Methodology of the Competition Statistics Database

Budapest, 2023.

CONTENT

The design of the Competition Statistics Database and the definition of the variables were commissioned by the Hungarian Competition Authority (GVH) and prepared by Ecostat Governmental Research Institute for Economic and Social Strategy in 2008. In 2010, Financial Research Plc. prepared the Database for 2007 and 2008. In 2023, the GVH and the Hungarian National Bank (MNB) decided to continue the Competition Statistics Database and produced the previously defined indicators for the years 2003 to 2021 on a uniform data set, with minor corrections where necessary.

The aim of the GVH is to make the Database publicly accessible and free to use by citing the source, in order to support research on competition policy and microeconomic theory, thus contributing to the functioning and development of the academic and research community in Hungary and helping to provide an objective approach to competition issues in the Hungarian economy.

The Database is intended for general statistical purposes only, mainly allowing time series and (to a limited extent) cross-sectoral comparisons for a relatively wide range of statistically defined sectors. The Database contains indicators that can be used to characterise the conditions and intensity of competition but are not or only partially suitable for other purposes, such as the description of competitiveness within sectors.

The Database is not intended to directly support competition cases or other GVH proceedings (e.g., sector inquiries) or to identify markets where GVH intervention may be necessary, nor to characterise relevant markets in a competition enforcement sense. The Database is not even appropriate for this purpose. Firstly, markets based on the Statistical Classification of Economic Activities in the European Community (NACE) code do not refer to relevant product or geographic markets in the context of competition policy, secondly, the indicators in the Database are inherently imperfect and thirdly, the Database can only be compiled under significant data constraints.[1]

The GVH and the MNB intend to make the data available on an ongoing basis in the future, updated with the latest data.

The methodological documentation contains a description of the indicators that make up the Competition Statistics Database (definitions, explanations, etc.) and the reasons for their selection, as well as the source of the data and the methodology and limitations of data collection, thus helping analysts who wish to rely on the Database.

[1] In light of this, the term “market” in this methodology never refers to the meaning of the word in the sense of competition policy, but to the segments defined according to the internationally standardised NACE codes.

I. GENERAL FEATURES OF THE COMPETITION STATISTICS DATABASE

The indicators in the Competition Statistics Database provide mainly a time series analysis and, with some limitations, a cross-sectoral comparison. The Database covers the period 2003-2021 and includes annual data. The indicators have been selected and developed largely on the basis of international literature and practices.

The indicators of the Competition Statistics Database are available broken down by the corresponding statistical activity codes of the NACE system. It is important to note that, for several reasons, the NACE classification cannot be assigned to markets defined in terms of competition policy. Firstly, NACE is a classification in statistical terms, the codes cover markets not defined by competition policy terms (which in most cases are the result of a separate economic analysis, both at product and geographic levels). Furthermore, the whole country is the geographical unit in all cases, whereas the geographical scope of the relevant market in competition policy terms may be local, national, regional, global, etc. The consequence of this (and the imperfections of the indicators used) is that the resulting indicators are not suitable for use in competition policy purposes.

A further problem with the statistical classification of enterprises is that since it is based on the main economic activity of the firm, the possibly multiple activity of the enterprise is placed under one code. These problems cannot be addressed because the necessary firm level data are only available in this form. Other problems arising from the classification or from differences in the accounting and economic interpretation of certain indicators are indicated in the discussion of each indicator.

The indicators in the Competition Statistics Database are suitable for time series analysis, taking into account that each indicator in the Database is expressed in forints or calculated from such basic data at current prices. There are no constant price or volume indicators in the Database, but it does contain price indices.

I.1 Source of data

The majority of the indicators in the Competition Statistics Database are calculated on the basis of firm-level data available from the MNB. Industry data are compiled as corresponding aggregates of individual company indicators. The MNB data are directly derived from the tax returns of those business entities that complete a corporate tax return in a given year and submit it to the National Tax and Customs Administration (NTCA). The data are provided to the MNB by the NTCA. These data are not otherwise made public, so users cannot retrieve the indicators of the Competition Statistics Database from the primary data source, the NTCA.

The MNB data are derived from the xx29[2] code tax returns completed by the double-entry bookkeeping companies and sent to the NTCA, where the MNB receives all the data for each company in the same structure, regardless of whether the company has prepared its income statement on a cash or accrual basis.

The data in the Competition Statistics Database is used exclusively for the

- double-entry bookkeeper,

[2] The first two digits of the code always indicate the current year, e.g., the code for the 2006 tax return was 0629.

- carrying on a commercial economic activity,
- with a turnover greater than zero

include aggregated indicators of enterprises at industry level.[3] The Database does not include data for enterprises that opt for simplified business tax, small business tax or the flat-rate tax for small taxable enterprises, or for enterprises that keep a single-entry bookkeeping system, or for non-profit organisations (Table 1). Partnerships have not been allowed to apply the single-entry method since 1 January 2004, so that a significant number of new companies entered the Database in 2004. The industry indicators in the Business Statistics database at each sectoral level include only the data of the group of enterprises defined above and not the data of enterprises not included in this group.

Table 1. Enterprises covered by the Competition Statistics Database

Companies registered in Hungary that have filed a corporate tax return in the current year	Competition Statistics Database includes / excludes group of companies
1. Businesses opting for the simplified business tax, small business tax or the flat-rate small business tax	not included
2. Single-entry bookkeeping enterprises	not included
3. Double-entry bookkeeping enterprises	
a. enterprises engaged in commercial economic activities	
i. companies and cooperatives	
• limited liability company • joint venture • public limited company • private limited company • cooperative • general partnership • limited partnership	include aggregated data of enterprises whose net turnover exceeded HUF 0
ii. other business entities	not included
b. non-profit enterprises (foundations, public benefit corporations, etc.)	not included

Our aim is to include in the Database businesses that are relevant for the assessment of the competitive situation. In this spirit, companies with a turnover of HUF 0 have been excluded.

I.1.1 Non-company level aggregated indicators of the Database

In addition, indicators have been developed that cannot be quantified from company data, i.e., from tax returns alone. Tax returns do not include import data for companies, R&D expenditure and the number of people employed in R&D, and producer price indices are not available from this source.[4] In these cases we rely on data from the Hungarian Central Statistical Office (HCSO). In the methodology of each indicator, the source of the data is indicated separately if it is different from the MNB database. If no specific comment is made in the Methodology for each indicator, the data source is automatically the MNB database.

I.1.2 Accounting for companies with different financial years

The MNB's database and the Competition Statistics Database also contain data on enterprises operating according to the so-called financial year (other than calendar year). The Accounting

[3] The order of the criteria reflects the specific way in which they are narrowed down.
[4] For the source and methodology of import data, see subchapter II.1.3.

Act allows foreign-owned companies to choose a different date (e.g., the closing date of the parent company's financial year) instead of 31 December. The turnover of these companies represents a significant part of the economy and therefore cannot be disregarded, even though their return data are only available with a delay. The data of these enterprises are always allocated to the calendar year to which the major part of their financial year belongs.[5]

I.2 Structure of the Competition Statistics Database

The indicators in the Database are compiled according to NACE Rev. 2, with Level 4 (class), Level 3 (group) and Level 2 (division) industry breakdowns, and at the level of the sections indicated by the letters, but only data at section and division levels are published publicly. For some indicators, the availability of the necessary basic data was limited and could not be calculated at each section/division level; this is indicated separately for each indicator in the Methodology and in the Database. Data for industries with fewer than three companies are not reported for reasons of data protection.

The scope and limitations of the NACE classification should be taken into account when interpreting the Database:

- NACE does not distinguish between statistical units according to their ownership, organisational form or mode of operation, because these criteria are not closely related to the nature of the activity.
- For manufacturing activities, the modern (large-scale, mechanical) and traditional (home, manual) nature of the production technology is not a criterion in NACE.

The database indicator set covers the following sections:

- A Agriculture, forestry and fishing
- B Mining and quarrying
- C Manufacturing
- D Electricity, gas, steam and air conditioning supply
- E Water supply; sewerage, waste management and remediation activities
- F Construction
- G Wholesale and retail trade; repair of motor vehicles and motorcycles
- H Transport and storage
- I Accommodation and food service activities
- J Information and communication
- L Real estate activities
- M Professional, scientific and technical activities
- N Administrative and support service activities
- Q Human health and social work activities
- R Arts, entertainment and recreation
- S Other service activities

[5] Examples of well-known companies are Egis, Hyginett, Flextronics, Siemens, Swietelsky, Tesco, Lidl.

The sectoral classification of each company is carried out by the HCSO in cooperation with the company concerned. The nomenclature used by HCSO has been applied in the calculations.[6] Enterprises may change their main activity once or several times. Such changes also lead to a change in the statistical classification of the enterprise. Too frequent changes cause problems in the comparability of the data. For this reason, the database contains indicators that provide information on the number, size and other characteristics of enterprises that change sector. These help to interpret changes in a given sector.

It is very often the case that a company that is active in several sectors becomes the main activity in one year and in another. A special case of this is when a merger leads to a change in the former main activity. As an example of the latter, Audi Hungaria Motor Kft. was merged into Audi Hungaria Services Zrt. on 31 December 2016 as a result of a decision by the owners. As a consequence, the core activity of Audi Hungaria Services Zrt. changed from the former sector 7022 (Business management and other management consultancy) to sector 2910 (Manufacture of motor vehicles, motorcycles and related products). Audi continues to carry out both activities, but at different ratio from year to year. The company restructurings are only a few examples of firm-level sectoral changes; for many of the activities carried out, even outside holding structures such as Audi, a number of changes in company profile, temporary or permanent specialisation can result in a change in the core activity of a company.

[6] For a detailed description of the methodology, illustrated with examples, see the HCSO website: https://www.ksh.hu/docs/osztalyozasok/teaor/teaor_methodology.pdf, https://www.ksh.hu/docs/osztalyozasok/teaor/teaor_rovid_leiras_eng.pdf and https://www.ksh.hu/docs/osztalyozasok/teaor/teaor_structure.pdf.

II. METRICS FROM THE COMPETITION STATISTICS DATABASE

The indicators used in the Competition Statistics Database provide an indication of the intensity of competition at each sectoral level, subject to the limits discussed in chapter I and separately for each indicator. In line with international practice and the availability of domestic data, the indicator framework of the Competition Statistics Database is structured as follows:

1. Indicators of market structure
2. Price conditions
3. Profitability
4. Productivity
    a. Factors of production
    b. Innovation
5. Other indicators

II.1 Indicators of market structure

Market structure indicators concern the number, size and market share of market players.

