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**Accounting for global production and consumption within a national context****Profiling of the Hungarian participation in the global automotive value chain****Prepared by the Hungarian Central Statistical Office<sup>1</sup>***Summary*

The paper aims to demonstrate how global value chains can be profiled at the national level i.e. to identify the companies and their specific position in the value chain, and to determine to what extent and how they are embedded in the national economy. Since 1989, the importance of the automotive industry in the Hungarian economy has gradually increased, and now it is the most significant sector both on the micro and macro level. Therefore, it became the focus of a collaborative research between the National Accounts Department and LCE. The research was mainly based on the register and VAT database. The latter was used to determine the purchasers and the suppliers of the analysed companies. However, several methodological challenges occurred (e.g. the industrial heterogeneity of the purchasers) and additional data sources had to be explored. The results of the research will be used by the Hungarian CSO for both forecasting and validation. The results may have particular importance in the case of recession due to the automotive industry's sensitivity to the business cycles.

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## I. Introduction

1. The world economy has been increasingly globalized since the 1990s. Multinational enterprises (MNEs) has been integrated to global value chains (GVCs) where particular lead firms govern the structure of the whole chain. Meanwhile every MNE – independent of their position in the chain – continuously rearranges their global production: offshoring and outsourcing of activities to other companies or subsidiaries has become regular. Thus, the global representation of a MNE (e.g. an automobile producer) split from there national representation (assembler factory, shared service center, wholesaler, retailer, insurance company, etc.).

2. Many endeavors were taken by international organizations to grab these global processes. We lean on the experience of three of them: (1) identification and characterization of the affiliates of MNEs; (2) measurement of the integration of national economy's particular industries to the global economy; (3) promoting data sharing and exchange. All of them is essential to understand the nature of international division of labour. The basic idea of them is to draw a global picture from national-level data.

In this paper, we try to take a step forward. We are interested in what we can say about national processes if we take into account the global processes. Our aim is to profile the national part of a global value chain. In other words, we have already had information about the MNEs' affiliates, and we know the amount of domestic value-added in international trade, but we have not seen the structure of GVC and how MNE's affiliates and local companies take place in it.

3. Our motivation is to understand how global processes embedded in national level and how we can estimate through these processes a country's GDP. From a global perspective we know, that leading firms have better capability to appropriate value than their suppliers, however it is not necessarily true in a national level. It depends on the particular presence of these MNEs. We also have a knowledge from TiVA database of the domestic value-added content of gross exports, nevertheless, we do not know its share between domestic and foreign ownership. Finally, although we can estimate the German economic growth' effect on an Eastern European countries' GDP, our hypothesis is that automotive industry's global performance could be a better variable, than national growth.

4. This paper is our first step to answer to these questions. We elaborate a method to identify the Hungarian companies that take part in the global automotive value chain for Tier-1 Suppliers. We used FATS, EGR and VAT data, together with industrial rankings and other sources on the Internet.

5. We structured our paper according to the following: First we provide an introduction to the recent developments of measuring global production. Then we introduce our methodology of determining lead firms (so called Original Equipment Manufacturers, OEMs) and their direct suppliers (so called Tier-1). Thirdly, we present the experience of the results. Finally we draw a conclusion and identify the next steps of our research.

## II. Literature review

6. Although globalization is not new, and its major statistical challenges for national accounting were recorded in manuals (SNA2008, ESA2010) at the end of 2000s, it gained intense attendance only after the world economic and financial crisis of 2008, and especially when the Irish case occurred in 2016 (see Stapel-Weber and Verrinder 2016).

7. One of the first answers was to identify and characterize the main economic actors of the globalization: multinational enterprises (MNEs). The so-called profiling project was launched in France, however it was embraced soon by the Eurostat in 2010. The main objective of the project is to identify all European subsidiaries of MNEs and characterize

them with the most relevant – and not sensitive – information: NACE, number of employees. Its platform became the Eurostat’s EuroGroup Register (EGR) and later OECD’s Analytical Database on Individual Multinationals and their Affiliates (ADIMA).

