agreement. The Community strategy is based on three pillars and only the industry's commitment delivered (an unbroken reduction trend of 13 % until 2004 and fleet composition changes can be observed). In his view, external factors pushed in the opposite direction and account for 15 g/km. These external factors should be considered in the assessment of whether the industry met the target. The automotive industry has introduced new technologies to the market every year. ACEA supports the political target of 120 g/km, but as a part of an integrated approach (together with eco-driving, alternative fuels, infrastructure measures). An integrated approach means that everybody has to participate. CO2 taxation needs to be harmonized across the EU. The target at stake seems in ACEA's view significantly more ambitious than the EU target of 20 % reduction between 1990 and 2020. On cost-effectiveness, both ECCP and the Stern review concluded that car technology is a high-cost measure. Other measures are much cheaper. This does not mean that the industry will not continue to improve vehicle technology. He illustrated the integrated approach with two potential measures (eco-driving (constant speed, which can deliver savings and reduces emissions across the board) and infrastructure (e.g. the Japanese experience). Complementary car technologies account for more than 5 g/km.

In conclusions, he reiterated ACEA's main points:

- Support for the 120 g target
- An integrated approach is needed

- The timeframe of 2012 is unrealistic and an appropriate lead-time (2015 at the earliest) is necessary

- Any system must safeguard diversity and social equity. Cars must remain affordable.

- Mass appears to be the most suitable parameter

- Flexibilities are needed (for instance group averaging, banking, credits for renewable fuel vehicles)

According to **Hiroki Ota (JAMA)**, JAMA members make an important contribution to the EU economy (15.9 bln in research) and are actively pursuing the introduction of CO2-efficient vehicles as part of the fight against climate change. He put forward two main concerns with the upcoming framework: 1. the 2012 target application year and 2. target values. Firstly, the target application year should be postponed as the development of a new car model requires a total lead time of at least 7 years prior to regulatory application. Japan has introduced fuel-efficient standards, giving a lead time of 8 years to the industry. In JAMA's view, the target application should be postponed until 2015 at the earliest. Secondly, JAMA supports the 120 g/km target, but this goal can only be met through a combination of efforts by various stakeholders (including industry, Governments and the driving public) in an integrated approach.

For the legislative framework JAMA recommends that the EU adopt a segmentation system based on vehicle mass categories. On complementary measures, JAPA supports the increased use of bio-fuels. Their blend rates should be determined on the basis of a comprehensive evaluation of their impact on emissions, drivability etc. Further CO2 reductions in the road transport sector will require improved road infrastructure and more effective traffic management as well as improved driver behaviour.

He illustrated this integrated approach by reference to the Japanese strategy which relies on three elements: 1. greater fuel efficiency, 2. traffic flow and 3. eco-driving. By adopting these measures, an estimated 54.9 Mt of CO2 will not be emitted in order to meet the Kyoto Protocol-related 2010 CO2 reduction target for Japan's road transport sector.

In conclusion, he stressed two major points:

- The application target year should be postponed until 2015 at the earliest

- An integrated approach should be considered

Agenda Item 2: Automotive supplier's perspective

In his address, **Lars Holmqvist (CLEPA)** assured participants that CLEPA members are fully committed to addressing climate change. However, setting the target of 120 g/km for 2012 does not provide for a long-term solution and a longer perspective is necessary. Today advanced technology is capable of reducing CO2 emissions, but a sufficient lead-time is needed. In his view, it is impossible with the current institutional set up to expect the legislation to be in place before 2009. The investment decisions driving the technologies to the market cannot take into account any late changes in the legislation.

CLEPA is not afraid of more ambitious targets, but there is a need to implement them and test them. Cars should remain reliable, safe, environmentally friendly and affordable in order to guarantee future mobility. Member States should stimulate demand for more fuel-efficient vehicles through labeling and/or taxes and there should be more investment in R&D. Good practices should be promoted (advertising). For the existing fleet (which is getting older and older), retrofitting is a solution. Among the complementary measures, CLEPA wishes to concentrate on telematics, tyre pressure monitoring, low rolling resistance tyres, alternative fuels and energy-efficient air conditioning. Use of eco-driving devices should be recognized alongside awareness campaigns. He quoted one experience with 2500 cars where a reduction in fuel consumption of 15 % was achieved through eco-driving. However, he admitted that this cannot be achieved across the board. He called for the agreed 10 years roadmap in CARS21 to be applied.