II.1.1 Concentration (M1–M20)

Concentration refers to the distribution of a market between players (in terms of total revenue, output or capacity). A market is said to be concentrated if a large part of the market is shared between a small number of firms, i.e., if a few dominant players account for a large part of the total revenue (output or capacity). The players that together account for only a relatively small share of the market at a given point in time are called marginal players (often called fringe players). A market is not concentrated if the total market turnover (most often referred to as the market size), capacity or output is relatively symmetrically distributed among a sufficiently large number of players.

For a given number of firms, a higher value of the indicator calculated on the basis of market shares indicates a more concentrated market, i.e., a more uneven distribution of the total quantity among the players. Concentration ratios are a decreasing function of the number of firms in the market, or for a given number of firms, they increase with the asymmetry of the distribution. The most commonly used measures are the Herfindahl-Hirschmann Index (HHI) and various simple concentration ratios (CR).

II.1.1.1 Simple concentration indicators (M1–M7)

The simplest possible measure of the degree of concentration is the number of market players in the market.

M1: Number of enterprises = the arithmetic sum of the number of enterprises active in a given sector (count)

Of course, the shortcoming of the simple measure is that it does not take into account differences in the size of individual market players, and therefore provides only limited

information on the market structure. The source of the indicator number of firms in the market (M1) is the MNB database.[7]

Cross-industry comparisons are possible, but many other factors need to be taken into account, like the different size of markets or important industry specificities such as the cost structure (due to production technology).

Concentration indices calculated by summing the market shares of the first N largest companies are widely used (see for example Nordic Competition Authority, 2004). They are calculated on the basis of net sales and total assets (capacity could also be used, but the necessary data are not available). They have the advantage over the Herfindahl–Hirschmann index that they do not require data from all market players, it is sufficient if the market share of the top N firms is available (i.e., the market share of the top N firms, and the total size of the market). They have the disadvantage that they do not provide information on performance differences within this group of firms, i.e., the indices do not provide information on the distribution between the first N players.[8]

The CR3, CR5 and CR10 indicators are calculated in the Competition Statistics Database. The method of calculation is as follows:

$$\mathrm{CR}N = \sum_{i=1}^{N} S_i,$$

where S_i is the market share of the i^{th} largest player, N for the calculated simple concentration ratios:

Basis for the calculation of market shares	$N = 3$	$N = 5$	$N = 10$
Net turnover	M2	M4	M6
Assets	M3	M5	M7

Accordingly, for example. $\mathrm{CR3} = \sum_{i=1}^{3} S_i$, where S can denote either net sales (M2) or assets (M3).

M2: CR3 based on net sales = combined market share of the three largest companies in the industry (based on sales) (%)

M3: CR3 based on total assets = combined market share of the three largest companies in the industry (based on total assets) (%)

M4: CR5 based on net sales = combined market share of the five largest companies in the industry (based on sales) (%)

[7] The source of the indicators is mentioned below only if the source is not the MNB database. The source of each indicator is given in Annex II.

[8] If, for example, we calculate the CR10 indicator for a market, which shows the share of the 10 largest companies, and the 10 companies together cover 70% of the market, we get the same figure if each of the 10 companies has 7% of the market, and if the first large company covers 61% of the market and the remaining 9 companies have only 1% each. This is the reason why several concentration ratios are used simultaneously in the literature.

M5: CR5 based on total assets = combined market share of the five largest companies in the industry (based on total assets) (%)

M6: CR10 based on net sales = combined market share of the top ten companies in the industry (based on sales) (%)

M7: CR10 based on total assets = combined market share of the ten largest companies in the industry (based on total assets) (%)

II.1.1.2 Relative dispersion of market shares (M8–M9)

The information contained in the distribution of market shares calculated on the basis of net sales and assets can be further described by additional indicators. The **relative standard deviation of market shares of** individual firms **(M8–M9)** (Kerékgyártó and Mundruczó, 1999) shows how the degree of deviation from the mean (the standard deviation) relates to the expected value (the mean). The standard deviation of market shares shows the extent to which the market shares of the players within each industry deviate from each other. Measuring this against the average of market shares (relative standard deviation) gives a simple measure in percentage form.

In a case where the relative standard deviation of shares is low for a given number of players, market conditions are more balanced, with players covering relatively similar shares of the market. At the same time, a sufficiently high number of firms in the industry suggests that competition is intense. As above, the relative standard deviation of market shares is calculated on the basis of net sales (turnover) and assets. The calculation of these two indicators is as follows:

M8: Relative standard deviation of shares based on net turnover = standard deviation of these shares / simple arithmetic average of these market shares (without unit of measurement)

M9: Relative standard deviation of shares based on total assets = standard deviation of these assets / simple arithmetic average of these market shares (without unit of measurement)

II.1.1.3 Herfindahl–Hirschmann Index (M10–M11)

The **Herfindahl–Hirschmann Index (HHI) is the** square sum of the value of market shares in percentage form (Creusen et al., 2006, p. 11), which we calculated both on the basis of net sales and assets. Concentration ratios should be calculated on the basis of both turnover and assets, because in some industries one is more relevant than the other. For example, in the commercial real estate renting sector, net sales are relatively low, while assets are high; the opposite is true for the energy trading sector. Direct comparisons are therefore only possible when these factors - and other industry specificities - are taken into account.

The indicator is calculated as follows:

$$\mathrm{HHI} = \sum_{i=1}^{M} S_i^2,$$

where M is the number of sample actors in the sector, and S the market share, which can be calculated on the basis of net sales or assets. A higher value of this indicator implies a higher market concentration, with a maximum value of 10,000 and a (theoretical) minimum of 0:

M10: HHI based on net sales = sum of squares of shares (based on net sales) (without unit of measurement)

M11: HHI based on total assets = sum of squares of shares (based on assets) (without unit of measurement)

II.1.1.4 Concentration indicators based on domestic consumption (M12–M20)

So far, we have calculated market shares and derived concentration ratios based on the goods produced by domestic firms in Hungary. For sections A, B, C, D, E, J, M, R and S, the most important indicators are also derived on the basis of domestic consumption, taking into account imports and exports, as follows:

Market share of a company based on domestic consumption = $\frac{Y_i - X_i}{\sum Y_i - \sum X_i + I}$ (%),

where Y_i is the net sales revenue of the company concerned, X_i is the value of the export turnover of the company according to its corporate tax return, $\sum Y_i$ the combined net turnover of the sales of the industry, $\sum X_i$ the combined export sales of the enterprises in the industry, and I the value of imports of the industry calculated based on product classification of external trade flows.[9] The import data used are only available for sections A, B, C, D, E, J, M, R and S, and therefore the consumption-based concentration indicators are only compiled for these nine sectors.

The numerator of a firm's market share will therefore be net sales minus exports, which represents the firm's domestic sales. The value of exports is derived from corporate tax returns, according to the main activity of the firm, just like net sales (i.e., the whole value of exports is allocated to the main activity). The denominator is the domestic consumption of the industry: the value of the industry's output, plus its import data as reported by the HCSO for the industry based on product classification and reduced by the combined exports of the industry's enterprises.[10] The latter is obtained by aggregating directly the export data of the enterprises so that it equals the sum of the export sales of each enterprise in the numerator.[11]

The aggregate value of imports by industry is added separately to the sum of the domestic sales of the enterprises, so that the enterprise market shares described above and imports as a share of domestic consumption together add up to 100%:

Imports as a percentage of domestic consumption = $\frac{I}{\sum Y_i - \sum X_i + I}$ (%),

[9] For details on the types and methodology of export and import data available and used in the Database, see Exhibit M28 (subchapter II.1.3, Table 2).

[10] The values of domestic consumption by industry (the denominator of the fraction) can be found in the Database as indicator M18.

[11] The sectoral exports calculated from individual export data of enterprises are theoretically equal to the sectoral export data of the HCSO based on the classification of enterprises. In the M71 indicator, we use the export data of the HCSO based on product classification (see subchapter II.5.1).

where I is the value of imports of the sector, calculated based on product classification of external trade flows, $\sum Y_i$ the total net sales of the industry, and $\sum X_i$ the combined export sales of the enterprises in the industry.[12]

It is important to note that double counting may occur in the above calculation: the aggregate import data at product level for a given industry may include quantities imported and sold by a firm in the same industry, so that it has already generated revenue (in other words, part of the value of imports in the industry is already covered by the total net sales of the industry). This double counting cannot be corrected for in our data, so unfortunately it somewhat worsens the estimate of the market share.

A further shortcoming of the data is that it is not known to how many firms the imports classified in each sector are attributable. This is a problem if concentration indicators are to be calculated using market shares based on domestic consumption. We therefore consider the two extreme cases: we assume that a) one firm imports the entire quantity or b) a large number of firms with negligible shares. Concentration ratios are calculated under both assumptions, and since both the simple concentration ratios and the HHI will be at least as much[13] if we assume a single importer rather than a large number of small firms, the result are on an interval bounded by the two extreme cases.

II.1.1.4.1 Calculation of CR3 and CR5 concentration ratios using market shares based on domestic consumption

Using the market shares calculated in this way, we calculate CR3 and CR5 **concentration ratios in** a similar way to the M2–M5 indicators, i.e., we report the combined market share of the top three or top five companies with the largest market shares in the Database. The calculation is done in the following two ways:

1. Assuming that **total imports in the sector are imported by a single firm**, the import share is treated as the market share of a single firm not yet considered. In this case, the firms' market shares and import shares are ranked in descending order of size and the sum of the first 3 and 5 market shares is taken.

M12: CR3 based on domestic consumption = sum of the top three largest market shares of the industry based on domestic consumption with the value of the share of imports included in the market shares of the ranked firms (%)

M14: CR5 based on domestic consumption = sum of the top five largest market shares of the industry based on domestic consumption with the value of the share of imports included in the market shares of the ranked firms (%)

2. In the second case, we assume that imports in the **sector were made by a number of small, non-competitive, i.e., zero market share, firms**. In this case, for the calculation of concentration ratios, only the market shares belonging to specific firms are ranked in descending order, without taking into account the share of imports:

[12] Import indicators for industries as a percentage of domestic consumption are included in the database as M20.
[13] The HHI is greater in the first case, not just greater or equal.

