

Industry concentration in Europe and North America

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Abstract

This paper presents new evidence on industry concentration at both the country and the world-region levels. It calculates country-level industry concentration measures from the novel data representative of the entire firm population in 12 European countries, and it develops a methodology for calculating industry concentration at the supranational level using detailed cross-country data on subsidiaries of business groups. This paper documents that industry concentration has increased not only in North America but also in Europe since 2000, albeit to a lesser extent.

JEL classification: D2, L1, L2

1. Introduction

A lively debate is under way about the evolution of industry concentration in recent years. Understanding trends in industry concentration is important because they can reflect or have implications for a range of economic phenomena. Increasing industry concentration may reflect technological change and/or globalization, which benefit disproportionately the most productive firms (Autor *et al.*, 2020). The increase in the scale of a few firms may also mean fewer buyers in input and local labor markets—i.e. monopsony—potentially impacting contractual terms for suppliers and workers (Webber, 2015; Azar *et al.*, 2022; Dube *et al.*, 2020). In addition, more concentrated markets create stronger incentives for lobbying (Grier *et al.*, 1994; Hill *et al.*, 2013). A high concentration may impact firm risk-taking behavior and government policies if they can be seen as “too big to fail”. Finally, although caution is warranted (Syverson, 2019), industry concentration may also proxy for the degree of market power, since mark-ups are a positive function of market shares in a large class of models based on oligopolistic competition (e.g., Atkeson and Burstein, 2008). The degree of competition, in turn, influences a variety of economic outcomes, such as productivity (Disney *et al.*, 2003; Aghion *et al.*, 2009), innovation (Aghion *et al.*, 2005), and income distribution (Siegenthaler and Stucki, 2015; Autor *et al.*, 2017; Autor *et al.*, 2020).

In this paper, we show that, despite the conceptual simplicity of industry concentration measures, computing them correctly requires care and some methodological aspects are crucial to

provide a reliable picture of concentration over time. We provide two measures of industry concentration, at the national and supranational levels, and in doing so we highlight two methodological issues, which, if ignored, can distort concentration measures: representativeness and presence of multiple subsidiaries that form part of the same business group.

The first measure we construct captures industry concentration within each country based on information representative of the whole population of firms in 12 European countries. We compute it as the share of industry sales generated by the 10% largest companies within each country, industry, and year. This first measure provides a reliable picture of industry concentration trends at the country level. However, for countries that are closely integrated with each other, it is legitimate to ask whether an individual country is the right level at which industry concentration should be studied. For instance, the intensive goods and services trade within Europe means that, in some industries, firms compete across Europe rather than within each country. Moreover, if the same multinationals hold subsidiaries in many European countries, a flat or decreasing country-level concentration could mask an increasing trend in concentration Europe-wide.¹ Our second measure, therefore, captures the concentration for Europe and North America, treating each world region as a whole.

Calculating these measures involves two methodological challenges.

First, capturing the concentration requires data that are representative of the economy in question. When calculating the industry concentration within individual countries, we exploit unique representative data for the universe of firms with more than one employee in 12 European countries. This novel dataset is obtained from confidential firm-level administrative data provided by national statistical offices (Organization for Economic Cooperation and Development [OECD] MultiProd project). However, computing the concentration at supranational level is further complicated by the fact that official cross-country firm-level representative data do not exist, as official administrative data cannot be pooled. We overcome this by combining a commercial cross-country database that offers comprehensive coverage of large firms (needed to measure concentration) with representative information on industry output from national accounts.² We show that computing industry output from (non-representative) commercial data instead, with coverage changing over time, would give a misleading picture of industry concentration in Europe.

Second, multiple firms belonging to the same business group may operate in a given industry. This raises the question of where the sales of each group should be allocated. In particular, if subsidiary firms within a business group operate in the same industry or world region, then calculating the concentration at the firm level will underestimate the industry concentration. At the same time, large business groups often operate in many different parts of the world and across many industries, so allocating all their sales to the headquarters location and industry will overestimate concentration there and underestimate it elsewhere. We are the first paper to demonstrate how ownership information and subsidiary-level (unconsolidated) and group-level (consolidated) financials from the Orbis, Worldscope, and Zephyr databases can be combined to reflect the structure of large business groups and their “aggregate” sales in a given industry and world region.³

We present new evidence that industry concentration has increased not only in North America, thus confirming findings by [Furman and Orszag \(2018\)](#) and others, but also in Europe, a fact that remained to be established. This is true for the concentration measured both at the country level and at the level of Europe as a whole. Between 2000 and 2014, the average share of the 10% largest companies in industry sales across 12 European countries increased by almost 4 percentage points (pp). Similarly, business-group-level concentration has shown a clear rise both in Europe

¹ Along similar lines, [Rossi-Hansberg *et al.* \(2021\)](#) show that increasing national concentration in the United States has gone hand-in-hand with a falling local concentration, as (nationally) large companies have opened plants in new locations.