In her presentation, **Fazilet Cinaralp (ETRMA)** explained the technical details of the tyre related measures, mainly in respect of tyre rolling resistance. The latter contributes together with a vehicle's other sources of drag, to its fuel consumption and, thus to its CO2 emissions. The rolling resistance of a tyre depends mainly on two factors: tyre design and tyre inflation pressure. Depending on the type of road and driving style, rolling resistance causes about 20 % of the CO2 emitted by a car, and about 30 % of the CO2 emitted by a heavy truck. Two main tyre- technological solutions have a positive impact on CO2 emissions reduction: 1. tyre pressure maintenance and 2. low rolling resistance tyres (accounting respectively for ~2 and 4 % of expected CO2 emissions reduction). Concerning the correct tyre inflation pressure, she explained the relationship with the rolling resistance: the lower the tyre inflation pressure, the higher the effect on rolling resistance. With a permanent 20 to 25 % under-inflation, the tyre rolling resistance is increased by 10 %, which in turn results in about 2 % more fuel consumption. Mrs Cinaralp emphasized the relationship and interdependence of tyre performance items and that maximized performance of one may have impacts on others.

She concluded by setting the main tyre industry proposals and their contribution in terms of CO2 annual savings:

- Establishing maximum limits and implementing a grading for rolling resistance to assure that consumers can make informed choices (- 22 Mt of CO2 annual savings)
- Maintenance of inflation pressure at the right level (10 Mt of CO2 annual savings)
- Observe minimum limits and a grading for Wet Grip to make sure that low RR tyres are achieved without compromising safety
- Sufficient lead time is needed for all sectors
- Proper enforcement of rules in order to ensure compliance and therefore certainty on the market

Agenda Item 3: NGO's perspective

In his presentation, **Jos Dings (Transport and Environment)** elaborated on four critical issues: 1. Impact assessment work, 2. targets and timelines, 3. compliance and 4. the class parameter.

In his view, the impact assessment has quite serious flaws:

- Its scope should be broadened to cover also the economic and environmental impact of the rules through lower oil imports and oil prices. He argued that costs and benefits are not symmetrical in geographic terms : most of the (oil) savings of the policy are net welfare gains for the EU, while most of the costs are not net welfare losses to the EU as they are investments into the European automotive supply industry. Therefore, the costs of the policy are not really costs but investments of capture a share of the low carbon technology market

- The effect on oil prices is likely to be significant – the EU is the world largest car market and almost the whole of Asia follows EU air pollution standards and is likely to be strongly influenced by EU fuel efficiency standards. The upcoming regulation represents the most significant policy to reduce oil demand (similar to the introduction of US fuel economy standards in the 1970's).

- The environmental impact of lower marginal oil demand should be addressed: with tar sands or CTL (coal to liquid fuel) replacing increased CO2 emission related to crude oil process.

- The impact of lower oil prices on coal/gas balance should be addressed as high oil/gas prices lead to a shift back to coal in power generation with the corresponding increased emissions.

- Not only low carbon technologies should be addressed, but also low carbon car specifications, i.e. look at possibilities of whole process of car design.

- The current impact assessment does not address the learning effect and mass production (for instance 3-way catalysts were estimated to cost 700 euro, whereas the current price is about 10 % of that figure).

Concerning targets and timetables, Jos Dings emphasized that the lead time given to the industry was already extended twice from 10 years to 17 years as the target was shifted from 2005 to 2012, and tat the target moved from 120 g initially to 130 g. Due to a decade of regulatory inaction, only 5 brands are close to meeting the voluntary agreement. The 120 g target by 2012 is perfectly feasible with the cost of 19 euro per tonne of CO2 according to the impact assessment. He concluded on this point that long-term targets are of absolute necessity for the industry and climate/energy policies. The regulator should accept that technological uncertainties exist.

The ambitious target would however mean nothing without a decent compliance mechanism. He warned against giving access to CDM/JI credits or ETS credits. He suggested a penalty of €150 per g/km per car as appropriate based on the marginal abatement costs. In case, it was lower, the industry would pay this as a tax which is not the purpose of this regulatory policy.