M13: CR3 based on domestic consumption = combined market share of the top three companies in the industry with the largest market share based on domestic consumption (not taking import shares into account) (%)

M15: CR5 based on domestic consumption = combined market share of the top five companies in the industry with the largest market share based on domestic consumption (not taking import shares into account) (%)

II.1.1.4.2 Calculation of the Herfindahl–Hirschmann index using market shares based on domestic consumption (M16–M17)

The HHI index based on domestic consumption is calculated in a similar way to the M10–M11 indicators, but again assuming the two extreme cases discussed in the previous subchapter. Under the first assumption, in which all imports in the sector are imported by a single company, the value of the import share is assumed to be that of a company not yet included in the market shares, as in the M12 and M14 indicators, so that the square of the import share is also part of the HHI:

M16: HHI based on domestic consumption = square of imports as a share of domestic consumption + sum of squares of market shares of enterprises in the industry based on domestic consumption (without unit of measurement)

In the second case, if we assume that imports are made through a number of insignificant companies with zero market share, as in the case of M13 and M15, the HHI will be the sum of the squared market shares of the specific companies:

M17: HHI based on domestic consumption = sum of squares of the market shares of the enterprises in the industry based on domestic consumption (without unit of measurement)

II.1.1.4.3 Other indicators from the Competition Statistics Database based on domestic consumption (M18–M20)

In addition to the concentration indicators, three other indicators are calculated based on domestic consumption:

M18: Value of domestic consumption = industry net sales − combined exports of enterprises belonging to the industry + imports of industry based on product classification (thousands HUF)

M19: Domestic consumption as a percentage of net sales = domestic consumption of the industry / industry net sales (%)

M20: Imports as a percentage of domestic consumption = imports of industry based on product classification / domestic consumption of the industry (%)

II.1.2 Size of companies in the market (M21–M27)

There is a close link between company size and competitiveness. Firm size is usually identified by indicators such as capital value, turnover or number of employees. As the size of a company increases, unit costs generally decrease to a certain extent. Consequently, larger companies often gain a competitive advantage over smaller ones. Depending on the sector or industry, the

typical size of a company may vary, due to the fact that certain activities can only be carried out economically above a certain volume because of the typical cost structure.

We use three different methods to quantify the **size of a company:**

1. The first method uses the number of employees in a company for the breakdown by company size and distinguishes between large companies: 250 employees or more, medium-sized companies: between 50 and 249 employees, and micro and small companies: below 49 employees.

2. The second follows the methodology of Eurostat[14] and takes into account not only the number of employees but also turnover and balance sheet data in the creation of the size categories.[15]

How the indicators are calculated:

M21a: Percentage of total sales attributable to large enterprises = total net sales of large enterprises (according to number of employees) in the industry / industry net sales (%)

M21b: Percentage of total sales attributable to large enterprises = total net sales of large enterprises in the industry as defined by Eurostat / industry net sales (%)

M22a: Percentage of total sales attributable to medium-sized enterprises = total net sales of medium-sized enterprises (according to number of employees) in the industry / industry net sales (%)

M22b: Percentage of total sales attributable to medium-sized enterprises = total net sales of medium-sized enterprises in the industry as defined by Eurostat / industry net sales (%)

M23a: Percentage of total sales attributable to micro and small enterprises = total net sales of micro and small enterprises (according to number of employees) in the industry / industry net sales (%)

M23b: Percentage of total sales attributable to micro and small enterprises = total net sales of micro and small enterprises in the industry as defined by Eurostat / industry net sales (%)

M24a: Percentage of total assets attributable to large enterprises = total assets of large enterprises (according to number of employees) in the industry / total assets in the industry (%)

[14] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:124:0036:0041:en:PDF and https://ec.europa.eu/eurostat/web/structural-business-statistics/information-on-data/small-and-medium-sized-enterprises.

[15] We differ from the official definition in that we do not expect a company to be above the appropriate threshold in terms of both headcount and total assets or turnover to be in the higher category. We consider it sufficient to place the enterprise in the higher category (in addition to the number of employees), either on the basis of balance sheet total or turnover. This avoids, for example, the classification of large enterprises that are start-ups, in their early years or only in the construction phase as micro-enterprises.

M24b: Percentage of total assets attributable to large enterprises = total assets of large enterprises in the industry as defined by Eurostat / total assets in the industry (%)

M25a: Percentage of total assets attributable to medium-sized enterprises = total assets of medium-sized enterprises (according to number of employees) in the industry / total assets in the industry (%)

M25b: Percentage of total assets attributable to medium-sized enterprises = total assets of medium-sized enterprises in the industry as defined by Eurostat / total assets in the industry (%)

M26a: Percentage of total assets attributable to micro and small enterprises = total assets of micro and small enterprises (according to number of employees) in the industry / total assets in the industry (%)

M26b: Percentage of total assets attributable to micro and small enterprises = total assets of micro and small enterprises in the industry as defined by Eurostat / total assets in the industry (%)

3. In the third method, companies in each industry were ranked by net sales, with the smallest 50% of companies in the small company category; the largest 50% of companies in the large company category. This categorisation was used, for example, for the M27 indicator, which shows the extent to which relatively 'larger' companies active in a given sector dominate the market over 'smaller' ones. Formula:

M27: Sales of smaller enterprises as a proportion of sales of larger enterprises = $\frac{X_{bottom50\%}}{X_{top50\%}}$ (%),

where $X_{bottom50\%}$ is the net sales revenue of the bottom 50% of companies in terms of net sales revenue and $X_{top50\%}$ the net sales of the top 50% of companies in order of net sales. In those industries where the number of enterprises is odd, i.e., the group cannot be divided into two equal sets, the middle set of enterprises is assigned to the top 50%.[16]

The lower the value of the indicator, the less significant the "smaller" players in the sector. In our view, when applying this indicator, it is appropriate to look at the number of firms and other concentration indicators in the industry. For example, the figure is different for the M27 indicator in a market with two players or in a market with 100 players.

[16] For each indicator where this problem may arise, we strive for consistency (M66, M67, M68). For indicator M78, we do not set the 50% threshold on the basis of the number of enterprises but on the basis of the net turnover they generate. Since this limit cannot be drawn precisely, the upper 50% is determined by taking the number of enterprises whose combined turnover already reaches 50%. This will never be exactly 50%, but will always exceed it, so the upper 50% will be slightly higher than the lower 50%.

II.1.3 Import share (M28)

The import share helps to infer the competitive situation in each market by characterising the competitive pressure exerted by imported products.[17] Theoretically, the higher the import penetration (the greater the role of foreign production in a given industry), the stronger the competition may be, since foreign firms exert stronger competitive pressure on domestic players.

In contrast to export data, domestic companies are not obliged to provide their import data to the NTCA, so these are not available in the MNB database (for the source of available data, see Table 2). Data on the value of imports by individual companies are not available from other sources. The sectoral data of the HCSO classify imported/exported products in two ways to the respective NACE sectors:

1. the import/export value is allocated to the sector to which the product itself would belong if it had been produced in Hungary;
2. the import/export value is allocated to the sector to which the importing enterprise belongs.

In the Competition Statistics Database, the M71 indicator discussed under M28 and other indicators is also calculated based on **product classification** (method 1). Since this method classifies external trade by the sector producing the product in our country, these data are only available for sections A, B, C, D, E, J, M, R and S. We chose to break down external trade by product because this is the best way to capture the strong external competition that productive sectors face. Aggregate sectoral import values are compared to the net sales of the sector in question to obtain the import share indicator:

> **M28: Annual import share based on product classification** = aggregate industry value of imported products (based on product classification) / industry net sales (%)

Table 2. Statistical accounts of trade flows by industry; sectoral breakdown and source of import and export data from the Trade Statistics Database[18]

Method of compilation of external trade data	Import	Export
Based on product classification	**M12–M20 and M28** **Source:** HCSO Dissemination database[19] **Level of detail:** up to Level 4 of NACE Rev. 2 (sections A, B, C, D, E, J, M, R and S)	**M71** **Source:** HCSO Dissemination database[20] **Level of detail:** up to Level 4 of NACE Rev. 2 (sections A, B, C, D, E, J, M, R and S)
Based on the classification of the importing or exporting enterprise	The data are available in the HCSO Dissemination database; they have not been used in the Competition Statistics Database.[21]	The data are available in the HCSO Dissemination database,[22] and should match the sum of the enterprise level data. For indicators **M12–M20,** the enterprise level data have been used.

[17] See also the M20 indicator calculated for domestic consumption-based indicators (subchapter II.1.1.4).
[18] For the M71 indicator see the subchapter II.5.1.
[19] Available at: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=KA0320&lang=en.
[20] Available at: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=KA0320&lang=en.
[21] Available at: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=KA0270&lang=en.
[22] Available at: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=KA0270&lang=en.

II.1.4 Access to and from the market (M29–M33)

Changes in the number of players in the market, the proportion of firms entering and exiting, capture the barriers to entry. In a market of theoretical perfect competition, there are no barriers to entry, entry and exit are both free. If there is a large movement of firms in an industry, barriers are presumably low. Some entry barriers are sector-specific (e.g., the size of the initial investment), others are regulated by the state (e.g., permits, rules on start-up and closure).

Data on exit and entry are taken from the MNB database. The number of firms entering the market can be captured by the number of newly established firms in a given year. We have also considered firms that are not newly established but are "re-entrants", i.e., firms that have temporarily suspended their activities for at least two years, as entrants. Therefore, by **firms entering in year t**, we mean firms that entered the market in year t (between 1 January and 31 December), i.e., firms **that were not active in years (t − 2) and (t − 1) but were active in year t.** Since observations where the turnover of the firm is zero are excluded from the sample, a firm which has reported but has no turnover for at least two consecutive years will be defined as an entrant under this definition.

A company is defined as **exiting** if it has not filed a tax return for two consecutive years or if it is excluded from the sample because of it has a turnover of HUF 0. This means that in year t, a firm is considered to be an exiting enterprise if it is **still active in year t, but not in year (t + 1) and (t + 2).** As with the returning entrants, there are among the exiting firms some that are inactive during certain periods. This methodology implies that we will only have final data on the exiting enterprises in a given year at the end of the two years following the year under consideration.

If a company changes its legal form, it will be given a new registration number. This would automatically increase the number of companies leaving and entering. Likewise, acquisitions, spin-offs, divisions and mergers cause an overestimation of the number of exits and/or entries. In the case of an acquisition, the acquired firm would be included among the exits. In the case of a merger, the two merging firms would increase the number of exits by two and the newly created firm would be included as an entrant. A similar principle would distort the estimate in the case of a split and a spin-off. Detailed information on these cases can be found in the HCSO Business Register. This allows us to adjust the estimates of the number of exits and entries to show only real movements. We have carried forward the stock of firms that cease to exist as a result of a transformation, so that they do not bias the estimation of the indicators for entries and exits. We have not considered as exiting firms those firms that have ceased to exist by merger, amalgamation, spin-off or division; nor have we considered as entering firms those firms that have been merged, amalgamated, spun-off or split up.

On the other hand, if a company changes its tax form and therefore leaves or enters the monitored enterprise population, it will appear in the Database as an exit or entry. These enterprises distort the data displayed.

