

# IS DIVERSIFICATION A STRATEGIC ADVANTAGE? THE EXAMPLE OF AUTOMOTIVE COMPONENTS IN THE CZECH REPUBLIC

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The automotive industry is a key sector of the Czech national economy. Its share of GDP represents more than 8% and the Czech Republic is the 14<sup>th</sup> biggest producer of personal cars in the world. The goal of this article is to analyze the development of the customer portfolio of automotive suppliers in the Czech Republic from the perspective of their international location. The diversification of the portfolio can be measured in many ways. The approach in this article relies both on the usual statistical tools (concentration ratio, Lorenz curve, Gini coefficient, Herfindahl-Hirschman index) and on specific approaches such as the number of partners, geographical diversification and average distance travelled by exported component. Even though the export volume has been dynamically growing, it has remained focused on a limited number of crucial countries, which are mostly located in the close neighborhood of the Czech Republic.

**JEL Classification:** L2, L62

## Introduction

The Czech automotive industry is a key sector of the national economy. Its part of the GDP represents more than 8% and the Czech Republic is the 14<sup>th</sup> biggest producer of personal cars in the world. Per capita, in 2011, the Czech Republic was in 2<sup>nd</sup> place after Slovakia, with a production of 113 cars per 1000 inhabitants. This industry is highly influenced by globalization and dominated by foreign capital representing 87.65% in its ownership structure. The efficiency of the industry can be illustrated by the fact that the share of the total volume of industrial production represents 22.3% but the share of the number of employees is only 11.1% (Auto SAP, 2012).

The role of international trade and its growth has been particularly remarkable in the recent history of the Czech automotive industry, covering both the production of finished automobiles and the production of their components. The share of export on the domestic production of motor vehicles in the Czech Republic achieved 80%, and the share of the consolidated export on the production of automotive components reached an even higher value, as it amounted to 89% (United Nations, 2011c and Eurostat, 2008). Up to now, about 80% of the production has been exported to EU member states. Dependence on the saturated European market is one of the major risks for the whole industry and all producers have to consider geographical diversification as an important strategic aim.

In 2001, the Czech Republic's share of EU production amounted to 2.8% in the case of personal cars (calculated by units according to OICA, 2011) and 2.6% in the case of automotive components (calculated by financial value according to Eurostat, 2012). Even though domestic demand grew only marginally in the following eight years (AutoSAP, 2012; SDA CIA, 2012), the country's share of the EU's total production grew to 6.9% in the case of vehicles (calculated by units according to OICA, 2011) and 7.6% in the case of their components (calculated by financial value according to Eurostat, 2012) in 2009, which clearly demonstrates the importance of international trade. Therefore, the diversification of the customer portfolio is particularly important for its long-term competitiveness.

The goal of this article is to analyze the development of Czech automotive suppliers' customer portfolio from the perspective of their international location. The underlying hypothesis is that increasing export volume raises the diversification of the customer portfolio and thus helps the Czech automotive suppliers to achieve a competitive advantage in the long term.

## Diversification and concentration

The diversification of the customer portfolio has been driven by three major goals – growth, profitability and risk reduction (Grant, 2008). First, in the absence of diversification,

firms are limited by the size of their industry and their domestic markets. Second, diversification allows companies to achieve either lower costs or higher revenues, or both, thus improving their financial results and value for the shareholders. Third, international diversification works as a natural way of risk mitigation as the individual markets can be susceptible to both economic and political fluctuations (Černohlávková, 2007). Therefore geographical diversification is particularly important, as it allows companies to take advantage of uneven development and different phases of the economic cycle in a wider number of countries and national markets (Machková, 2009).

The level of diversification can be measured by a wide range of statistical tools. Entropy, for instance, is a useful measure for examining industrial diversity either among regions or for a particular region over time (Attaran, 1989). Many studies apply the opposite approach by measuring the level of industry or portfolio concentration and thus deriving the reverse value of its diversification. This approach will be applied in this article as well.