In principle the target should not distinguish between different types of cars. At least over time standards should become independent of car classes. If, however, a utility parameter is politically necessary in the short term, it should be a fair representation of customer value and avoid perverse incentives that increase CO2 and safety. Put

differently: the parameter should give car makers the maximum degree of options to reduce CO2. Footprint, number of seats or surface (shadow) represents the best compromise. They all enable car makers to reduce CO2 by reducing weight, height or power of the car – improving safety at the same time. Weight, height and power of the car therefore should definitely not be part of the utility parameter.

He concluded:

- The targets should be come stricter over time, 120 by 2012, 80 g in 2020, 60 by 2025
- A strict compliance regime should be set
- Footprint or number of seats should be chosen as utility parameters
- the impact assessment should take the strategic and global outlook (impact on oil markets and car suppliers)

Agenda Item 4: Consumers perspective

According to **Laure Degallaix (BEUC)**, the car manufacturers' voluntary agreement has failed. Transport sector is responsible for 12 % of EU total CO2 emissions and its emissions rose by 26 % between 1990 and 2004. This sector has been the worst performing one regarding the achievement of EU objectives under the Kyoto Protocol. The car manufacturers' voluntary agreement lacked ambition, transparency and efficacy – in the same way as the vast majority of voluntary agreements have proven to be in the past. She denounced the increasing use of such agreements by EU institutions in the environmental area. It is time for car manufacturers to take their responsibilities and for the EU Commission to adopt a strong and ambitious regulation to reduce car emissions.

In overall, the proposed Commission's integrated approach is welcomed by EU consumers' organisations. The policy toolbox is varied in this area and all economic actors should contribute to the reduction of CO2 emissions. However, the bulk of reduction should come from individual car emissions values. Other complementary technological improvements (such as gear shift indicators or biofuels) should only be additional to mandatory improved vehicle technology measures. All tools/techniques should be measurable, accountable and easy to monitor. Taxation and fiscal incentives should also be part of the legislative framework. In order to increase consumers' interest and contribution, energy efficiency, as well as sustainable development and mobility, should be promoted. Up to now, there has been a clear discrepancy between the increasing market for more powerful and fuel-intensive cars and the objectives of the EU climate change and energy efficiency policies. It is necessary to ensure coherence between market and political objectives; this only will guarantee the credibility of the EU policy in the future. An improved EU labelling scheme is needed as it is not harmonised across the EU and its visibility is low. This was illustrated by comparing the labels currently used in Germany and in the United Kingdom. Finally, rules should be imposed on advertising and marketing to avoid misleading messages and provide consumers with clearer and more visible information on CO2 emissions. Ms Degallaix illustrated this with an advertisement which claimed that a hybrid car, whose CO2 emission level was of 192g/km, was low-emitting. Consumers should have the possibility not only to compare products but also to identify which are more ecologically-friendly.

In conclusion:

- Ambitious regulation is a matter of urgency
- The implementation of this regulations should be transparent, and its progress should be monitored and made publicly available
- The 120g/km target for 2012 should be adhered to and should be implemented in a transparent way
- Intermediate and long-term mandatory targets for car emissions values also needed, it is unclear what is foreseen by the 2010 review in the Commission's communication
- Fundamental and sustainable change in the transport sector is needed, energy efficiency should become a minimum requirement

In his presentation, **Wil Botman (FIA)** presented the FIA vision from European, global and consumer information perspective. He applauded the efforts of the automotive industry so far, but acknowledged that the cars have become heavier and that this has resulted in increased CO2 emissions. This is partly dues to additional safety features included on cars. He welcomed the 120g/km target and the integrated approach. In his view, there is a role for complementary measures, such as infrastructure and consumer behaviour. Mobility has increased, but the infrastructure has not grown to the same extent. The consumers should have the right to choose to but a bigger car but must have the information to make an informed choice. There are a number of measures which could influence consumer choice: CO2 based taxation, taxation on new cars, and the cost of fuel (which is in itself CO2 based) and eco-labelling. The information on labels is often hidden and more work should be done on improving eco-labelling. Driver behaviour could be influenced by eco-driving, and this would not only cover new cars but also the existing fleet and could result in CO2 savings of up to 10%. Efforts should be fairly distributed across the industry. From the global perspective, Mr Botman underlined that the climate change is a global problem and EU must look beyond its own borders. EU should therefore work in international fora, such the UNECE working party, where the fuel quality will also be addressed. He mentioned the EcoTest developed by ADAC with a database of 200 current models. FIA will further push for a harmonised clear fuel label as this is a promising way to influence consumer's choice.

Agenda Item 5: International perspective

In his presentation **Drew Kodjak (ICCT)** placed the European proposals within the international context and gave some thought to addressing the competitiveness issue in the design of the regulation. He presented the early findings of a study done by ICCT reviewing passenger cars standards, fuel economy standards and GHG emissions. The report is entitled 'Passenger Vehicle Greenhouse Gas and Fuel Economy Emissions Standards: A Global Review'. Both the EU and Japan are still global leaders with the most stringent passenger vehicle greenhouse gas and fuel economy standards. Japanese standards are expected to lead to the lowest fleet average GHG emissions (125g by 2015). California was bolstered recently by the decision of the US Supreme Court that GHG is a pollutant and can be regulated by the Environmental Protection Agency. To date, eleven other US states have adopted the Californian standards. The US lags behind,

but a lot is happening in the US Congress and the executive branch. A fuel economy standard of 35 mpg by 2020 was passed by the Senate. South Korea opted for different, more lenient standards for vehicles with larger displacement engines. The shift in the market is expected to result in an increase in GHG emissions. He explained the graphic with different CO2-equivalent emission standards based on the European test cycle and explained the methodology and translation of various vehicle standards (i.e., CO2, GHG and fuel economy) to enable a fair and uniform comparison. Japan has the most stringent standards, followed by the EU. No action has taken place in China since 2004, but China has new taxation measures in place. By 2011, the new U.S. passenger vehicle fleet is expected to achieve 236 g CO2/ km under the European test cycle. As to the magnitude of reductions, the EU has done an excellent job with a sufficient long lead time since 1995.

Competitiveness is a significant issue (also for the US): looking at the table showing the ranking of different manufacturers, there is a difference between the best performing (Peugeot, Fiat, Renault) and the low end, mainly German manufacturers. It is challenging but possible to reconcile environmental sustainability with competitive neutrality by adopting an appropriate policy design.

Drew Kodjak explained that the US has grappled with the same problem of competitiveness among manufacturers for many years. The latest reform of CAFE (Corporate Average Fuel Economy) changed dramatically the standards that apply to light trucks. This regulation is now based on size (by footprint) and on continuous function, correlating each vehicle size to a fuel economy standard. As a result, each manufacturer will have its own fleet average fuel economy standard based on its own sales mix of light trucks, starting in 2008. The slope of the function was designed in a way to disincentivise the upsizing of vehicles in order to achieve less stringent standards.

In conclusion:

- The EU has done a lot: long-term standards with sufficient lead time, high fuel taxes to reduce demand for driving and energy consumption, differentiated taxes in order to ensure higher diesel penetration

- It is a good idea to shift from voluntary to mandatory policy: for instance, Canada envisages the same move, starting in 2010

Looking ahead, the EU should continue with long-term targets. It is possible to design the policy in a way which addresses competitiveness concerns – the US is a good example here. The policy and any additional fiscal policies should promote technology innovation and discourage increases in vehicle size, weight and power as it is difficult to reverse the trend.

Session 2 : Statements by other stakeholders, Q and A

In his statement, **Axel Friedrich (Umweltbundesamt, UBA)** presented some thoughts about how reductions could be achieved through retrofit. A 125 KW (170 horse power) gasoline car was selected and through a number of measures with small CO2 reduction contribution (such as transmission with long gear ratios, downsized engine, start-stop function, heat storage, mirror substitution, low resistance tyres), the CO2 emissions of

the basic vehicle were brought down from 172 g to 131 g with no changes in horse power, safety etc. He informed participants about another retrofit project carried out by VOX-TV in cooperation with 9ff Dortmund. Most of the reduction came through weight reduction. The goal is to bring the Diesel Golf below 80g/km CO2. He suggested a limit for each vehicle model based on the area of the vehicle as nearly all manufacturers would have the same burden and stressed that weight is not the best parameter.

In conclusion, he argued that:

- There is no need to develop new vehicles as this adjustment can be made on existing cars.

- Only exchange of parts and improvements are enough to meet the 130 g/km target in 2012.