However, neither entering nor exiting firms are included if they were previously in a different industry according to their NACE classification, and the same rules apply to exiting firms. To capture inter-sectoral movements, we have introduced variables for the indicator on total exits and entries which show the number of 'sector-switching' firms (i.e., firms that move out of or into a given sector because of a change in their main activity rather than actual exits or entries).

The **number of firms entering the market (M29a)** and the **number of firms exiting the market (M30a),** as well as the **number of firms switching between sectors (M29b, M30b)** are also provided in pieces and their share in the total market. The indicators **M31a, M31b, M32a** and **M32b** thus give the same as **a percentage of total enterprises in the industry:**

M29a: Number of enterprises entering the market in a given year according to the above definition (count)

M29b: Number of enterprises entering the sector from another sector in a given year (count)

M30a: Number of enterprises exiting the market in a given year according to the above definition (count)

M30b: Number of enterprises leaving the sector to another sector in a given year (count)

M31a: Percentage of enterprises entering in year t = number of entering enterprises in year t / total number of enterprises in year t (%)

M31b: Percentage of enterprises entering the sector from another sectors in year t = number of enterprises entering the sector from another sectors in year t / total number of enterprises in year t (%)

M32a: Percentage of enterprises exiting in year t = number of exits in year t / total number of enterprises in year t (%)

M32b: Percentage of enterprises exiting the sector to another sector in year t = number of enterprises exiting the sector to another sector in year t / total number of enterprises in year t (%)

The analysis of entry and exit in the industry over time provides information on the extent to which the players in the industry are able to overcome existing entry barriers. For this the **churn** indicator, which treats entries and exits in aggregate, is used.[23] Its calculation is based on the

M33: Churn rate in year t = (number of enterprises entering in year t + number of enterprises exiting in year t) / total number of enterprises in year t. (%)

formula, where sector changing firms are not taken into account. The low value of the indicator indicates that the ratio of entry to exiting firms is low, suggesting that entry and exit barriers are high. Due to the high entry and exit barriers it is likely that competition is not strong in the relevant market. However, a low value of the indicator does not necessarily imply high entry barriers.

[23] Source: OFT (2004a).

II.1.5 Market share of exiting and entering firms (M34–M37)

The market share of entrants and exits shows what percentage of the industry's turnover and assets belonged to firms that exited or entered the market each year. Accordingly, the market share of firms is measured by the following indicators:

M34a: Net sales of exiting enterprises in year t as a percentage of total industry sales in year t = total net sales of exiting enterprises in year t / total industry net sales in year t (%)

M34b: Net sales of enterprises changing to another sector in year t as a percentage of total industry sales in year t = total net sales of enterprises changing to another sector in year t / total industry net sales in year t (%)

M35a: Assets of exiting enterprises in year t as a percentage of total industry assets in year t = Total assets of exiting enterprises in year t / total industry assets in year t (%)

M35b: Assets of enterprises changing to another sector in year t as a percentage of total industry assets in year t = total assets of enterprises changing to another sector in year t / total industry assets in year t (%)

M36a: Net sales of new entrants in year t as a percentage of total industry sales in year t = total net sales of new entrants in year t / total industry net sales in year t (%)

M36b: Net sales of enterprises entering from another sector in year t as a percentage of total industry sales in year t = total net sales of enterprises entering from another sector in year t / total industry net sales in year t (%)

M37a: Assets of new entrants in year t as a percentage of total industry assets in year t = Assets of new entrants in year t / total industry assets in year t (%)

M37b: Assets of enterprises entering from another sector in year t as a percentage of total industry assets in year t = assets of enterprises entering from another sector in year t / total industry assets in year t (%)

The indicators are calculated both ways (on the basis of turnover and on the basis of assets) because of the specificities of the industries (capital intensity, etc.) as explained above.

II.1.6 Other market structure indicators (M38–M39)

As the logic of competition follows, the firms that have to leave the market are the less profitable ones. This is examined by the M38a indicator, which compares the aggregate profitability of firms leaving the market with the aggregate profitability of firms remaining in the market. The indicator is calculated as follows:

M38a: Profitability of exiting enterprises relative to the profitability of remaining enterprises = combined ROE of exiting enterprises in a given year / combined ROE of remaining enterprises in a given year (%)[24]

The indicator M38a is formed as a quotient which, in some rare cases, may have both a negative numerator and a negative denominator. In the database, therefore, for these and all other indicators, we use indicator variables to indicate, in addition to the individual values, if a positive result is the quotient of two negative numbers.

M38a_i: Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M38a have negative values

The general expectation regarding the indicator is that exiting firms perform worse, so such a case does not occur that, for example, the combined ROE of exiting firms is positive but that of staying firms is negative. However, it is possible that in a given year, the retained firms are less profitable than the exiting firms than expected, e.g., if the exiting firms have made a large investment in that year. In such cases, although the incumbents are less profitable in that year, they are likely to be more profitable in the long run. In particular, this may still be the case for firms switching sectors. Thus, indicator variables have been constructed for indicators M38a, M38b, M38c, M39a and M39b to indicate when the numerator of the indicator is positive, but the denominator is negative.

M38a_i2: Indicator variable: takes the value of 1 if the numerator of indicator M38a is positive but the denominator is negative

M38a_i3: Indicator variable: takes the value of 1 if the numerator of indicator M38a has a positive value and is the quotient of two negative numbers

M38b: Profitability of enterprises exiting the sector to another sector compared to the profitability of remaining enterprises = combined ROE of enterprises exiting the sector to another sector in a given year / combined ROE of remaining enterprises in the sector in a given year (%)

M38b_i: Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M38b have negative values

M38b_i2: Indicator variable: takes the value of 1 if the numerator of indicator M38b is positive but the denominator is negative

M38_i3: Indicator variable: takes the value of 1 if the numerator of indicator M38b has a positive value and is the quotient of two negative numbers

[24] For information on the ROE indicator, see indicators M46–M48. ROE = Return on equity

M38c: Profitability of exiting enterprises relative to the profitability of remaining enterprises = combined ROA of exiting enterprises in a given year / combined ROA of remaining enterprises in a given year (%)

M38c_i: Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M38c have negative values

M38c_i2: Indicator variable: takes the value of 1 if the numerator of indicator M38c is positive but the denominator is negative

Less efficient firms may be driven out of the market by strong competition, as their products and services are priced too high (or have too low quality) to compete with those that can offer higher productivity. If competition is not fierce, less productive firms are more likely to stay in the market longer. If the less productive firms are forced to exit the industry, it is assumed that the selection effect of competition is at work. Productivity is measured by the gross value added per capita (M55) indicator based on Hamar (2005).

M39a: Productivity of exiting enterprises relative to the productivity of remaining enterprises = combined productivity of exiting enterprises in a given year / combined productivity of remaining enterprises in a given year (%)

As with indicators M38a and M38b, for indicators M39a and M39b, indicator variables are used in addition to the individual values to indicate if the positive result is the quotient of two negative numbers, or if the numerator of the indicator is positive but the denominator is negative.

M39a_i: Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M39a have negative values

M39a_i2: Indicator variable: takes the value of 1 if the numerator of indicator M39a is positive but the denominator is negative

M39b: Productivity of enterprises exiting the sector to another sector compared to the productivity of remaining enterprises = combined productivity of enterprises exiting the sector to another sector in a given year / combined productivity of remaining enterprises in a given year (%)

M39b_i: Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M39b have negative values

M39b_i2: Indicator variable: takes the value of 1 if the numerator of indicator M39b is positive but the denominator is negative

The indicator is expected to show the productivity-enhancing effect of competition when analysed over time. For example, if competition in an industry increases for some external reason, in principle, turnover and attrition will increase.

In an industry where competition is increasing, we expect firms exiting the market to be less productive (the value of the indicator is less than one) and the productivity gap between the remaining players in the market and between the firms exiting and remaining in the market to gradually decrease. The presence of low productivity firms in the market does not necessarily imply a lack of competition. A good example is that a firm with patent protection or a well-established brand name can theoretically operate with lower than typical productivity in a differentiated product market.

II.1.7 Number of firms not included in the sample (M40)

The market structure indicators are calculated for a set of enterprises filtered by the number of employees and then by net sales. However, it may also be informative to record how many companies are excluded from the sample when filtering companies according to these criteria. This is given by the indicator M40a:

M40a: Number of enterprises not included in the sample = number of enterprises in the industry with zero sales in the given year (count)

M40b: Percentage of enterprises not included in the sample = number of enterprises in the industry with zero sales in the given year / (total number of enterprises + number of enterprises in the industry with zero sales in the given year) (%)

II.2 Price conditions (M41–M43)

In general, increasing competition is associated with falling prices, and decreasing competition with rising prices. For each industry, the reasons for any price increase or decrease need to be assessed on an individual basis.

Theoretically, a study of prices should be able to show precisely whether competition is having a welfare-enhancing effect on consumers. However, this is complicated by, among other factors, the lack of adequate data for the economy as a whole. Only **industrial producer prices** and **price indices for domestic and export sales** are available for industries an economy.[25] The source of the data is the HCSO. They are included in the database under the names M41–M43:

M41: Industrial producer price index (index, previous year = 100)

M42: Producer price index of domestic sales (index, previous year = 100)

M43: Producer price index of export sales (index, previous year = 100)

The representative price monitoring of the HCSO covers around 1,400 economic organisations and nearly 6,000 products.[26] The observed price is the base price for domestic sales, which is included in the revenue, excluding sales tax, calculated with a price supplement; for foreign sales, it is the price at border parity converted into forints, at the exchange rate of the day of the fulfilment. The industrial producer price index is the weighted average of the price indices for

[25] For sections A, B, C, D, E, F, H, I, J, L, M and N of the NACE Rev. 2.

[26] The detailed methodology is available on the HCSO website: https://www.ksh.hu/docs/eng/modsz/ara_meth.html.

domestic sales and export sales. The price index of domestic sales of an industry is an index based on the net turnover of goods and services sold in the domestic market, weighted by the base period. The price index of export sales of an industry is an index weighted by the base period, based on the turnover of goods sold directly, or through an agent, or in a joint venture to external trade. The export price index excludes services sold. The data are typically available by sections and at Level 2 of NACE Rev. 2.[27] Industry price indices can be compared with the development of the consumer price index or the aggregate producer price index.

II.3 Profitability (M44–M54)

The relationship between competition and profitability is based on the fact that if competition in the industry is not sufficiently intense, firms can achieve high margins above marginal cost and therefore their profitability can be high or increase. However, the measurement of profitability is inherently imperfect because we cannot use profit in the economic sense, but only profit calculated based on accounting conventions. Differences in the data in particular years can also be caused by one-off factors that are independent of competition (e.g., one-off high value investments, R&D).

Accounting indicators of profitability can be derived from the balance sheets and the income statements of companies. Operating profit, profit before tax or profit after tax can be related to and expressed as a ratio of the corresponding balance sheet and income statement items (i.e., how a company's profit is related to net sales, total assets or capital employed). The disadvantage of profitability indicators calculated based on the balance sheet is that balance sheets are often constructed in a very conservative way, for example because of the undervaluation of intangible assets and the cost-based accounting of other assets. The appropriate approach would be to record assets at their replacement value. As a result of valuation problems, the value indicators for assets are typically underestimated. Consequently, the profitability indicators that include them in the denominator will be overestimated.

Based on company-level data, financial indicators are calculated on an aggregated basis by industry. The higher the sectoral performance indicator, calculated by different definitions, the better the performance of the sector. However, a year-on-year decline in the financial accounting performance indicator of an industry does not necessarily mean that competition in the market has increased.

Profitability can be assessed by using operating profit, profit before tax, profit after tax adjusted or unadjusted for depreciation and amortisation. Profit margin, return on invested capital, return on assets or return on equity are also available. Although indicators based on uniform accounting conventions are calculated in the same way and can therefore be directly compared, the characteristics of the sector in question must always be considered. For example, in some industries, the return on equity is inherently high because of the low level of assets required to run the business (e.g., consultancy firms). Other industries invest heavily in infrastructure before they can make a profit (e.g., mining or oil refineries), so the value of the same indicator is low, and in this case, for example, it is also important how long the company has been in operation (whether it is already profitable or not).

[27] Industrial products: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=SI202&lang=en; construction: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=SE20012&lang=en; agricultural products: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=MR1A051&lang=en; services: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=SG2A04&lang=en.

Similar problems can arise when looking at sectoral data for a particular year. It is possible that a large player in an industry has invested heavily in a given year, so there will be a break in the return on equity indicators in that year. If, without this information, we look only at the value of the indicator, we might also think that the break was caused by, for example, a new competitor or government intervention. Therefore, profitability ratios alone are also not good indicators of the state of competition.

In the calculation of industry profitability indicators, the question arises of how to aggregate the indicators of individual companies when there are companies with negative results at some accounting "profit level". The problem can be approached in three ways.

- These rows are "zeroed out" for each company. This has not been done because it would homogenise the loss-making companies and blur the extent of the losses.
- In these cases, the indicators for profitable and loss-making companies are put in separate columns. In this case, there would be two columns for each indicator concerned, one positive (the aggregate of the companies that have a positive result for the indicator) and one negative. In our view, this is not a good solution either, because each company will become loss-making at different accounting profit levels, and in addition the interpretability and usability of the database will be greatly impaired.
- The practice of the HCSO is the one we use. We use an aggregation with the correct sign of the individual company results in each industry, i.e., a negative result reduces the aggregated industry result. If a negative aggregate indicator leads to a misleading result, then that is indicated by the corresponding indicator variable.

In the case of an industry where not only individual companies, but entire industry levels show negative values for certain profitability indicators, we also proceed as above. Generally speaking, we can say that the negative value of the financial indicators we calculate is also informative, furthermore, if we ignore them, we would not be able to provide data for a large proportion of sectors.

In the Competition Statistics Database, we use the profitability indicators presented in the subsections below.

II.3.1 Operating profit as a percentage of net sales, EBIT[28] rate (M44)

The simplest indicator of profitability is operating profit as a percentage of net sales. A major advantage of this indicator over the return on equity indicators that are used in the Database is that, since they do not include an equity indicator, they are free from the errors that arise from it, i.e., they are not distorted by the different capital intensity of different industries or by accounting problems in capital valuation. It also has the advantage of not accounting for extraordinary and financial results, i.e., it captures purely industry-specific market trends. Nor does it take account of financing conditions, since the operating result does not include the result of financial operations. It is calculated using the following formula:

M44: EBIT margin = industry's combined operating (business) profit / industry's net sales (%)

The indicators in the Competition Statistics Database are calculated on an aggregated basis, always for a given industry or part of an industry, rather than by company. This is also the case

[28] EBIT = Earnings Before Interest and Taxes

for the EBIT margin, which is calculated for the whole industry by summing the operating profit of all companies in the industry and dividing it by the total net sales of the industry. Its value is, of course, not equal to the simple arithmetic average of the EBIT ratios of the individual companies. If a simple arithmetic average is used for an industry or sub-industry indicator instead of this method, it is indicated separately.

II.3.2 Operating profit adjusted for depreciation and amortisation as a percentage of net sales, EBITDA[29] rate (M45)

The annual depreciation charge is included in the expenses side of the operating result. As this can be used to increase the company's future development funds, it can also be included in the company's assets alongside the profit. For this reason, we calculate the EBITDA ratio, in which the previously deducted depreciation is added to the value of the operating result. An additional advantage of using this indicator is that, once depreciation is 'added back' to the operating profit, it provides a better basis for comparison between industries with different asset intensity and eliminates differences arising from different depreciation methods used by different companies. The EBITDA and EBIT ratios are frequently used in the international literature for industry analysis (e.g., Demailly and Quirion, 2008; Chari and Gupta, 2008).

For comparability reasons, this is also expressed as a percentage of net sales as follows:

M45: EBITDA margin = (industry operating (business) profit + industry depreciation) / industry net sales (%)

II.3.3 Return on equity after tax, ROE (M46–M48)

Return on equity indicators are widely used. These indicators are, in our view, closer to the econometric definition of profit as opposed to profitability indicators that measure profitability as a proportion of sales revenue, because they consider profit as a return on investment. The ROE indicator is often used in the international literature to measure profitability in the light of changes in the competitive environment (e.g., Won, 2007). However, for each indicator that includes a capital ratio, the following problems arise.

- The capital requirements of different industries differ; this has been mentioned above.
- We use accounting data to value company capital, which by their very nature are conservative, do not reflect a fair market valuation and may therefore be distorted. The bias is understood to be "downward", i.e., the value of the company's capital is usually actually higher than what is shown in the accounting rules; the resulting profitability ratios thus give a higher value than is actually the case. In fact, we should use the real market value of companies instead of the accounting value of capital, but this is not feasible.
- Return on capital ratios cannot be interpreted for individual years because they do not take into account the state of the business cycle of the economy. The indicators can only be interpreted by looking at several years together. In this respect, the turnover ratio indicators are better because the numerator and denominator of the indicator are likely to change during a cycle, whereas the accounting value of capital is not dependent on the business cycle.

[29] EBITDA = Earnings Before Interest, Taxes, Depreciation and Amortisation

- Return on equity may differ depending on how long a firm has been in the market, or when it has made a major investment, acquisition, etc.

In the Competition Statistics Database, the ROE indicator is calculated in three ways:

M46: Return on equity before tax (ROE1) = Industry profit before tax / Industry equity (%)

Similar to the quotient indicators presented so far, indicator variables are used to indicate when the numerator and denominator of a given indicator have both negative values.

M46_i: Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M46 have a negative value

M47: Return on equity after tax (ROE2) = industry profit after tax / industry equity (%)

M47_i: Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M47 have negative values

The ratio calculated on a pre-tax basis and on an after-tax basis is not equivalent because the tax liability differs significantly between industries due to tax benefits for individual companies. The level of profit before tax is the level at which the performance of different companies can still be compared.

M48: Return on equity (ROE3) = industry balance sheet profit / industry equity (%)

M48_i: Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M48 have negative values

ROE calculated on the basis of the balance sheet profit takes into account the value of dividend payments. The balance sheet profit is the net profit by which equity has increased in a given year.

II.3.4 Return on capital employed, ROCE[30] (M49)

The indicator is calculated as follows:

M49: Return on capital employed (ROCE) = Industry operating (business) profit / (industry total liabilities − industry current liabilities) (%)

The indicator takes the capital stock into account by removing current liabilities from liabilities, because these are intra-year debts such as suppliers, employee salaries, taxes payable, etc. These liabilities are needed to finance operations, not to finance the capital stock. The sum of liabilities without these liabilities is effectively the sum of equity and debt. The advantage of this indicator is that it gives a concrete measure of profitability as a percentage of the capital employed, i.e., it is closer to the theoretical definition of profit. The indicator is intermediate between ROE and ROA in the sense that the former includes only equity, ROCE includes equity and debt, while ROA includes short-term liabilities, provisions, and current liabilities (Sirtaine et al., 2005).

[30] ROCE = Return on capital employed

M49_i: Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M49 have negative values

II.3.5 Profit after tax as a percent of sales, ROS[31] (M50)

The indicator is calculated as follows:

M50: Return on sales (ROS) = Industry profit after tax / Net sales of the industry (%)

The indicator uses net sales instead of the capital stock indicator, thus avoiding the problems already discussed (Marthur and Banchuenvijit, 2007).

II.3.6 Return on investment, ROI[32] (M51)

Different definitions of the ROI indicator are used in the literature. In the Competition Statistics Database, the indicator is calculated as follows (Lahtinen and Toppinen, 2008):

M51: Return on investment (ROI) = industry operating profit / industry fixed assets (%)

The indicator quantifies the proportion of the industry's investment that could be recovered from the industry's normal business activities. Several definitions and methods of calculation are known in the literature. Its usability raises concerns because it uses tangible assets as a benchmark whose value is not the same as the industry''s investment. Nevertheless, we have decided not to exclude it from the database because, on the one hand, it is widely used and, on the other hand, we cannot calculate a better indicator based on the data.

II.3.7 Return on average assets, ROA (M52)

The international literature often relies on the ROA indicator in industry analysis (Haugland et al., 2008; Andre, 2008). The ROA indicator refers to the return on assets of a company. We consider that ROA is not suitable for cross-industry comparisons due to some specific conditions, but it is suitable for the analysis of companies within an industry and for time series analysis of certain industries. It is not suitable for cross-industry comparisons because firms in industries where capital is quickly turned over (e.g., fast food chains) may operate with lower profit margins, while firms in industries where the return on assets is low (e.g., hotels) may compensate with higher profit margins. This problem arises similarly for any indicator that uses the value of assets. Calculation:

M52: Return on assets (ROA) = industry combined profit after tax / industry total assets (%)

ROA, ROS, and ROE together are the three indicators most commonly used to assess the profitability of companies.

II.3.8 Return on invested capital, ROIC[33] (M53)

The indicator shows how much income the company generates through its normal business activities (Petersen and Plenborg, 2006). It excludes those extraordinary entries that affect the current period result but do not affect the company's ability to generate profit in the long run. Its calculation is based on the US financial reporting system, which differs significantly from

[31] ROS = Return on sales
[32] ROI = Return on Investments
[33] ROIC = Return on Invested Capital

the Hungarian system, and even this has to be corrected for certain factors. If we break down its various elements, we obtain categories (e.g., assets related to other operations, i.e., assets not related to normal business activities) which are difficult to define for a domestic industrial company. Among the many possible ways of calculating the indicator, we have tried to select the one that is most applicable to Hungarian conditions and can be calculated from the available data. The indicator is calculated using the following formula:

M53: Return on invested capital (ROIC) = (industry operating profit − industry corporate tax) / (industry total liabilities − industry suppliers − industry accruals and deferrals) (%)

II.3.9 Industry loss as a percentage of net sales (M54)

The profitability indicators summarise the values of the revenue and profit categories of the industries with the correct signs for the reasons already discussed. To give an indication of the loss within industries, we calculate the industry loss as a percentage of net turnover indicator (M54) to complement the profitability indicators:

M54: Industry loss as a percentage of net sales = absolute value of industry loss / net sales of total industry sales (%)

The "absolute value of the industry loss" is calculated by adding together the after-tax profits of companies with a negative after-tax profit within the industry and multiplying it by −1. The numerical value of the indicator is either zero (if there were no companies with negative after-tax profits in the industry in the year in question) or positive.

II.4 Productivity (M55–M70)

Productivity is the quantity and value of output (goods and services) produced per unit of input (capital, labour, other resources). A more productive firm produces the same output with fewer inputs or can produce more output with the same amount of inputs. The firm with higher productivity can achieve higher profits due to lower average costs. Strong competition may encourage firms to achieve the highest possible productivity given the technological opportunities - and other parameters of the economic environment. Technological innovations, organisational changes, training of employees, a better incentive system, etc. can lead to productivity gains.

Both theoretical and empirical studies have concluded that there is a link between the intensity of economic competition in a given market and productivity developments. Competition in the market can affect the productivity of an industry in two ways: first, it encourages firms to use inputs more efficiently, and second, it can lead to the crowding out of less productive firms, resulting in the market penetration of more productive firms.

Theoretical and empirical studies suggest that the productivity-enhancing, cost-reducing effects of competition can be significant. Competition also has a productivity-enhancing effect by providing firms with incentives to better serve their customers' needs. Fierce competition induces firms to adopt the lowest-cost production technologies available on the market. New technology allows companies to produce more products and services with fewer inputs, thus improving productivity.

Productivity is measured by the amount of output per unit of resource, or combination of resources. Studies examining the relationship between competition and productivity tend to use

two main productivity indicators, labour productivity (e.g., Blanchflower and Machin, 1996) and total factor productivity (e.g., Griffith, 2001).

Productivity levels, growth and dispersion all carry information. A study by the UK Office of Fair Trading (OFT) (2004a) used three productivity indicators (labour productivity growth, total factor productivity (TFP) levels and total factor productivity growth) from firm-level data. In the Competition Statistics Database, both labour productivity and total factor productivity are calculated, including their absolute level per year and their change between years.

II.4.1 Production factors (M55–M66)

The productivity indicators are the followings.

II.4.1.1 Labour productivity (M55–M62)

Labour productivity is defined as the quantity of output produced per unit of working hours or labour (e.g., per hour or per employee). On the input side, labour productivity is often measured in terms of hours worked, number of employees or cost of labour. On the output side, it is usually based on gross value added. In addition to the level of labour productivity, the change in the value of the indicator over time (the calculated annual growth rate of labour productivity) or the standard deviation of labour productivity also provides important information and is therefore also used to quantify these indicators.

Labour productivity is significantly influenced by the labour intensity and technology intensity of a given industry. Consequently, it is not necessarily worth comparing highly labour-intensive sectors with sectors where technology plays a more important role in productivity.

To measure labour productivity at the industry level, **gross value added is** used as output (Hamar, 2005). Gross value added is defined as the sum of personnel costs, adjusted operating profit and annual depreciation. The adjusted operating profit excludes other income and other expenditure. Technically, this means that the value of other income is deducted from the value of operating profit and the value of other expenses is added. The resulting amount (gross value added) is equal to net turnover minus total material costs plus capitalised production.[34] In the Competition Statistics Database, gross value added is calculated in the first way, from operating profit. Based on this, labour productivity indicators were calculated according to the following formulae:

M55: Gross value added per capita = (industry level personnel costs + industry annual depreciation + industry adjusted operating profit) / number of employees in the industry (thousands HUF/capita)

[34] Gross value added can be negative if, for example, operating profit is negative and other income is high. It may also be the case if the operating result is positive, but the value of other income is higher than the sum of the operating result and other expenses. The value of material costs will be zero in the balance sheet of many companies from 2017 and onwards due to the structure of simplified accounting reports, so by removing material costs, the balance of the balance sheet will have to be rearranged to obtain results consistent with the value added obtained as the difference between output (net sales + value of own capitalised production) and output consumption (material costs), avoiding inconsistencies over time. Accordingly, the following formula has been used to calculate the value added at enterprise level:
Value added = operating result − income from investment service activities + expenses from investment service activities − other income + personnel expenses + depreciation + other expenses.

M56: Gross value added per unit labour cost = (industry level personnel costs + industry annual depreciation + industry adjusted operating profit) / industry level personnel costs (without unit of measurement)

The labour productivity growth rate (M57–M58) indicators show the change in the use of labour as a factor of production. They compare labour productivity in a given period with labour productivity in the previous period. If the indicators show an increase, then labour has been used more efficiently in successive years.

If the output produced with the same number of workers, hours worked or labour cost in period t is greater than in period (t − 1), then there is an increase in labour productivity. Intensified competition forces firms to make their workers produce more efficiently, i.e., to increase output at the same labour cost. Therefore, in sectors where labour productivity growth rates are high, intense competition can be inferred.

The labour productivity growth rate is calculated based on the number of employees and labour costs as follows:

M57: Labour productivity (gross value added per capita) growth rate in year t = labour productivity (gross value added per capita) in year t / labour productivity (gross value added per capita) in year (t − 1) (index, previous year = 100)

M58: Labour productivity (gross value added per unit labour cost) growth rate in year t = labour productivity (gross value added per unit of labour cost) in year t / labour productivity (gross value added per unit of labour cost) in year (t − 1) (index, previous year = 100)

Due to the definition of the indicators, the Competition Statistics Database does not contain data for 2003.

The relative standard deviation of labour productivity by industry (M59–M60) indicates the extent of productivity differences between firms in each industry. According to Oulton (1998), who studied the productivity of UK industry, manufacturing has a lower productivity standard deviation. The standard deviation of productivity in some industries (e.g., manufacturing) is significantly (40–50%) lower than in other industries. This can be explained by the fact that competition in the UK manufacturing sector was very intense during the period under review, mainly due to competitive pressure from abroad. At least three quarters of the standard deviation of productivity is due to differences between firms in the same industry. Disney et al. (2003) also concluded that firms' productivity converges more rapidly under more intense competition, as competition induces them to produce more efficiently. Of course, it is not necessarily true that the lower the variance of labour productivity, the more intense the competition, or that a high level of variance indicates low-intensity competition.

The relative standard deviation of labour productivity is calculated using the following formula:

M59: Relative standard deviation of gross value added per capita = $\sqrt{\frac{\sum(X_{GVA}-M_{GVA})^2}{N-1}} \cdot \frac{1}{M_{GVA}}$ (without unit of measurement),

where X_{GVA} is the gross value added per capita of each enterprise, M_{GVA} is their simple arithmetic average (M61a) and N is the number of enterprises.

M60: Relative standard deviation of gross value added per unit labour cost = $\sqrt{\frac{\sum(X_{GVALC}-M_{GVALC})^2}{N-1}} \cdot \frac{1}{M_{GVALC}}$ (without unit of measurement),

where X_{GVALC} is the gross value added per unit labour cost of each enterprise, M_{GVALC} is their simple (unweighted) arithmetic average (M62a) and N is the number of enterprises.

M61a: Simple arithmetic average of gross value added per capita = simple arithmetic average (unweighted) of the gross value added per capita of each enterprise (thousands HUF/capita)

M61b: Median gross value added per capita = median gross value added per capita of each enterprise (thousands HUF/capita)

M62a: Simple arithmetic average of gross value added per unit labour cost = simple arithmetic average (unweighted) of the gross value added per unit labour cost of each enterprise (without unit of measurement)

M62b: Median gross value added per unit labour cost = median gross value added per unit labour cost of each enterprise (without unit of measurement)

II.4.1.2 Total factor productivity (M63–M66)

Total factor productivity, TFP (M63), like other productivity indicators, shows how efficiently a firm converts its factors of production into output, but takes into account a wider range of inputs, most often labour and capital. Total factor productivity includes the effects on productivity of improvements in technology, economies of scale, management skills, production externalities and other non-traditional growth factors.

The relationship between production factors and output is most often described by the Cobb-Douglas production function. Total factor productivity is based on this:

$$TFP = \frac{Y}{K^{S_K} L^{S_L}},$$

where Y is the output, K is the capital, L labour, S_K and S_L the partial elasticity of production of capital and labour[35] (Varian, 2003, p. 337).

The indicator was calculated using the following formula (OFT, 2004a):

M63: Total factor productivity (TFP) = $\frac{NSR}{TA^{\frac{TA}{TA+PE}} \times PE^{\frac{PE}{TA+PE}}}$ (without unit of measurement),

where NSR is the net sales revenue of the industry, TA is the industry's tangible assets and PE is the personnel expenses of the industry.

TFP is based on the production function specified in the Cobb-Douglas way. The way TFP is calculated in this case differs slightly from the literature (OFT, 2004a, p. 76), where the

[35] The partial elasticity of production of capital or labour shows that if the quantity of capital or labour used in production increases by 1%, then, all else being equal, what percentage the output changes.

denominator in the base of the second term of the multiplication is not personnel expenses but the number of employees.

The relative standard deviation of **TFP (M64)** is calculated in the same way as the relative standard deviation of labour productivity:

M64: Relative standard deviation of TFP = $\sqrt{\frac{\sum(X_{TFP}-M_{TFP})^2}{N-1}} \cdot \frac{1}{M_{TFP}}$ (without unit of measurement),

where X_{TFP} is the total factor productivity of each firm, M_{TFP} is their simple (unweighted) arithmetic average (M65a) and N is the number of enterprises.