The term “concentration” has been employed in many different senses, and the “concentration indices” have been constructed to measure a number of quite distinct characteristics (Rosenbluth, 1955). In the selection of appropriate measures, this study took advantage of the indices that measure the extent to which a small number of foreign partners account for a large proportion of the export volume.

The basic index for measuring the concentration of the customer portfolio is the number of partners the company or country trades with. This number gives a brief overview of the range of customers and its development over time. However, it doesn't take into account their different significance and thus can't provide any further detailed information about the qualitative level of diversification.

The classical statistical measure for describing diversification is the concentration ratio (Rosenbluth, 1955). This ratio stands for the percentage of total export (or other measure), which a given number of customers accounts for. The five-customers concentration ratio (CR5) measures the relative share of total export accounted for by the five largest partners. Similarly, CR10 or CR20 measures may be computed. A disadvantage of the concentration ratio is that it does not indicate the total number of partners that are involved in the portfolio (OECD, 1993).

Concentration ratios can be graphically depicted by a Lorenz curve. This curve represents the cumulative distribution function and thus shows the proportion of the distribution assumed by the bottom  $y\%$  of the values. It is often used to represent income distribution and its inequality, where it shows for the bottom  $x\%$  of households, what percentage  $y\%$  of the total income they have, but it may be applied

in a various range of studies. In case the income (or other measure) is ideally split among all households (or other parties involved), the Lorenz curve is equal to a 45° curve (Lapáček, 2007).

The Gini coefficient (also known as the Gini index or Gini ratio) is the numerical expression of the deviation between the Lorenz curve and the 45° curve, which represents equal distribution. The Gini coefficient measures the inequality among values of a frequency distribution. Whereas the Gini coefficient of zero represents perfect equality and diversification, the index of one stands for the maximal inequality among the analyzed values. The Gini coefficient is referred to as a relative measure of concentration (Naude, 2006).

The Herfindahl-Hirschman index, also known as Herfindahl index, is another very popular measure, which is often applied to measure the level of diversification or concentration. This measure is based on the shares of the individual partners on the total output (such as export). Most commonly, it measures the concentration of a particular industry of a national economy. Decreases in the Herfindahl-Hirschman index generally indicate a higher level of diversification, whereas increases imply the reverse. The index can range up to 10,000, if percents are used as whole numbers. The maximum in this case is  $100^2 = 10,000$ . In case the index value is below 1,000, it indicates an unconcentrated index and a high level of diversification. In case it ranges between 1,000 and 1,800, it indicates moderate diversification. If the value exceeds 1,800, the concentration is high and the diversification is thus low (Naude, 2006).

### Data structure and analysis process

The precise definition of “automotive industry” is a subject of much discussion. A comparison between the North American Industry Classification System (United States Department of Labor, 2011), the Nomenclature générale des activités économiques dans les Communautés Européennes (Eurostat, 2008) and the Standard International Trade Classification (United Nations, 2011b and 2011c) represents this terminological dichotomy well. The lack of precise definitions is one of the key reasons why reliable long-term data, which would enable worldwide comparison of the automotive industry's development, are not available. Furthermore, even the classifications applied by a single institution are often subject to modifications, which further complicate the comparison of data over time.

The data applied in this article stem mainly from the Standard International Trade Classification (SITC), which is a classification for monitoring the development of international trade according to various categories used by the United Nations and a range of other institutions.

The analysis conducted in this article, which is focused on the export of automotive components out of the Czech Republic and the range of customer portfolio from the international perspective, covers a period of 16 years, from 1995 to 2010. The study takes advantage of the data collected under group 784 – parts and accessories of motor vehicles of groups 722, 781, 782 and 783, where these respective groups refer to road motor vehicles and tractors (United Nations, 2011a). Between 1995 and 2006, analysis stems from the SITC Rev. 3 data (United Nations, 2011b) and from 2007 onwards, the data come from SITC Rev. 4 (United Nations, 2011c). In this case, the structure and logic of both revisions in the automotive industry field, and specifically among the parts and accessories of motor vehicles, remained the same, which allows direct comparison of both revisions.