According to **Sophie Dupressoir (ETUC)**, the organisation is supportive of the Commission's proposals. The future regulation should be based on 3 key principles:

- It should help the European industry to improve its long-term competitiveness. Fuel efficiency and CO2 emissions standards will be key future drivers for global vehicle markets, and especially emerging markets. The EU automotive industry has not stepped up innovative efforts on hydrogen or hybrid cars to the same extent as international competitors have already done. The regulation should therefore include long-term targets in order to trigger the necessary innovation and investments and bring significant competitive advantages to the automotive industry.

- The deadline of 2012 should be kept. A fair burden should be imposed on all industries as an advantage given to one industry would impose additional burden on others, including workers and consumers.

- The target should be set according to the polluter pays principle, rewarding the early movers while not threatening the viability of the high emissions car producers.

An open European social dialogue on the implementation of climate change policies should be established.

Nikolaus Schmidt (EMF) commented on the contribution of the automotive industry to employment in Europe (2.2 million direct jobs, 12 million indirect). It is therefore important to determine framework conditions leading to growth, innovation and employment. This should be at the heart of industrial policy. The measures for fighting the climate change should include the transport sector. The European EU Commission's objective is supported, but serious discussions are needed on the timetable. He welcomed the principles on which the future framework should be based (competitively neutral and socially equitable and sustainable reduction targets which are equitable to the diversity of the European automobile manufacturers and which avoid any unjustified distortion of competition between automobile manufacturers). In line with these principles a legislative approach should be shaped in a way that:

- establishes targets for the further reduction of CO2 emissions for all kinds of cars (all segments of PC's and LCV's) – with higher reduction targets for cars with higher weight and power.

- ensures that all types of cars can still be produced in the future

- minimizes the risk of job-losses and plant closures

- includes a control mechanism on the European level

As for the mechanism of implementation of the target, in his view a closed emissions trading system will not fit with the CO_2 reduction strategy, as it is not competitively neutral. He suggested the establishment of a European fund collecting the penalties, which could be used to finance measures to develop an integrated and inter-modular system in Europe – including R&D.

Arnaud Duvielguerbigny (AEGPL), commented on the LPG (liquefied petroleum gas) positive contribution in terms of savings.

LPG cars can be either brand new bi-fuelled cars or petrol-fuelled vehicles converted to LPG. About 4.5 million LPG-fuelled vehicles run on LPG in EU, supported by a network of 22,500 filling stations.

The current fleet of LPG-fuelled vehicles saves 1.4 million tones of CO2 per annum (compared to petrol-fuelled cars). LPG is also good from the energy diversification aspect, with less than 1.7 % imports coming from the Middle East. AEGPL would like to see an equal consideration given to all alternative fuels, that is to say the same kind of regulation for alternative gaseous fuels, LPG and Natural gas. In addition, they support the introduction of an instrument to allow car manufacturers selling bi-fuelled (petrol + LPG) vehicles to base their CO2 emissions declaration on the LPG mode. AEGPL agrees with the specific target and the timeline set by the Commission in its Strategy, and is ready to contribute to the debate.

According to **Martin Suenson (EUROPIA)**, an integrated approach is a good way forward. He expressed some sympathy for the wish to have a target that could be monitorable and assigned. However, other soft measures such as infrastructure or eco-driving should not be overlooked. An integrated approach demands an integrated and holistic impact assessment. There are secondary effects and mutually conflicting goals that must be understood in order to arrive at coherent strategies and regulation. He illustrated this point on with three examples: First, the increased dieselization will reduce the emissions of CO2 from cars, but will increase the CO2 emissions from refineries and will even lead to an overall increase in CO2 emissions if taken too far. Second, given a limited availability of biomass, if biomass is used for transportation fuels, it will not be available for other CO2 emission reducing purposes, e.g. the generation of heat and power (where the CO2 avoidance potential is roughly double). Biomass and bio-fuels is being mentioned in many different contexts and a coherent set of strategies must take account of the total availability of biomass as a fuels source. Finally, increasing environmental specifications for fuels, for example the sulfur content, are leading to increased processing in the refineries and hence increased CO2 emissions in refineries, so holistic environmental regulation must recognize and balance these trade-offs.

Michela Vuerich (ANEC) stated that consumers could play a role when buying a new car, but need to be well informed and thus need comparable information. This could be achieved through harmonised and improved car labelling across the EU, with graphical displays and comparable energy efficiency grades. However, such a labelling scheme is of little use unless supported by mandatory car standards. High targets for car emissions should also be imposed.