M65a: Simple arithmetic average of TFP = simple arithmetic average (unweighted) of TFP of each enterprise in the industry (without unit of measurement)

M65b: Median TFP = median TFP of enterprises in the industry (without unit of measurement)

M65c: The ratio of TFP of industry leaders and laggards = 90th percentile of the enterprise-level TFP distribution of the industry / 10th percentile of the enterprise-level TFP distribution of the industry (without unit of measurement)

The M66 indicator is calculated using the gross value added per unit labour cost indicator:

M66: Productivity of smaller firms compared to larger firms = combined gross value added per capita of smaller firms / combined gross value added per capita of larger firms (without unit of measurement)

Gross value added per capita is calculated in the same way as for indicator M55. Firms are ranked based on turnover on a sectorial level, then the ranking is halved, and the gross value added per capita of the lower turnover firms (bottom 50%) is divided by the gross value added per capita of the larger firms (top 50%).[36]

If the value of the indicator is higher than the average, we can conclude that smaller companies in the industry are at a more moderate disadvantage compared to larger companies than in other industries. This may also indicate that productivity is less linked to firm size and therefore barriers to entry are lower. The lower the value of the indicator, the greater the scale advantage of larger firms.

II.4.2 The link between profitability and productivity (M67–M68)

The joint analysis of profitability and productivity is based on the principle that increased competition in a sector may affect the profitability of firms with high and low productivity differently. In the presence of more intense competition, the profitability of low-productivity firms may be worse and that of higher-productivity firms may be better than in the presence of less intense competition (Boone, 2004). More intense competition (lower entry barriers or costs or aggressive interaction between incumbent firms) may increase profitability by "shifting"

[36] The gross value added is calculated in the same way as the numerator of the M55 indicator: personnel costs + annual depreciation + adjusted operating result.

production from less efficient firms to more efficient firms. Because of this, it is usually the less productive, and therefore low-profitability, firms that are driven out of the market first. The Boone indicator, which has been developed and is often cited to examine profitability and productivity together, cannot be quantified in the absence of adequate data (marginal cost). Instead, we can calculate the following indicator:

The relationship between profitability and productivity = the combined profitability of the less productive (bottom) 50% of firms in a given industry ranked by productivity / the combined profitability of the top 50% of firms.

The usefulness of the indicator is complicated by the fact that in many cases the numerator, the denominator or both can be negative, so that the sign of the resulting quotient cannot be interpreted by itself. To avoid this problem, the numerator and the denominator of the indicator are given as separate indicators as follows:

M67: Numerator of the indicator on the relationship between profitability and productivity = the combined profitability of the less productive (bottom) 50% of enterprises in the given industry in terms of productivity (%)

M68: Denominator of the indicator on the relationship between profitability and productivity = the combined profitability of the more productive (top) 50% of enterprises in the given industry in terms of productivity (%)

For both M67 and M68, the productivity indicator is the gross value added per capita (M55) and the profitability indicator is the EBIT ratio (M44).

II.4.3 Innovation (M69–M70)

Innovation is the engine of long-term growth and productivity. There is no generalisable relationship between market power and the incentive to innovate, i.e., it is not necessarily and always true that as competition increases, so does the propensity to innovate. The relationship between competition and innovation is characterised by the dichotomies that defined Schumpeter and Arrow's 'debate'. Schumpeter postulates a positive relationship between innovation, firm size, and market concentration. Arrow argues that the higher the profit before innovation, the lower the net gains from innovation, so that competing firms are presumably more interested in innovation than the monopolist, which can achieve high profits without it.

The complex relationship between competition and innovation is supported by empirical analyses. Blundell et al. (1995) analysed the relationship between competition and innovation using data from 375 UK listed firms. Dominant firms with a larger market share were measured significantly more innovative than smaller firms. They also found that industrial concentration, i.e., when few firms are active in a given sector, stifles rather than stimulates innovation. Aghion et al. (2000) found that the level of innovation is also low in the presence of less intense competition because there is no incentive. In the case of medium-intensity competition, the intensity of innovation is high, as firms seek to compete by creating new products and processes. However, when competition is very strong, innovation is reduced (for example, the benefits of innovation are reduced by the risk of copying).

In measuring innovation, the international literature quantifies both input and output indicators. The input side is measured by R&D expenditure, the number of graduates and employees from

the field of science and engineering, the number of people employed in R&D, and the business application of innovation (see e.g., European Innovation Scoreboard). The output side of innovation is measured by the number of patents, high-tech exports, and the share of employment in medium- and high-tech industries. In some sectors and sub-sectors, innovation indicators can be meaningful (e.g., chemicals, telecommunications), while in others (e.g., retail) R&D expenditure is not applicable.

Of the above data, only R&D expenditure and the number of people employed in R&D are available by sector. The MNB database does not include R&D expenditure at the enterprise level, as this is not required to be reported separately. The source of the data is the HCSO.[37] In some cases, where R&D is practically negligible or non-existent, data are only available up to Level 2 classification. The number of R&D personnel is a corrected headcount in which the number of non-full-time employees has been converted into full-time employees. R&D expenditure includes, in addition to current expenditure, the sum of R&D investments in the given year.

The two R&D indicators are included in the Competition Statistics Database as follows:

M69: Percentage of R&D expenditure = R&D expenditure in the industry / industry net sales (%)

M70: Percentage of R&D employment = number of R&D employees in the industry / total number of employees in the industry (%)

The M69 indicator measures R&D expenditure to output. The ratio of R&D expenditure to net sales revenue allows us to draw conclusions about how innovation intensive the industry is. However, low R&D expenditure does not necessarily imply low intensity of competition, as in some sectors there is little or no innovation activity (e.g., retail).

For the M70 indicator, the number of R&D employees is expressed as a percentage of the total number of employees, in line with international practice. In typically innovation-driven industries (e.g., pharmaceuticals, machinery), high R&D employment and expenditure may be an indicator of more intense competition, as the production, output and productivity of such firms are highly dependent on their innovation activity.

II.5 Other indicators (M71–M79)

II.5.1 Share of exports in sales turnover (M71)

Most of the existing indicators do not take into account whether companies in a given industry compete mainly on domestic or international markets. **This issue can be approached by using the export share in** addition to the import share (M28).

For the representation of exports, the **M71 indicator** is calculated on the basis of the trade in goods data of the HCSO.[38] As for the M28 indicator, data based on product classification are only available for sections A, B, C, D, E, J, M, R and S.

[37] R&D expenditure: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=HA4B01&lang=en; R&D personnel: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=HA4A01&lang=en.

[38] For more details on the compilation and methodology of import and export data, see subchapter II.1.3 and Table 2. See also indicators M12–M20 (subchapter II.1.1.4).

M71: Percentage of export based on product classification = value of exports by industry based on product classification / industry net sales (%)

The higher the value of the indicator, the stronger the pressure of international competition on the industry. The indicator does not provide answer about what intensity of competition do the Hungarian companies face in the international markets.

II.5.2 Investment by enterprises (M72–M73)

The **investment activity of firms** is measured by the M72 and M73 indicators. The renewal of tangible assets indicator (M72) shows the extent of investment by firms in each industry.

The point of investment is that the company obtains goods that facilitate the production of other goods. Therefore, investment, considered over a period of time, is nothing more than an increase in the capital stock (i.e., the stock of productive assets) of a firm. Intensified competition induces firms to increase their productivity, i.e., to use capital as an input more efficiently. The efficient use of capital starts with optimal investments, e.g., in the case of a manufacturing firm, the purchase of new, more efficient machineries. When competition is less intense in an industry, then firms are less motivated to invest constantly, e.g., to execute technological improvements, because they are able to provide competitive products at affordable prices without improving their cost levels.

M72: Renewal of tangible assets based on investments placed in service = investments in tangible assets placed in service in the industry / total tangible assets in the industry (%)

The M73 indicator measures the same with the performance value of investments in the current year as follows:

M73: Renewal of tangible assets based on the performance value of investments in the current year = performance value of investments in the industry during the current year / total tangible assets in the industry (%)

The two indicators represent the renewal of the capital stock. The difference between the two indicators is that M72 is the amount of capital expenditure that are actually completed, delivered and among the fixed assets capitalised in the given year, while M73 is the amount of cash paid out for capital expenditure in the given year, part of which will be delivered only in following years. The values for the two indicators may differ considerably, since investments put into service do not necessarily generate a profit in the year in which they are put into service. The performance value (M73) is a more stable indicator, with less variation from year to year, while M72 shows greater fluctuations, as firms may capitalise several years of continuous investment at the same time. However, the expansion of the market is more accurately reflected by the investments already in operation (M72). Future production expansion (and hence a possible increase in competition) is based on the latter.[39]

[39] For example, during the construction of a shopping centre, the development of the property may take several years and thus appear in the investments for the current year (M73) for three years. However, the investment will be capitalised in one step at the end of the construction when the investments for the three years are put into operation, thus the total expenditure for the three years of development will appear as a one-off item in M72. The increase in competition in the shopping centre market will become apparent once the investment has been put into service.

II.5.3 Foreign ownership as a percentage of registered capital (M74)

M74: Foreign ownership as a percentage of share capital = foreign ownership of share capital / total share capital of industry (%)

The foreign ownership of capital, similarly to most of the data, is derived from corporate tax return data, which get aggregated at industry level.

II.5.4 Size and growth rate of industries (M75–M77)

The size of the industries is indicated by the net turnover of the industries (M75) or by the ranking number (M76) given by the order of the net turnover. The growth rate of industries (M77) is given by the net turnover chain index.

M75: Industry size = combined net sales of the enterprises in the industry (thousands HUF)

When assessing the net turnover of the branches, it should be taken into account that the net turnover of the branches which produce and trade products subject to excise law includes the value of excise duties. This implies that the value of net turnover in these specialised sectors is highly overestimated; the more so the higher the share of excise duty in the price of the product (e.g., 1200 manufacture of tobacco products, 4635 wholesale of tobacco products). In these cases, in addition to the M75 indicator, the value of each indicator calculated by using net turnover directly or indirectly will also be biased.

M76: Ranking by industry size = ranking in descending order of the combined net sales of the enterprises in the industry (without unit of measurement)

M77: Growth rate of the industry = total net sales of the enterprises in the industry in year t / total net sales of the enterprises in the industry in year (t − 1) (index, previous year = 100)

Due to the calculation method, no such data is available in the Competition Statistics Database for 2003.

II.5.5 The cost disadvantage ratio (M78)

The cost disadvantage ratio (CDR) indicator (**M78)** is defined as the ratio (average cost − marginal cost) / average cost based on Sulamaa and Widrén (2007), where average cost is the total cost divided by output and marginal cost is the cost of the output of the additional unit.

There is a link between the cost structure of the firm and the intensity of competition. The calculation of the cost disadvantage ratio is used in the context of economies of scale. The higher the ratio of fixed costs to variable costs in an industry, the greater the economies of scale, and therefore the greater the cost advantage of a large firm size.

The quantification of the cost disadvantage ratio would ideally be based on average and marginal cost calculations, but these are not available at corporate or industry level. The Competition Statistics Database uses a simpler but manageable method (OFT, 2004a, p. 27), based on comparing the productivity of firms ranked by size.

The index is constructed by taking the value added per person employed into consideration. This is calculated in an aggregated form for firms producing the bottom 50% of sales, and it is

divided by the same for the firms producing the top 50% of sales.[40] The size of the company is approximated by net sales.

M78: Cost disadvantage ratio = gross value added per capita of enterprises in the bottom 50% of total industry net sales / gross value added per capita of enterprises in the top 50% of total industry net sales[41] (without unit of measurement)

The lower the value of the indicator, the greater the benefits of company size in the industry. In other words, the lower the value of the indicator, the higher the fixed costs of the industry. Higher fixed costs require a larger minimum efficient size, i.e., entry becomes increasingly difficult with rising fixed costs.

II.5.6 GDP deflator (M79)

The GDP deflator shows the average price change for a given industry compared to the reference year or the previous year. It shows by how much the average prices of an industry in a given year were lower or higher than in the previous year. The source of the data is the HCSO.[42]

M79: GDP deflator (implicit price index of gross value added) (previous year = 100)

[40] See also footnote 16.
[41] The gross value added is calculated in the same way as the numerator of the M55 indicator: personnel costs + annual depreciation + adjusted operating result.
[42] Available at: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=GPK201&lang=en.

III. ANNEX I: STATISTICS ON COMPETITION DATABASE INDICATORS

Indicators of market structure	
M1	Number of enterprises (count)
M2	CR3 based on net sales (%)
M3	CR3 based on total assets (%)
M4	CR5 based on net sales (%)
M5	CR5 based on total assets (%)
M6	CR10 based on net sales (%)
M7	CR10 based on total assets (%)
M8	Relative standard deviation of shares based on net turnover
M9	Relative standard deviation of shares based on total assets
M10	HHI based on net sales
M11	HHI based on total assets
M12	CR3 based on domestic consumption (assumption 1) (%)
M13	CR3 based on domestic consumption (assumption 2) (%)
M14	CR5 based on domestic consumption (assumption 1) (%)
M15	CR5 based on domestic consumption (assumption 2) (%)
M16	HHI based on domestic consumption (assumption 1)
M17	HHI based on domestic consumption (assumption 2)
M18	Value of domestic consumption (thousands HUF)
M19	Domestic consumption as a percentage of net sales (%)
M20	Imports as a percentage of domestic consumption (%)
M21a	Percentage of total sales attributable to large enterprises (by number of employees) (%)
M21b	Percentage of total sales attributable to large enterprises (Eurostat definition) (%)
M22a	Percentage of total sales attributable to medium-sized enterprises (by number of employees) (%)

M22b	Percentage of total sales attributable to medium-sized enterprises (Eurostat definition) (%)
M23a	Percentage of total sales attributable to micro and small enterprises (by number of employees) (%)
M23b	Percentage of total sales attributable to micro and small enterprises (Eurostat definition) (%)
M24a	Percentage of total assets attributable to large enterprises (by number of employees) (%)
M24b	Percentage of total assets attributable to large enterprises (Eurostat definition) (%)
M25a	Percentage of total assets attributable to medium-sized enterprises (by number of employees) (%)
M25b	Percentage of total assets attributable to medium-sized enterprises (Eurostat definition) (%)
M26a	Percentage of total assets attributable to micro and small enterprises (by number of employees) (%)
M26b	Percentage of total assets attributable to micro and small enterprises (Eurostat definition) (%)
M27	Sales of smaller enterprises as a proportion of sales of larger enterprises (%)
M28	Annual import share based on product classification (%)
M29a	Number of enterprises entering the market in a given year (count)
M29b	Number of enterprises entering the sector from another sector in a given year (count)
M30a	Number of enterprises exiting the market in a given year (count)
M30b	Number of enterprises leaving the sector to another sector in a given year (count)
M31a	Percentage of enterprises entering in year t (%)
M31b	Percentage of enterprises entering the sector from another sectors in year t (%)
M32a	Percentage of enterprises exiting in year t (%)
M32b	Percentage of enterprises exiting the sector to another sector in year t (%)
M33	Churn rate in year t (%)

M34a	Net sales of exiting enterprises in year t as a percentage of total industry sales in year t (%)
M34b	Net sales of enterprises changing to another sector in year t as a percentage of total industry sales in year t (%)
M35a	Assets of exiting enterprises in year t as a percentage of total industry assets in year t (%)
M35b	Assets of enterprises changing to another sector in year t as a percentage of total industry assets in year t (%)
M36a	Net sales of new entrants in year t as a percentage of total industry sales in year t (%)
M36b	Net sales of enterprises entering from another sector in year t as a percentage of total industry sales in year t (%)
M37a	Assets of new entrants in year t as a percentage of total industry assets in year t (%)
M37b	Assets of enterprises entering from another sector in year t as a percentage of total industry assets in year t (%)
M38a	Profitability of exiting enterprises relative to the profitability of remaining enterprises (based on ROE) (%)
M38a_i	Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M38a have negative values
M38a_i2	Indicator variable: takes the value of 1 if the numerator of indicator M38a is positive but the denominator is negative
M38a_i3	Indicator variable: takes the value of 1 if the numerator of indicator M38a has a positive value and is the quotient of two negative numbers
M38b	Profitability of enterprises exiting the sector to another sector compared to the profitability of remaining enterprises (based on ROE) (%)
M38b_i	Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M38b have negative values
M38b_i2	Indicator variable: takes the value of 1 if the numerator of indicator M38b is positive but the denominator is negative
M38b_i3	Indicator variable: takes the value of 1 if the numerator of indicator M38b has a positive value and is the quotient of two negative numbers

M38c	Profitability of exiting enterprises relative to the profitability of remaining enterprises (based on ROA) (%)
M38c_i	Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M38c have negative values
M38c_i2	Indicator variable: takes the value of 1 if the numerator of indicator M38c is positive but the denominator is negative
M39a	Productivity of exiting firms compared to productivity of firms remaining (%)
M39a_i	Indicator variable: takes the value 1 if both the numerator and the denominator of indicator M39a have negative values
M39a_i2	Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M39a have negative values
M39b	Productivity of enterprises exiting the sector to another sector compared to the productivity of remaining enterprises (%)
M39b_i	Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M39b have negative values
M39b_i2	Indicator variable: takes the value of 1 if the numerator of indicator M39b is positive but the denominator is negative
M40a	Number of enterprises not included in the sample (count)
M40b	Number of enterprises not included in the sample (%)
Price conditions	
M41	Industrial producer price index (previous year = 100)
M42	Producer price index of domestic sales (previous year = 100)
M43	Producer price index of export sales (previous year = 100)
Profitability	
M44	EBIT margin (%)
M45	EBITDA margin (%)
M46	Return on equity before tax (ROE1) (%)
M46_i	Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M46 have negative values

M47	Return on equity after tax (ROE2) (%)
M47_i	Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M47 have negative values
M48	Return on equity (ROE3) (%)
M48_i	Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M48 have negative values
M49	Return on capital employed (ROCE) (%)
M49_i	Indicator variable: takes the value of 1 if both the numerator and the denominator of indicator M49 have negative values
M50	Return on sales (ROS) (%)
M51	Return on investment (ROI) (%)
M52	Return on assets (ROA) (%)
M53	Return on invested capital (ROIC) (%)
M54	Industry loss as a percentage of net sales (%)
Productivity	
M55	Gross value added per capita (thousands HUF/capita)
M56	Gross value added per unit labour cost
M57	Labour productivity (gross value added per capita) growth rate in year t (previous year = 100)
M58	Labour productivity (gross value added per unit labour cost) growth rate in year t (previous year = 100)
M59	Relative standard deviation of gross value added per capita
M60	Relative standard deviation of gross value added per unit labour cost
M61a	Simple arithmetic average of gross value added per capita (thousands HUF/capita)
M61b	Median gross value added per capita (thousands HUF/capita)
M62a	Simple arithmetic average of gross value added per unit labour cost
M62b	Median gross value added per unit labour cost
M63	Total factor productivity (TFP)
M64	Relative standard deviation of TFP

M65a	Simple arithmetic average of TFP
M65b	Median TFP
M65c	The ratio of TFP of industry leaders and laggards
M66	Productivity of smaller firms compared to larger firms
M67	Numerator of the indicator on the relationship between profitability and productivity (%)
M68	Denominator of the indicator on the relationship between profitability and productivity (%)
M69	Percentage of R&D expenditure (%)
M70	Percentage of R&D employment (%)
Other indicators	
M71	Percentage of export based on product classification (%)
M72	Renewal of tangible assets based on investments placed in service (%)
M73	Renewal of tangible assets based on the performance value of investments in the current year (%)
M74	Foreign ownership as a percentage of share capital (%)
M75	Industry size (thousands HUF)
M76	Ranking by industry size
M77	Growth rate of the industry (previous year = 100)
M78	Cost disadvantage ratio
M79	GDP deflator (previous year = 100)

IV. ANNEX II: DATA SOURCES OF THE COMPETITION STATISTICS DATABASE

The source of the data for the Competition Statistics Database is mainly the MNB database, which is directly derived from the tax returns of companies, from the NTCA. These data are not publicly available and therefore cannot be searched back at the data source. The following data are from external sources.

Index serial number	HCSO data used for the indicator	Source of data	Comment
M12-M20, M28	Import value calculated based on product classification of external trade	HCSO Dissemination database (https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=KA0320&lang=en)	Data available up to Level 4 of NACE back to 2019
M41-M43	Producer price indices	HCSO Dissemination database (https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=SI202&lang=en, https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=SE20012&lang=en, https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=MR1A051&lang=en, https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=SG2A04&lang=en)	Typically, data are available up to Level 4 of NACE back to 2001, but not in all cases
M69	Total intramural R&D expenditure	HCSO Dissemination database (https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=HA4B01&lang=en)	Data are available up to Level 2 of NACE back to 2017
M70	Number of total internal R&D personnel in head count	HCSO Dissemination database (https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=HA4A01&lang=en)	Data are available up to Leve 2 of NACE back to 2017
M71	Export value calculated based on product classification of external trade	HCSO Dissemination database (https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=KA0320&lang=en)	Data available up to Level 4 of NACE back to 2019
M79	Implicit price indices of gross value added	HCSO Dissemination database (https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=GPK201&lang=en)	Data are available up to Level 2 of NACE back to 1996

V. ANNEX III: LITERATURE

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