8. EGR is strongly connected to foreign affiliates statistics (FATS) that determines on the one hand all foreign affiliates in a country and their global decision centre (inward FATS), and on the other hand all global decision centres in a country and their foreign affiliates (outward FATS). This database can be analysed through data from structural business statistics (SBS).

9. EGR could have many useful applications. These registers can be a good base for creating enterprise groups and a framework for manage transfer pricing and the distribution of intellectual property products (IPPs) in the long run. Or it could be connected to the survey for international sourcing.

10. Beside profiling another important initiative is the measurement of trade in value added. OECD has taken serious work in the coordination and formation of World Input-Output Tables (WIOT) and Trade in Value Added (TiVA) database. Due to them we gained valuable information about the form of integration into the international division of labour.

11. Projects connecting to profiling are really useful to identify and characterize MNEs. Nevertheless, in our research we are also strongly interested in those domestically owned firms that are connected to global value chains – independent of whether they have any foreign subsidiaries or not. TiVA gives us essential and clear insights into the direct and indirect links to the international trade, however we inevitably lose micro data in the analysis. Finally, none of them can be used to identify the positions of the particular firms in the hierarchical structure of global value chains.

### III. Data sources and difficulties

12. To analyse the network of automotive industry in Hungary, it is necessary to identify the global and local units of this industry. Hungarian Central Statistical Office (HCSO) has no direct administrative information about the global players in the automotive industry. The global business groups can include different brands, divisions, and a lot of subsidiaries. The whole system of the global enterprises is difficult to grab.

13. In the countries’ level, individual data can be available about the enterprises and VAT registered units, but their role in the system and their connection to the global group is not clear in most cases. The resident and VAT registered units need to be assigned to the global corporate groups in order to draw a real picture from the part of value chain.

14. The reference year of our analysis is 2017.

15. To achieve this aim, in the first step there were prepared a list of global OEM and Tier-1 enterprises. The OEM list includes twelve global players, the Tier-1 list the hundred most significant global companies among the first level automotive suppliers.

16. In the second step there were assigned the Hungarian subsidiaries and VAT registered units to the OEM and Tier-1 list, which had been investigated from previous LCU or national accounts (NA) processes. The data sources were the IFATS and the Business Register of HCSO.

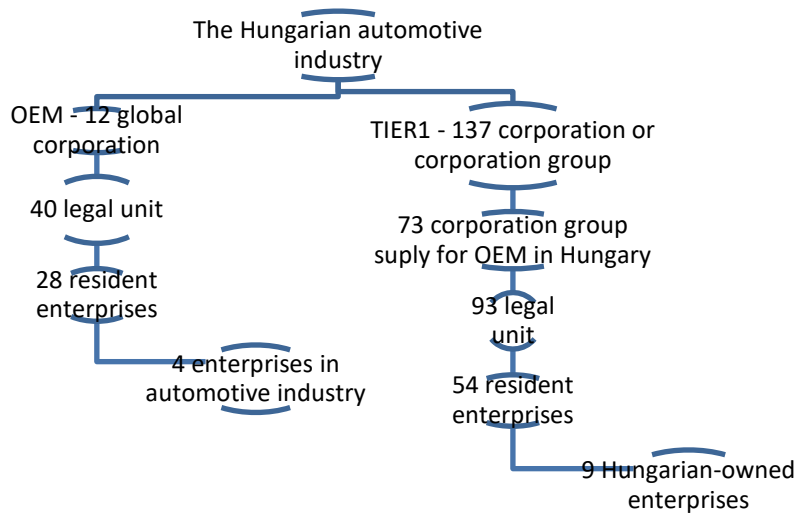
17. In Hungary the VAT returns includes an additional report (65M) included the transaction level data about the domestic sales and purchases having more than one million forints VAT content. This database was aggregated by purchasers and suppliers, so the aggregated database included all combination of enterprises, which appeared in the examined period. The set of combinations was narrowed by the list of Tier-1 and OEM list and the production of Manufacture of motor vehicle industry. If a company on either side of database available on the Tier-1 or OEM list, or it operates in Manufacture of motor vehicle industry,