Joeri Thijs (Greenpeace) reacted to the statements of the industry representatives on the lead time. According to him, the lead time has already been there for 12 years and the 120g target, set in 1995, was postponed already 2 times. He claimed that today, with even much more certainty and proof showing the urgency of measures to tackle climate change and the need for a strong reduction of CO2-emissions, the Commission plans to weaken again this 12 year old target (by imposing only a 130 g by vehicle improvement). According to Mr. Thijs, this is because the car industry is claiming that the 120g target is not achievable and that more time is needed. He stated that not only did the industry already have a lead time of 12 years, but that it is also incorrect to say that this target is not achievable by 2012.

A recent study available on www.cleangreencars.co.uk showed that if all models in each class had the same CO2-output as the best performing models in their own class, the target would already be almost reached today. This shows again that it is not unrealistic at all to achieve 120g by 2012. Greenpeace expects the EU to take its own climate policies serious, and expects that the EU will set a binding 120-target (by vehicle measures only) for 2012 and ambitious long term targets. Finally, he pointed out that it would be outrageous and counterproductive to set an overambitious EU target for biofuels and at the same time remain much less ambitious in making cars more fuel efficient.

Jeroen Verhoeven (Friends of the Earth), reacted to ACEA's statement on competition issues. In FoE's view, competition is about adopting best practices, and if all car manufacturers adopted existing best practices in every class, the target of 120 g could be reached now. H drew attention to the role of car advertising, as the majority of the advertisements are promoting high CO2 emitting cars such as SUVs. Consequently, car advertisements failed to show the CO2 emissions of cars, which is a clear responsibility of the automotive industry. At the same time, a "green washing operation" is happening where high CO2 emitting cars are being advertised as environmentally friendly. Biofuels are also being used as a tool to green wash the trend to ever more powerful cars. As an example, a SAAB flexi-fuel car which is running on ethanol has 30 more horsepower than the regular version. "Mr Verhoeven raised the question whether this additional 30 horsepower is necessary and logical, especially when the car manufacturers are simultaneously promoting the idea of “eco-driving”. Regarding energy efficiency, if the 120g CO2/km target is replaced by a 130g CO2/km target, while counting on the use of biofuels, this would lead to using biofuels as a substitute for energy efficiency. On top of this, converting biomass into biofuels is not the most energy efficient use of biomass, and biomass is a scarce resource as well. Finally, he questioned how the proposed policy can be in line with the EU target to increase energy efficiency by 20% by 2020.

Stefan Singer (WWF) expressed his support to ideas expressed by the environmental NGOs community and the criticism by T&E in its morning presentation. He reiterated that there is no reason for further delay in reaching the 120 g target. Opportunities for

reaching the target were there and it is logical if voluntary approaches have missed the target, it should now become mandatory. Eco-driving, rolling resistance or tyres pressure monitoring systems are certainly valuable elements and educational tools, which should be made mandatory in any kind of system. WWF is however concerned by the the question of who should be accountable if those activities became part of the regulation. Secondly, WWF is in favour of sustainable biofuels, but is concerned if they count towards the target. If credits are generated through the use of biofuels, consideration should be given to what happens with debits from the use of dirty fuels (tar sands, CTL). Biofuels should be part of the policy on fuel quality and reward the fuel suppliers making them accountable for rendering biofuels sustainable. Finally, concerning the transport, the first generation of biofuels will only reduce growth of emissions. The IPPC report concludes, 90 % of emissions reduction should come from reductions in the industrialized countries. The transport sector should therefore strive to become a low carbon sector in order to achieve the objectives of halving transport emissions by 2020 or 2025.

Hermann Meyer (Volkswagen) commented on the short presentation from Mr Friedrich and underlined that it is positive that both Mr Friedrich and IKA work on the issues. The more institutions contribute to find ways to increase the CO2 efficiency of cars, the better. However, he regretted that Volkswagen was not consulted properly on the presentation prior to the public hearing. He expressed caution as some of the results seem to be derived from the simulations, and not yet shown by vehicles themselves. He also explained that through changes to seats or the hood, severe safety considerations are at stake. Conclusive statements on safety impact can only be made after crash tests. Finally, whatever changes are made on the prototype, it does not mean that this car can be produced in high volume and that this car can perform in all conditions. This would have to be thoroughly investigated. Volkswagen is prepared to discuss the results with Mr. Friedrich and the IKA in more detail in the future.

Frank Van West (FIA) stated that the EU has a harmonized directive on labelling, but unfortunately at the time of its adoption no agreement on the label was found due to subsidiarity considerations. As a result, 12 different consumption labels are used for the same car and this is very confusing. He informed participants about ADAC work on labelling. In assignment of the Commission (DG Environment) the ADAC has produced a report which could be used as a basis for future harmonisation. In addition, ADAC has the ecotest database with 200 car models. In conclusion, he pleaded for a legally harmonised label.

Closing remarks

Catherine Day (Secretary General) stressed that the Commission has not made up its mind and pointed to the fact that the many issues raised are interconnected. A holistic approach is needed.

Peter Carl (DG for Environment) elaborated on the different responsibilities of various actors responsible for the implementation of the strategy. Four different actors have an important role to play:

- The European institutions: they have the responsibility for presenting the proposals not only on core issues, but also on associated issues (labelling)

- Member States: they have powerful tools, such as taxation and if they were to take quite significant measures, this would drive down the cost of the transformation of the EU industry.

- Manufacturers: through investment in new technologies and research, a tremendous amount can be achieved by the industry (slightly smaller, lighter cars, down sized cars, advertising)

- Consumers: driving less, consuming less fuel

Heinz Zourek (Director General for Enterprise and Industry), explained that the focus of the session was on the hard legislation, but the contribution of labelling or infrastructure should not be underestimated. DG ENTR is used to working through an approach based on type approval. In this particular case, the scenario changes from a voluntary to a mandatory approach. However, there is no experience on market surveillance. Control costs should not overshoot the benefits. He emphasized also the importance of tyres. With the type-approval directive on tyres, tyres could be addressed in a comprehensive manner (not only CO2, but also noise). This directive might have immediate benefits as it would address the fleet in use.

Catherine Day (Secretary General), concluded that the targets and the timeline are already decided and that the discussion should concentrate on the way to get there. She appreciated the usefulness of the meeting, which had enabled participants to make public their different views. The Commission will now have to look at the different options and weigh them up. Impact assessment is important for the Commission to make an informed choice and explain to others the Commission's choice. She reassured the audience that this was not the last time that the Commission would engage collectively with stakeholders.

ANNEX III: DETAILED RESULTS OF THE PUBLIC CONSULTATION

Review of the EU strategy to reduce CO_2 emissions and improve fuel efficiency from cars

Report on the Public Consultation May – July 2007

Stakeholder consultation

Introduction

A public consultation was carried out between 5 May and 15 July, 2007 in order to gather different views on how the Commission's proposed strategy should be implemented. The public consultation was based on a web-tool developed by the Commission. All contributions were submitted electronically.

The Commission did not provide any specific questions do be addressed, but indicated that the contributions should relate to reaching the 130 g/km objective through improvements of vehicle technology. In particular, the Commission stated that it would welcome further input for its impact assessment in terms of costs and benefits for the implementation of the various elements of the proposed strategy.

A substantial number of contributions from were submitted. The total number of contributions was 2390, divided between the following general stakeholder groupings:

- Contributions from individuals[38] : 2340
- Industry organisations[39] : 23
- Governmental organisations : 4
- Non-governmental organisations[40] : 23

The substantial number of contributions and the heterogeneous nature of organisations within the same grouping makes it difficult to draw conclusions However, after having carefully examined all contributions some general trends have been identified. Individuals and NGOs mostly argued for the stricter application of targets, timeframes and flexibility in order to ensure the environmental outcome of the regulatory framework. Industry organisations generally provided support for a less stringent target and more flexibility which they consider a more realistic approach.

The following sections attempt to summarise the contributions to the public consultation with respect to key elements of the Commission's revised strategy as presented in the Communication. It should be kept in mind that a number of contributions go against

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38 2278 of these contributions were identical (but in different languages)

39 A majority of which were car manufacturers, their suppliers, and industry associations organising these

40 A majority of which were environmental NGOs, but also including consumer organisations, trade unions and industry associations not directly associated with the automotive industry

these generalisations, and that the majority of contributions only address a few of the different elements.

Reactions on the main aspects of the Commission's communication

Statutory targets

The Commission's preference for introducing statutory targets to reduce CO2 was widely supported. The vast majority of contributions addressing this issue stated that a new strategy involving legislation is needed in order to reach the Community objectives. Representatives of the automotive industry specifically did not clearly indicate if they support a statutory target, but acknowledged that a reviewed strategy is necessary despite their efforts under the voluntary commitments.

Mandatory compliance in 2012

The contributions expressed diverging views on the feasibility of the Community objective to reach the target by 2012. NGOs (including trade unions and consumer organisations) and individuals showed general support for the suggested timeframe and underlined that the industry has been aware of the 2012 targets at least since the Commission's previous strategy to reduce CO_2 emissions from cars was adopted in 1995. Consequently, they argued that the lead time necessary for the industry to adapt production and product ranges is sufficient. Industry organisations on the other hand strongly argued that the 2012 timeframe is not realistic, especially if the 130 g/km objective is retained. The main reason for this view (as expressed in the contributions) is that the development and product cycle in the automotive sector demands more lead-time in order to introduce new technology.

The integrated approach

The integrated approach is, based on the assumption that further-reaching and less costly reductions can be achieved by combining improvements in vehicle technology with complementary measures, was widely embraced by the different stakeholders. However, there is a clear disagreement between the different stakeholder groupings with regard to how the burden should be shared between the different elements of the integrated approach. These issues are further addressed in the sections below.

The 130 g/km objective to be met through improvements of vehicle technology

Contributions showed diverging views with regard to the 130 g/km objective. NGOs and individuals widely expressed support for even tougher targets, such as a 120 g/km target to be met by improvements in vehicle technology alone. Industry organisations on the other hand[41] generally indicated that the 130 g/km target is unrealistic, and that the overall objective of 120 g/km should be reached by a wider application of the integrated approach.

Complementary measures to obtain further reductions by 10 g/km

[41] Especially representatives of the automotive industry, including ACEA, JAMA and KAMA

Again, the views of NGOs and individuals converge on the view that complementary measures should not count towards the 120 g/km target. Contributions from Industry organisations generally suggested the opposite, indicating that the complementary measures should indeed count towards the overall target, and consequently should result in a *higher* target to be reached by improvements in vehicle technology.

As regards the complementary measures which should form part of the Community strategy, a number of contributions pointed towards measures which were mentioned in the Commission's Communication as possible measures at the Member States level. Examples of these are eco-driving and investment in road infrastructure. While it is difficult to generalise on this point, most stakeholders appeared to favour a broad use of complementary measures. Opinions differed however on the extent to which the complementary measures should affect the target to be met by improvements in vehicle technology.

Method to set the target

As regards the *overall method* to set 2012 targets, two main views emerged: individuals and the majority of NGOs generally expressed support for a uniform target to be applied to all cars or all manufacturer averages, while industry organisations generally argued for differentiated targets in order to take the diversity of manufacturers into consideration (such as targets set by a utility function). A relatively smaller number of contributions addressed issue of utility parameter to be used if a utility-based target function would be used. Again, the views diverge between NGOs and individuals on the one hand and industry organisations on the other. The former generally argued for footprint (or pan area), the latter for weight. The main arguments expressed for weight were that this parameter would provide for international convergence and a more equal burden-sharing between manufacturers. The main arguments put forward for footprint (or pan area) were that this parameter is more difficult to alter and that it would avoid perverse effects (such as manufacturers increasing weight in order to face a higher target).

Flexibility, enforcement etc

A relatively limited number of contributions addressed the issue of flexibility. The vast majority of contributions support a target to be met *on average*, i.e. not absolute targets that would prevent vehicles exceeding the target to be placed on the market. A majority of contributions also implicitly supported the possibility for manufacturers to be held responsible for their average emissions rather than the emissions of each specific model.

As regards emission trading between manufacturers, many Industry organisations addressing the issue argued against allowing for trading in the regulatory approach, while some NGOs in particular argued for allowing this possibility. However, some representatives of the automotive industry suggested that the inclusion of the transport sector in the existing EU Emission Trading Scheme should be further evaluated, whereas NGOs tended to oppose this approach.

A limited number of contributions also addressed the issue of enforcement. While many contributions at least implicitly acknowledged that fines should be imposed on manufacturers in case of non compliance, the opinions on the level of fines were divergent. NGOs generally argued that fines must be set at levels which deter

manufacturers from non-compliance (i.e. missing their 2012 targets), while representatives of the automotive industry in particular were less explicit on the issue.