² See [Bajgar *et al.* \(2020\)](#), where we analyze the coverage and representativeness of Orbis data.

³ As we explain later, existing papers either assign the aggregate sales of the entire business group to the headquarters country and industry or consider each individual subsidiary as separate firms, neglecting that subsidiaries may be part of the same business group.

and in North America, with an increase between 2000 and 2014 of about 2 pp in Europe and 7 pp in North America.

In summary, the contribution of this paper is threefold. First, it calculates country-level industry concentration measures from novel data representative of the entire firm population in 12 European countries. Second, the paper develops an innovative methodology for calculating industry concentration at the supranational level (e.g. at the European level). Third, it provides two complementary pieces of evidence both documenting that, since 2000, industry concentration has increased not only in North America but also in Europe, where the evidence to date has been limited and inconclusive. Our results are robust to various methodological choices as well as to variations in the definition of the relevant output market, where we compare national and supranational European concentrations and we control for the sales of foreign competitors by adjusting for industry imports. The latter exercise in particular shows that, allowing for trade, the increase in industry concentration is dampened in North America consistently with [Amiti and Heise \(2021\)](#), while it is reinforced in Europe.

The paper is related to a lively and expanding literature that investigates the trends and the economic impact of industry concentration, largely based on US evidence. A number of studies suggest that industry concentration has increased over recent years in the United States (e.g., [Furman and Orszag, 2018](#); [Grullon et al., 2019](#); [Autor et al., 2020](#))⁴ and to a lesser extent in Japan ([Honjo et al., 2014](#)). However, the evidence for other parts of the world is limited and inconclusive. The initial results for Europe have so far offered mixed evidence of concentration trends ([Valletti et al., 2017](#); [Corfe and Gicheva, 2017](#); [Gutiérrez and Philippon, 2018](#); [Affeldt et al., 2021](#)). Specifically, [Gutiérrez and Philippon \(2018\)](#) use Orbis data and find that concentration ratios have remained broadly stable in Europe, both when calculated within countries and when aggregating at the European level. [Kalemli-Özcan et al. \(2019\)](#) find rising aggregate sales of business groups, but falling sales shares of individual firms in Europe.⁵ Using Euromonitor data for 2010–2015, [Valletti et al. \(2017\)](#) similarly find mixed concentration trends for European economies.⁶ We argue that the choice of the industry denominator in the computation of concentration measures is non-trivial: using total sales of firms present in the data is not appropriate when the dataset is not representative and its coverage changes over time. We show that measured industry concentration displays a *decreasing* trend in Europe when the denominator is computed using the sales of firms present in the Orbis dataset.

When drawing implications for market power and anti-trust issues, the definition of the relevant output market is an open and often contentious point in the literature. In contrast to the typical definition of industry used at a national level, recent contributions in the literature use narrower market definitions. [Rossi-Hansberg et al. \(2021\)](#) define the market at the local geographical level, while [Benkard et al. \(2021\)](#) focus on narrowly defined product markets. They both find decreasing trends in market concentration. [Affeldt et al. \(2021\)](#) analyze concentration within competition markets flexibly defined using data coming from a sample of 2000 mergers scrutinized by the European Commission between 1995 and 2014.⁷ As [Benkard et al. \(2021\)](#), they find much higher *levels* of market concentration than commonly measured in the literature,

4 Recent interest in industry concentration in the United States was triggered by [Furman and Orszag \(2018\)](#), who analyze the sales shares of the 50 largest companies within 2-digit industries using official firm-level Census Bureau data and find that about three-quarters of these sectors see an increase in concentration between 1997 and 2007. [Autor et al. \(2020\)](#) similarly use Census Bureau data but analyze a range of concentration metrics (CR4, CR20, and Herfindahl) within 4-digit Standard Industrial Classification (SIC) industries between 1982 and 2012 and find that CR4 increased on average by 4 pp in services, 5 pp in manufacturing, 6 pp in wholesale, 8 pp in utilities, 11 pp in finance, and 15 pp in retail. Other studies have instead used Compustat data, which covers listed firms, again finding an overall increase in industry concentration ([Grullon et al., 2019](#); [Gutiérrez and Philippon, 2017](#)). [Barkai \(2020\)](#) and [Autor et al. \(2020\)](#) show that the increases in industry concentration are correlated with declines in the labor share of income. [Ganapati \(2021\)](#) finds that they are positively correlated with productivity and output growth and uncorrelated with price changes.