our dataset included it. This reduced dataset would be merged by the common database of corporation's annual report and SBS data of HCSO and the VAT return database. The common database of corporation's annual report and SBS is the basis of the annual gross value added calculation for non-financial sector.

18. Finally, we examined the merged database, and investigated case by case the corporations, which sales exceed one billion HUF to each OEM in Manufacture of motor vehicle industry. So the list of Tier-1 was completed by the relevant Hungarian-owned and global automotive suppliers. Figure 1 shows the case study of OEM-Tier-1 database.

Figure 1

**Case study of OEM-Tier-1 database**



19. Our final list included twelve global OEM and 137 different TIER companies at corporation group level. These companies are represented themselves by 202 legal unit in Hungary, from which 93 are included in the Tier-1 list in 2017. Deducting the VAT registered units the resident companies included 28 unit in set of OEMs and 54 Tier-1 companies. From the resident OEM subsidiaries 4 enterprises produce in the automotive industry, the others are classified into the services. The Tier-1 list includes only nine Hungarian-owned companies.

20. The collected database includes categories and numeric variable both in supply and demand side of transactions as follows:

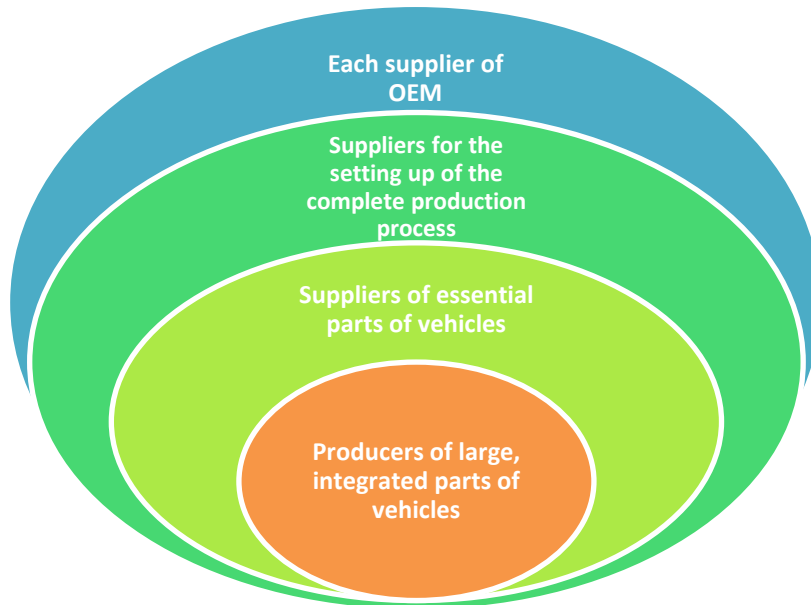
- registration number
- NACE Rev2.
- county
- business form code
- value of transactions between purchaser and supplier
- total sales
- export
- domestic sales
- total purchases
- import
- domestic purchases
- output
- gross value added
- employment

21. Many problems recognized by the process of data collection. The first and most significant problem is the appropriate definition of Tier-1 companies. The generally accepted definition determines the Tier-1 companies, like the producer of large, integrated parts of

vehicles (for example landing gear assembled). In broader approach Tier-1 company can be an enterprise, if it supplies essential parts of vehicles form OEM's. In the third approach the Tier-1 company is determined from the point of view of production process. In this case the producers of machinery equipments, the transportation companies, and moreover the special waste handler enterprises are included into the Tier-1 corporation set. The hierarchy of different definitions are shown in the following figure.

Figure 2

**Hierarchy of definitions**



22. Each approach results problem in classification process, moreover the wider definitions result more extended suppliers' network among the economy. Our analyses follow the second approach, which classify the suppliers of essential parts of vehicle.

23. The next difficulty was the classification of borderline cases. For example, it had to be fought the problem of diversification of production process. Some significant global enterprise group included into different supply chains (for example: Flextronics or Bosch). In this case it is difficult to decide that the Hungarian subsidiaries are integrated in which supply chains. The magnitude of transaction among the network help to classify these companies.

24. In some cases, the OEMs have such subsidiaries, which can be classified into the Tier-1 level (for example Faurecia is owned by Peugeot). These companies were listed into Tier-1 dataset.

25. The classification of companies can be depending on the degree of integration into the supply chain of OEMs. Therefore, a constraint was determined in our analysis, the suppliers, which sold less than one billion HUF to OEMs, fell out from our analysis.

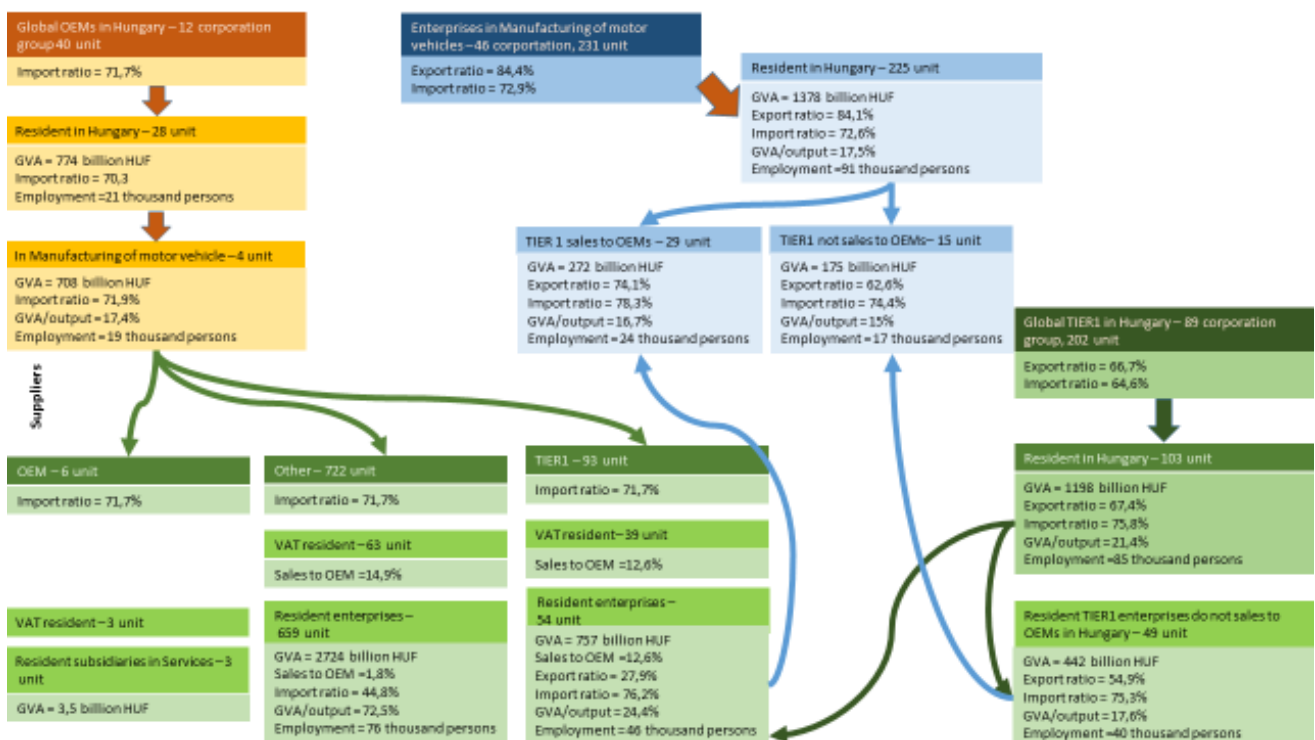
26. Finally, due to the lack of international data exchange – only the Hungarian part of network can be detected, the transactions with foreign affiliates, subsidiaries or parent companies cannot be followed. Therefore, it may occur that subsidiaries in Hungary, which were integrated into the Hungarian automotive network in 2017, were handled separately if they sales their products to OEMs through their parent company or foreign subsidiaries.

## VI. Results

27. The collected database is appropriate to analyse the first and second level of value chain in Hungary. The data can be examined among different dimensions on the demand and supply side as well.

28. The value chain of automotive industry affects different areas of Hungarian economy, it is integrated into several branches, and the analyses can be started from different directions. Our examination tries to draw up the network of enterprises, therefore it allows the analyses from any point of view. For example, the following figure (Figure 3) shows the automotive value chain from the point of view of OEM's, Tier-1 enterprises and automotive industry.

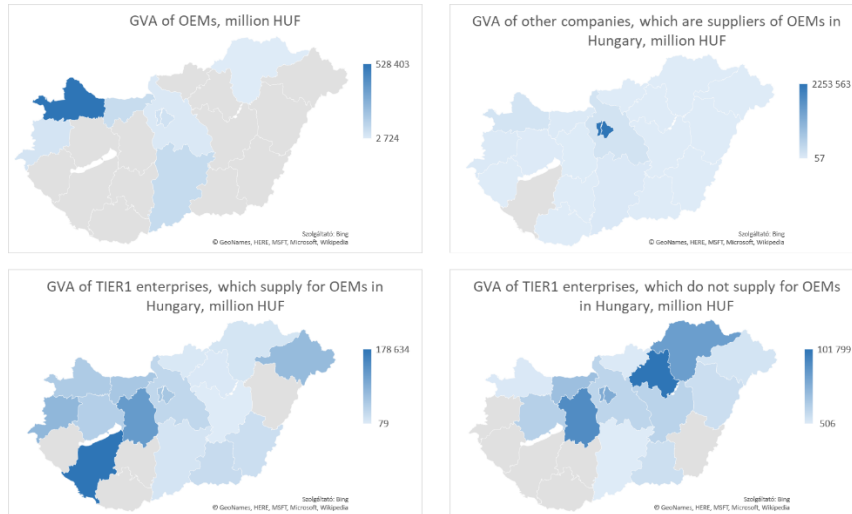
Figure 3  
Automotive value chain from the point of view of OEM's, Tier-1 enterprises and automotive industry



29. The illustration of automotive network allows several conclusions to be drawn. The OEMs in Manufacture of motor vehicle industry means the significant part of economic performance and employment of Manufacture of motor vehicle industry, they produce the 51.4% of total GVA, while they employ only 20.9% of total employment. The economic performance of other subsidiaries of OEMs is infinitesimal. The first and second level of value chain works with high import ratio (more than 70%). The export ratio is lower in case of Tier-1 enterprises which sales to OEMs in Hungary, their export ratio is only 27.9%, while the Tier-1 enterprises which are not suppliers for OEMs in Hungary export more than 50% of their total sales. The OEM and Tier-1 levels get 83.8% of GVA in Motor vehicle industry. At the same time the employment of the first and second level of value chain in automotive industry means only 65.9% of total employment in this industry. The Tier-1 enterprises, which sales to OEMs in Hungary produce 63.2% of total GVA of resident Tier-1 companies.

30. The next figure illustrates the differences among regional distribution of OEMs, Tier-1 and other corporations.

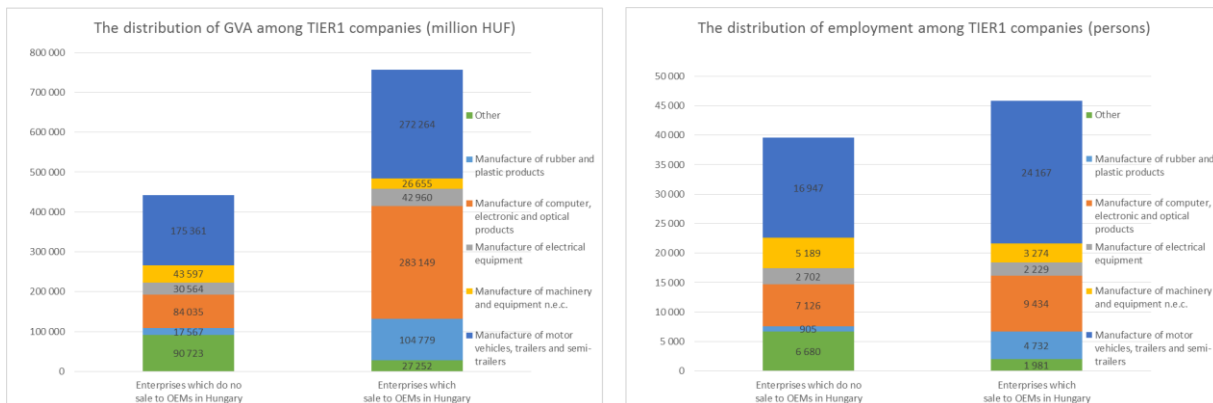
Figure 4  
Differences among regional distribution of OEMs, Tier-1 and other corporations



31. The first quarter of above figure the regional OEMs’ data shows that the leader position of the most significant OEM in Hungary determines the regional inequality (Audi Hungária Zrt. 2018). The differences between the first and the other three OEMs in Manufacture of motor vehicle industry is very conspicuous. The OEMs’ subsidiaries in the field of services operate in Budapest, therefore it is moderately significant. The Tier-1 enterprises, which are suppliers of OEMs in Hungary concentrated in West-Hungary, on the contrary the other – non-Tier-1 enterprises supply in Budapest. The leader position of County Somogy is due to the Flextronics (Flextronics International Company 2018). Finally, the Tier-1 companies, which do not sales to OEMs in Hungary have a greater role in the eastern part of the country.

32. The following figure (see Figure5) shows the distribution of gross value added by industries for the two subgroups of Tier-1 enterprises.

Figure 5  
Distribution of gross value added by industries for the two subgroup of Tier-1 enterprises



33. Both subgroups of enterprises have the highest proportion of GVA in Manufacture of motor vehicles and Manufacture of computer, electronic and optical products industries. The picture is similar from employment point of view, but the differences between subgroups of enterprises are smaller.

## V. Conclusion

34. The analysis of parts of value chains can be carried out by several points of view. The different slices among different dimensions highlights the diversity of the value chain. So the separation of similar subgroups eases the understanding of processes and structure of value chain. This kind of analysis is possible, if the value chain will be treated as the network of companies. In this approach the enterprises of network can be classified by their individual data, and the connections among participants can be evaluated by the magnitude of transaction.

35. The analysis of network in value chains depends on the definitions, and the detection of participants is difficult to automatize due to lack of information in relevant databases.

36. Our analysis is insufficient from three points of view. The different definitions of Tier-1 can allow the extension of our research on different parts of value chains. For example, it can be examined the connection between OEMs, Tier-1 enterprises and the transportation firms as well. The second lack of our research is the analysis of Tier-2 level of value chains. Unfortunately, the identification of third level is very difficult due to the missing databases and the relatively small size of companies. Finally, the Hungarian part of automotive value chain is closely integrated into the automotive cluster of Eastern-Europe, but this cluster is only a part of the global automotive network. The analysis in network concept could be more complete, if individual and transaction level data would be available for the other parts of value chain.

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