As was stated in the introduction, the automotive industry of the Czech Republic has, in recent years, become one of the main pillars of national economic growth and one of the dominant employers within the country. This development has occurred under the premise of nearly stagnant domestic demand for personal automobiles, which suggests a crucial role for export activities. Such development clearly indicates that the automotive suppliers located in the Czech Republic, as well as the local producers of motor vehicles, have been extending the volume of their foreign deliveries. Therefore, the first step of this study is focused on an evaluation of the export development of automotive components in terms of financial volume.

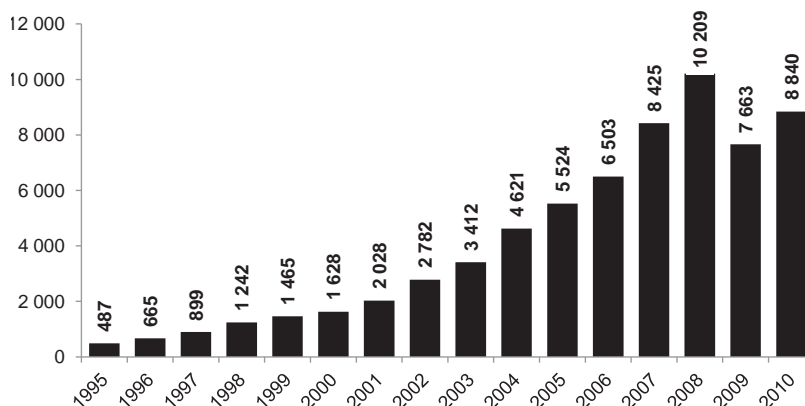
The main part of this article is devoted to an analysis of the diversification of export partners in terms of their international location. One of the key positive aspects of international trade and one of the crucial reasons for companies to participate in it is that it helps diversify the customer portfolio and thus helps stabilize fluctuations in the inflow of orders and payments. The growing volume of exports should

therefore theoretically contribute to balanced development and should enhance the portfolio of the business partners to countries that are less dependent on each other's economies. The underlying hypothesis is that increasing the export volume raises the diversification of the customer portfolio and thus helps Czech automotive suppliers achieve a competitive advantage over the long term. This study is conducted on a strategic level and therefore analyzes the development of export and its diversification from a national perspective. Czech automotive suppliers can open business partnerships with a wide portfolio of companies located potentially in any country of the world. The greater the number of countries that Czech suppliers trade with, the higher the diversification level of such a portfolio from the national point of view, *ceteris paribus*. The number of partner countries is therefore a subject of analysis in the first step. The next parts are focused on the level of diversification of the customer portfolio from the qualitative point of view and follow the chronological order of the statistical tools presented above – starting from the concentration ratio (CR1, CR), over the Lorenz curve (in years 1995, 2000, 2005 and 2010) and the Gini coefficient, to the Herfindahl-Hirschman index. Furthermore, diversification is evaluated from the geographical perspective and the development of average distance travelled by exported components is also analyzed.

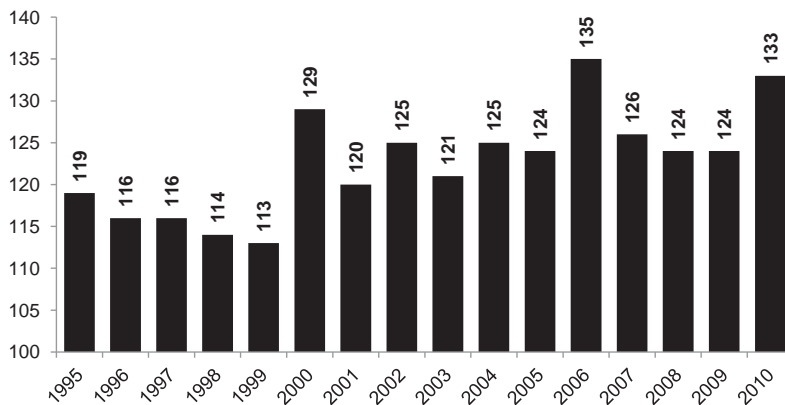
### The impact of diversification on Czech export of automotive components

The export volume of automotive components has been, in the recent years, following a dynamically growing trajectory and experienced only one year-on-year decline, which in 2009 was caused by the global economic slowdown (Mohelský, 2012). What is more, export experienced strong growth not only in the initial years of the analysis (between 1995 and 1998), when the basis was relative low and the annual increments

**Graph 1 Export of automotive components, current value in million USD**



Source: Mohelský (2012)

**Graph 2 Number of partner countries of Czech automotive suppliers**

Source: United Nations (2011a)

easier to achieve, but also in the 21<sup>st</sup> century (particularly in years 2002, 2004, and 2007). The compound annual growth rate between 1995 and 2010 amounted to 21%.

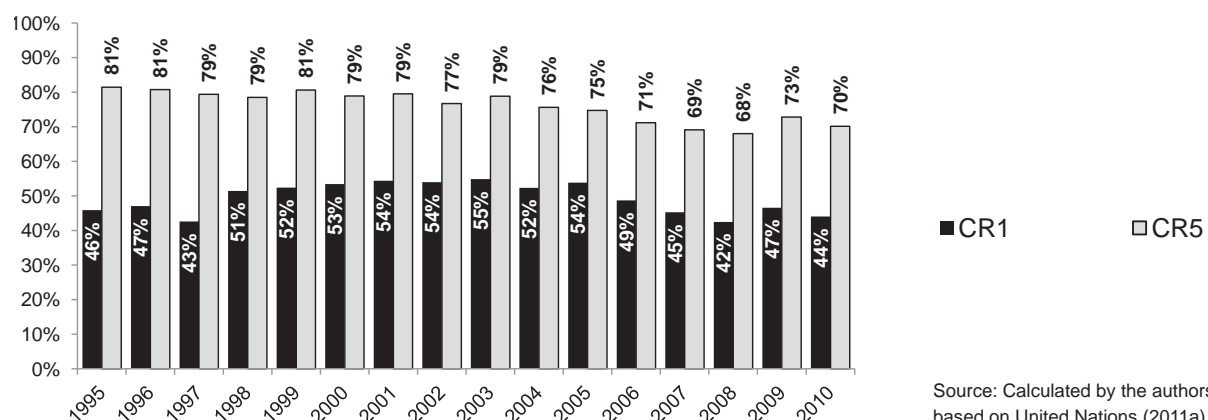
In 1995, Czech automotive suppliers actively traded with 119 countries, which corresponds to about 62% of the total number of independent countries worldwide (United Nations, 2012). Then until 1999, the portfolio slowly decreased to reach 113 partners. However, since 2000, the number of partners hasn't fallen under 120, with the record level experienced in 2006 with 135 partners. In the last year of the tracked period, the number of partners amounted to 133, which represents the second highest result registered and represents nearly 70% of all countries in the world.

Thus according to the results, Czech automotive suppliers have been diversifying their customer portfolio from the international perspective. Even though the development has not been strictly ascending in all years, the general long-term trend signals an increasing level of export diversification.

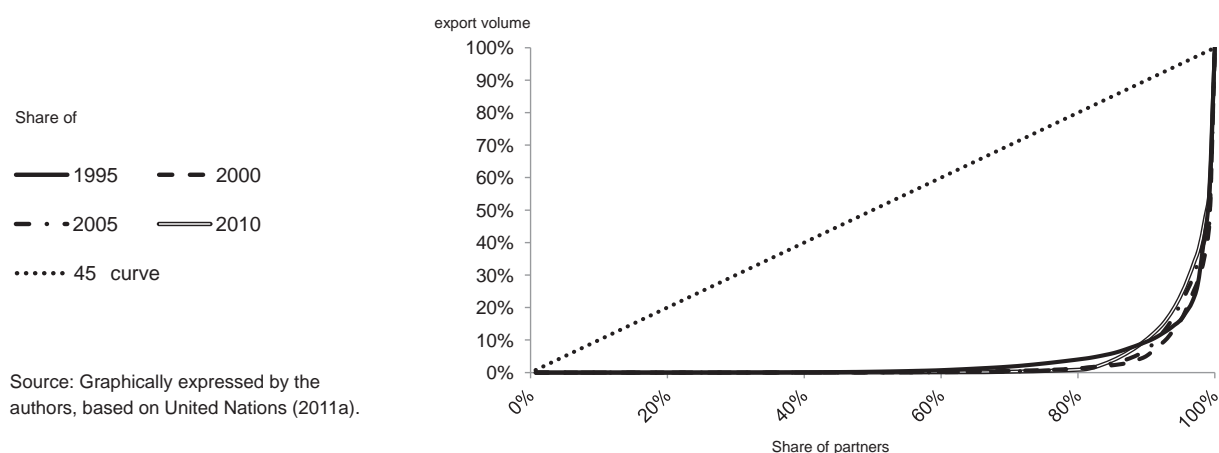
The concentration ratio is the initial index that tests the level of customer portfolio diversification and its development from 1995 to 2010 in a qualitative way.

In case of the CR1 index, which takes into account solely the share of the biggest partner on the total export, the results do not seem to exhibit any persuasive trend for the growth of diversity. Whereas in 1995 the top destination accounted for 46% of the total exported volume, sixteen years later the same indicator stood at 44%. It is noteworthy that in all analyzed years the most important partner of the Czech Republic was Germany, which illustrates the importance of international trade in the field of automotive industry between the Czech Republic and its largest neighbor.

The development of the CR5 index, which already considers the share of the five largest export destinations, shows a clear tendency towards increased diversity in the customer portfolio. In the beginning of the tracked period,

**Graph 3 Concentration ratio of the largest partner (CR1) and the largest 5 partners (CR5)**

Source: Calculated by the authors, based on United Nations (2011a).

**Graph 4 Lorenz curves in 1995, 2000, 2005 and 2010 and their comparison to 45° curve**

the index amounted to 81%; however, it significantly decreased in the following years to reach the level of 70% in 2010. This is a positive signal from the diversification perspective.

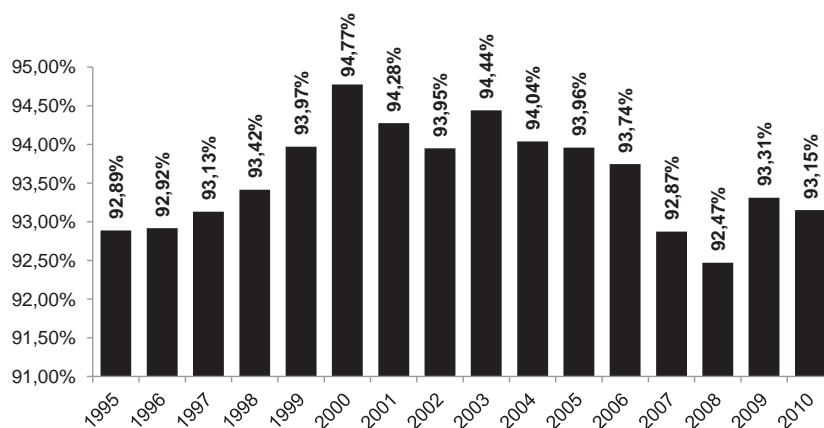
The results of the concentration ratio in the case of top one and top five export destinations offer ambiguous results. Whereas the CR1 indicator experienced a development path, which can be described as stable, the CR5 index exhibited a clearly decreasing trajectory, thus confirming diversity growth among the international portfolio of partner countries in the field of automotive components.

### Lorenz curve

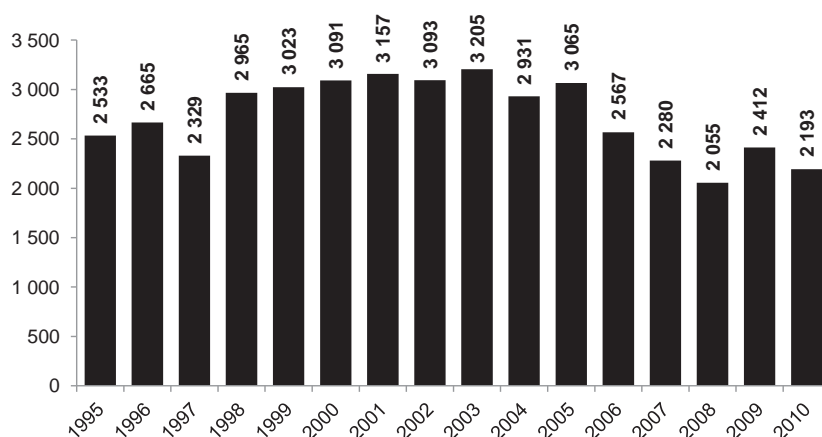
The Lorenz curve represents the cumulative distribution function and thus captures the proportion of the export share held by the given percentage of the partner countries. Furthermore, it also shows how far the actual status is from the ideal 45° curve, in which all partners participate by

exactly the same shares on the total level of export volume. The chart above, which represents the Lorenz curve in years 1995, 2000, 2005 and 2010, and the 45° curve, clearly demonstrates how unbalanced the structure of Czech export is in the case of automotive components. To surpass the cumulative level of a 1% share on the total export volume took more than 63% of all destinations in 1995, over 78% in 2000 and 2005, and more than 81% in case of 2010. Such results suggest that even though the number of partner countries may be rising, the actual importance of the vast majority of them is insignificant.

The graphical presentation of the Lorenz curves of 1995, 2000, 2005 and 2010 can't provide any further specific results on the topic of diversification. The only fact, which is clear to see from the development, is that the year-on-year changes have not affected the general shape of the curve much, and haven't even modified its distance from the ideal 45° curve.

**Graph 5 Gini coefficient between 1995 and 2010**

Source: Calculated by authors, based on United Nations (2011a).

**Graph 6 Herfindahl-Hirschman index between 1995 and 2010**

Source: Calculated by authors, based on United Nations (2011a).

### Gini coefficient

The Gini coefficient is the numerical expression of the Lorenz curve and its distance from the ideally distributed 45° curve. The higher the coefficient is, the lower level of diversification it represents. The values of the Gini coefficient can precisely capture the development, which was not clearly identified in the graphical expression of the Lorenz curve.

In 1995, the Gini coefficient of export diversification in the case of Czech automotive components reached nearly 93%, which suggested a very high level of concentration, as the maximum height that the indicator can amount to is 100%. In the following years, the situation got even worse, as the index further grew to reach the maximum level of almost 95% in 2000. Even though the Gini coefficient followed a continuously decreasing trajectory, in the 21<sup>st</sup> century it ended up with the value of more than 93% in 2010, which is a higher result than in the initial year of observation.

Even though the long-term linear trend line of the whole 16 year period is, in the case of the Gini coefficient, aiming slightly downwards, the overall development suggests that the level of export diversification has not come to any significant improvements.

### Herfindahl-Hirschman index

The Herfindahl-Hirschman index (HHI) and the Gini coefficient represent the two most commonly used ways of measuring concentration; in this article, both are applied to evaluate the diversification of the international customer portfolio. The HHI can range up to 10,000, which is the level of maximum concentration, and any declines thus generally indicate a higher level of diversification.

In the first year of the tracked period, the Herfindahl-Hirschman index amounted to 2,533, which is considered to be a very high number, as the level of 1,800 marks high

concentration (Naude, 2006). Similar to the Gini coefficient, the Herfindahl-Hirschman index further increased in the following years and surpassed the 3,000 mark regularly between 1999 and 2005, with 2004 being the only exception. Towards the end of the first decade of the 21<sup>st</sup> century, the HHI followed a distinctively decreasing trajectory, which is a positive sign representing growing diversification. In 2010, the index amounted to 2,193, which is 13% below its 1995 value and suggests positive long-term development. Nevertheless, over the whole period, the HHI did not reach below 1,800 points and thus remained in the area of high concentration.

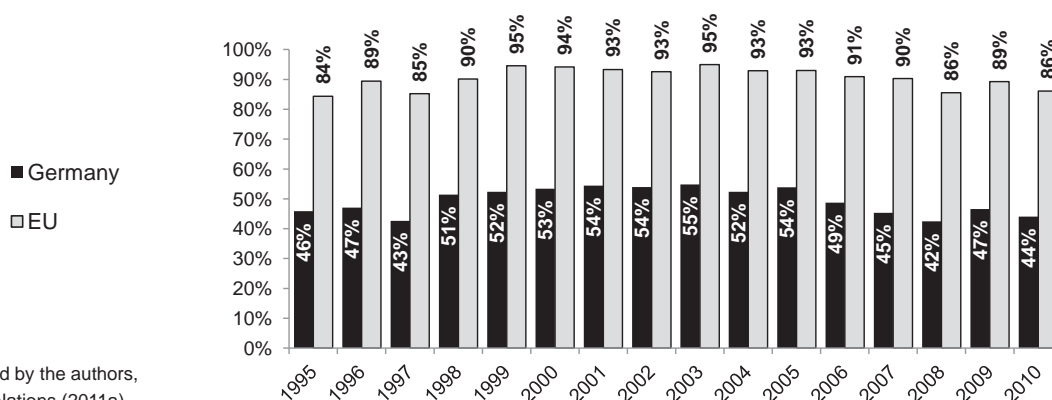
After the initial increase of the Herfindahl-Hirschman index between 1997 and 1998, the indicator reached very high levels, which represents poor diversification. The situation significantly improved towards the end of the period and the overall development can thus be perceived as slightly positive, even though the level of concentration remained very high in all analyzed years.

### Territorial diversification

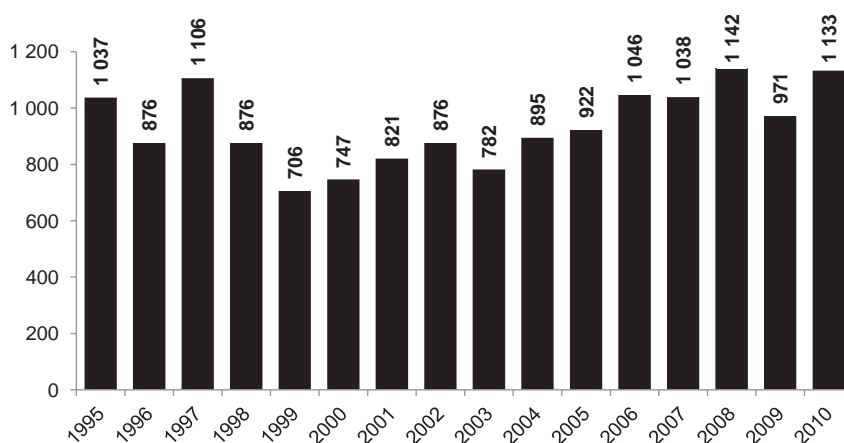
The indicators presented above focused on measurement of the export diversification mostly from the perspective of statistical methods. Nevertheless, the level of diversification can also be measured alternatively. Important information can be further obtained from an analysis of the export countries from the regional point of view or by calculating the average distance travelled by exported components.

As was already pointed out above, the most important destination of Czech export – in the field of automotive components – is Germany, whose share ranged from 42% to 45% in the analyzed period. This unique importance of one single country has a natural impact on the level of geographical diversification. Furthermore, the most important world



**Graph 7 Share of Germany and EU on total export of automotive components**

Source: Calculated by the authors, based on United Nations (2011a).

**Graph 8 Development of average distance travelled by exported components between 1995 and 2010**

Source: Calculated by the authors, based on United Nations (2011a).

region for the export of Czech automotive parts is the European Union, which was the destination of 84% to 95% of the total volume between 1995 and 2010.

The new emerging regions of the automotive industry, such as Brazil, Turkey, India, or the biggest automotive market of today – China, do not play any significant role in the export of automotive parts from the Czech Republic. Such a situation represents one of the key challenges of today and significant potential for the future.

As the overwhelming majority of export went to European countries, it is not surprising that the average distance travelled by each component ranged, in the analyzed period, between 706 and 1,142 kilometers.<sup>1</sup> This represents a very

narrow circle of destinations, which thus limits the diversification of the customer portfolio. One stimulating fact is that the distance has been steadily growing in recent years.

### Managerial implications

The importance of international trade and its growth has been particularly remarkable in the recent history of the Czech automotive industry, as it surpassed the level of 80% of domestic production in the case of automobiles and 89% in the case of their components.

The goal of this article was to analyze the development of the customer portfolio of the Czech automotive suppliers from the perspective of their international location. The underlying hypothesis, which was tested from various perspectives, was that increasing export volume raises the diversification of the customer portfolio and thus helps the Czech automotive suppliers achieve a competitive advantage over the long term.

Portfolio diversification can be measured in many ways. The approach in this study relied both on the usual statistical

<sup>1</sup> The average distance travelled by exported components was measured by using the distance between Prague and other capital cities worldwide. The indicator was then calculated as the weighted average of the distances in every year, with the share of export volume to each country representing the weight.

tools (concentration ratio, Lorenz curve, Gini coefficient, Herfindahl-Hirschman index) and on specific approaches (number of partners, geographical diversification, average distance travelled by exported component), which are not part of common methods.

In the first step, we confirmed that export activities have been playing an increasingly important role in the production of automotive components within the Czech Republic, as their financial volume grew by an average of 21% per annum in the analyzed period. As the financial volume of the exported components continuously grew, the total number of destinations also experienced increasing development – i.e. from 119 partner countries in 1995 to 133 destinations in 2010 – which thus suggests a higher level of diversification. This assumption was further confirmed by the development of the concentration ratio, as the CR5 index decreased from 81% to 70%, even though the share of the largest export partner (Germany) remained relatively stable. However, the graphical expression of the Lorenz curve revealed a different picture. A comparison of the Lorenz curves in years 1995, 2000, 2005 and 2010, and the equal 45° curve, clearly demonstrated that the structure of Czech export in the case of automotive components was significantly unbalanced. To surpass the cumulative level of 1% share on the total export volume took more than 63% of all destinations in 1995, over 78% in 2000 and 2005, and more than 81% in case of 2010. Such a result suggests that even though the number of partner countries may be rising, the actual importance of the vast majority of them is insignificant. The Gini coefficient further confirmed that the level of diversification has not been growing in any convincing way. This result was again re-confirmed by the development of the Herfindahl-Hirschman index.

The level of diversification was further analyzed from the regional point of view and by calculating the average distance travelled by the exported components. These indicators also revealed the limited level of diversification. The Czech exporters of automotive components relied mainly on the European Union, which was the destination of 84% to 95% of the total exported volume between 1995 and 2010, without any signals for a long-term decrease. Analogically, the average distance travelled by each component ranged between 706 and 1,142 kilometers, but did at least experience decent growth in recent years.

The overall outcomes of the article provide ambiguous results. The volume level of export has been dynamically rising and the number of its destinations has been also experiencing continuous growth. However, the importance of the biggest partner remained constantly high. The main hypothesis of the study thus cannot be confirmed according to the results. Increasing export volume doesn't seem

to provide the Czech Republic and its exporters of automotive components with any significant advantage in terms of diversification of the customer portfolio. Even though the export volume has been dynamically growing, it has remained focused on a limited number of crucial countries, i.e. those that are mostly located in the close neighborhood of the Czech Republic. The new emerging regions of the automotive industry, such as Turkey, India or China, do not play any significant role in the export of the automotive parts, which thus represent an opportunity for the future.

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