5 However, the paper does not consider ownership linkages and that individual firms may not be independent but rather can be subsidiaries of the same business group. In Europe, the average “top 8” business group in our sample has 20 subsidiaries within the same industry (median is 9).

6 Using administrative data for France, [Lashkari et al. \(2019\)](#) find that the share of total industry sales accounted for by the top 5% of firms increased by 6.4 pp between 1990 and 2007.

7 Note that both the product and the geographical aggregation levels can vary across competition markets. The relevant antitrust markets are defined by the European Commission for each case during its merger investigations.

but they show that market concentration has increased over time on average. In this study, we focus on the not-so-obvious issue of measuring industry concentration across countries, which is distinct from narrower concentration in particular product markets and has broader implications beyond market power in output markets, as highlighted above. We nonetheless contribute to this debate by reporting both national and supranational concentrations, and the robustness of concentration trends to the adjustment for trade flows and to the level of industry aggregation.

Understanding concentration trends in Europe is not only important on its own right, but it also helps shedding light on the mechanisms behind the causes of the trends observed elsewhere. Had industry concentration increased only in the United States, explanatory factors would need to be country-specific. On the contrary, a concurrent increase in concentration in many countries would call for broader factors, such as technological change and globalization, as the more likely explanation (Van Reenen, 2018). We find that the concentration has increased in both world regions, but to a smaller extent in Europe compared to what we, and other studies, document for the United States. This result suggests that both country-specific and broader structural factors may form part of the explanation for the observed trends. This relates to the rich literature that has analyzed the evolution of the firm size distribution, with evidence showing how financing constraints (e.g., Cabral and Mata, 2003), selection and knowledge diffusion (e.g., Luttmer, 2007), technological change (e.g., Dosi *et al.*, 2008), structural change (e.g., Nuvolari and Russo, 2021) can all affect the size distribution and the degree of concentration of industries.

2. Data

We present evidence on concentration trends using two independent sources of data: representative firm-level data from the OECD MultiProd project and business group-level data from Orbis-Worldscope-Zephyr.

Our first source of data relies on a unique dataset put together through the OECD “MultiProd” project. It has the advantage of being representative of the whole population of firms and constructed comparably across countries with a standardized routine that micro-aggregates confidential firm-level administrative data. For most countries, the data cover the entire population of firms; where they only cover a sample of firms, they are re-weighted using business registers to ensure representativeness.⁸

The MultiProd database covers most sectors of the economy, but this study focuses on manufacturing and non-financial market services in order to enhance cross-country comparability.⁹ MultiProd defines industries following the OECD STAN A38 classification, which is slightly more aggregated than 2-digit International Standard Industrial Classification (ISIC) codes, but for simplicity we simply refer to 2-digit industries throughout the paper.¹⁰ We keep the 12 European countries in common with the Orbis data and for which concentration measures are available at the 2-digit industry level. The data are representative of the entire population of firms in each country, with the notable exceptions of Germany, for which a business register is not available (and manufacturing data are left censored at 20 employees), and the Netherlands, for which the data are left censored at 10 employees.¹¹ The two countries are kept for their economic significance and because no better data exist.¹² **Supplementary Section B.1** in the Online Appendix

⁸ See **Supplementary Section A.1** in the Online Appendix for details on the project, the data sources, and the representativeness of the data.

⁹ Manufacture of Coke and Refined Petroleum and Real Estate are excluded from the analysis.

¹⁰ For information on the A38 classification used in the OECD STructural ANalysis (STAN) Database, see <http://www.oecd.org/sti/ind/3max.pdf>.

¹¹ The countries and periods covered are as follows: Belgium (2000–2014), Denmark (2000–2012), Finland (2000–2012), France (2000–2014), