Cost-Oriented Approach in the Process of CO2 Reduction of a Car Manufacturer

Masterarbeit

zur Erlangung des akademischen Grades „Master of Science (M.Sc.)“ im Studiengang Wirtschaftswissenschaft der Wirtschaftswissenschaftlichen Fakultät der Leibniz Universität Hannover

vorgelegt von

Name: Prause Vorname: Sven

[redacted] [redacted] [redacted] [redacted]

Prüfer: Prof. Dr. Michael H. Breitner [redacted]

Hannover, den 04. August 2016

Table of Content

1. Introduction

1.1 Current challenges and relevance

In the past years, regulations of the CO2 emissions and fuel consumption of motor vehicles have been introduced in the worldwide greatest sales markets China, the United States and the European Union. Those regulations aim to diminish the climate change and to reduce the economic dependence on oil imports. All regulations have in common to restrict the average CO2 emissions of new registered vehicles of a car manufacturer on a predefined value. If the limits are not achieved, the manufacturers will have to fear sanctions such as financial penalties or sales prohibitions.

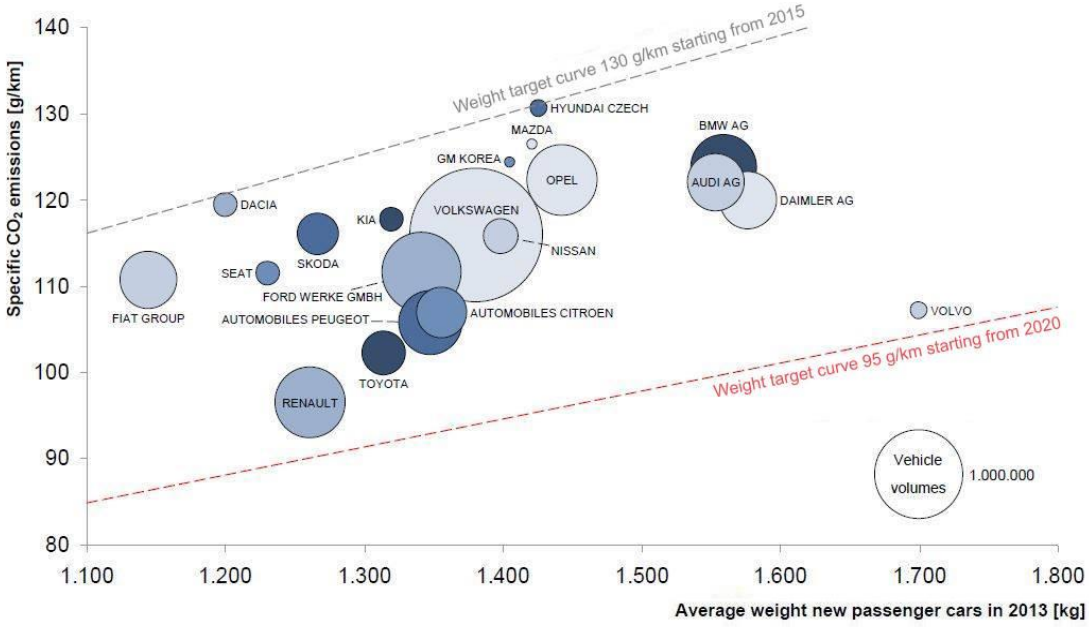

Figure 1: CO2 emissions of the car manufacturers in the EU in 2013[1]

The permitted level of CO2 emissions is reducing significantly in all legislations in the upcoming years. In the European Union (EU) the weight-related CO2 limits will be tightened by an average from 130 g/km to 95 g/km per vehicle by the year 2020, which corresponds to one of strictest regulations in the world.[2] Figure 1 illustrates the average fleet emissions of all big car manufactures in the EU from the year 2013. The target value until 2020 of in average 130 g/km is already reached by all manufacturers.[3] But to meet the following target of 95 g/km, the need of action is still high. Thereby, the reduction of the fleet emissions will be way harder than before. On the one hand, the relatively easily implementable reduction measures have already been realized, what brings as a consequence that the financial and

[1] Own illustration based on EEA (2014), p. 24.
[2] See Verordnung (EG) Nr. 443/2009 (2009).
[3] See EEA (2014), p. 23.

technological expenses will be higher. On the other hand, the development of the demand is counterproductive to the emission reductions, as a view on the German vehicle market exemplarily shows. For a majority of the customers, low fuel consumption does not have priority, so that they would not accept lower requirements on driving comfort, safety or purchase price.[4] The market share of Sport Utility Vehicles (SUV), which tends to consume more fuel, constantly increases from 11.4% in 2010 to expected 28% in 2020.[5] The average performance of all motor vehicles has also been rising from 121 HP up to 140 HP in the past 10 years.[6] All those facts have been resulting in decreased CO2 reduction rates for the manufacturers. Already in 2014, the yearly reduction of CO2 emissions in Germany was at a level of 2.6%, whereas in the previous years it was at 3%.[7]

The car manufacturers are facing the challenge to continue offering attractive products for the customers and simultaneously reaching the fleet emissions targets. Against this background, the fleet legislation allows a flexible organization of the single motor vehicle emissions. To continuously offer a large range of various motor vehicle models, the car manufacturers have the possibility to build up support relations between low and high emission models. The determination of those support relations preferably takes place at an early stage in the product development by target values. With the CO2 target, the reachable emission values for a motor vehicle model is specified and can be higher or lower than the legislation value according to the support relation.

There are many requirements for the CO2 target determination process. On the one hand, the CO2 targets have to represent the technical feasible and economically reasonable reduction objectives. And on the other hand, they are supposed to match with the product character of the vehicles and the reduction targets of the competition. At the same time, the targeting is expected to take place at an early stage of the product development and with reasonable expenses. Previous methods of the targeting process are hardly systematized and do not consider many economic criteria. That is the reason for the examination of a financial steering approach of the targeting process, which allows a broad covering of the requirements.

1.2 Aim

This thesis aims to develop a methodology to determine the CO2 targets of the motor vehicle models according to financial criteria. Therefore, it is necessary to assess the financial impacts of the CO2 reduction on the motor vehicle projects early on and to

[4] See Liebl (2014), p. 41.
[5] See Dudenhöffer (2014), p. 602.
[6] See Frankfurter Allgemeine Zeitung (2015).
[7] See KBA (2014), p. 18; KBA (2015), p. 16.

assimilate them in the targeting process. Further, the integration of a cost-oriented approach in the process of CO2 reduction is examined.

1.3 Structure

The structure is divided into a theoretical and practical section. In the first part, the background and theory, on which the developed methodological approach is built upon, is explained and illustrated. In the second part, the methodological approach is integrated in the structures of a car manufacturer and consolidated by expert interviews.

Chapter one provides a first introduction in the topic and presents the general problem. Further, the objective is derived from the concrete problem definition.

In chapter two, the relevant fundamentals are presented. First, the CO2 emissions of motor vehicles are explained, followed by an illustration of notable legislations. Subsequently, there is an overview about the CO2 reduction potentials.

In chapter three, the relevant corporate divisions of a car manufacturer such as company structure, product structure and planning processes are presented as part of the Volkswagen group.

In chapter four, the theoretical concepts of Target Costing, Green Target Costing and Carbon Management/Controlling as well as CO2 targeting are defined and explained.

Based on the fundamentals of the theory, a methodological approach towards a cost-oriented targeting is developed in chapter five. Therefore, the requirements and premises are defined and the specification of the CO2 reduction analyzed.

In chapter six, the complete methodology of the cost oriented targeting is set up and an efficiency key figure as crucial factor of a target determination at optimal costs is developed. Subsequently, the methodology is summarized and further integrated in the existing CO2 reduction process.

Following in chapter seven, the structure of an interview guideline for expert interviews is developed and followed by a qualitative content analysis.

In chapter eight, the comprehensive findings with implications and limitations are discussed.

Concluding, the results are summed up and an outlook on future research fields is made in chapter nine.

9. Conclusion and outlook

The global CO2 legislations require a significant reduction of the CO2 emission of all vehicles from the automotive manufactures. Until the beginning of the next decade, the legal values are tightened on the large sales markets, so that the target achievements are combined with tremendous financial efforts. In regard of the high penalty payments in case of a missed target, the emission reductions are unavoidable.

However, the legal regulations of the CO2 emissions across the fleet average allow a flexible emission reduction on the level of individual vehicles. Some shares of the vehicle fleet are allowed to exceed the legal value of CO2 emission, if in equal proportions the other shares are below the limit. Therefore, the automotive manufacturer can freely decide about the required CO2 reduction of the individual vehicle models in regard of the fleet emission. The CO2 reduction targets have to be considered at an early stage in the product development. Hence, the manufacturers assign CO2 targets to the vehicle models to determine the reduction targets.

For the planning of the CO2 reduction, the three planning values CO2-EV, CO2 target and the CO2 legal value are essential. The specification of the planning values can be illustrated in a steering cycle. Whereas the values of CO2-EV and the CO2 legal value can be directly derived from the portfolio and the volume planning of the manufacturer, for the CO2 target there is no universal procedure.

From this background a systematic methodology for the determination of targets has been developed. Thereby, the financial impacts have been selected as the main criteria for the specification of the targets. The individual CO2 measures have been identified as the cost incurrence factors of the CO2 reduction. Furthermore, a systematic allocation process has been developed to assign the measures to the vehicle models, in which they are practically implementable. Thus, the result was a list with all feasible vehicle-measure allocations. Through the methodology all allocations are evaluated with a specifically modified efficiency key figure, which takes into account the outcomes of each allocation on the group product result. With the support of the efficiency, the list of measures at optimal costs for the target achievement can be determined. When the list with separated individual vehicle models is used, for each vehicle model the ideal CO2 reduction from the included measures can be derived. Thereby, the target is fixed on the amount of the optimal CO2 reduction.

The methodology allows a relatively simple and fast way of the targeting process at little expenses. It only relates to values, which are available within the company and which are updated regularly. In addition, the methodology can be applied to all fleet legislations that exist right now.

The topic of CO2 targeting and steering within the automotive industry is still at the beginning. Processes, methods and best practices are under investigations. But due to the time pressure, which will enhance more and more until 2020, the development of procedures will continuously accelerate and intensify in the future.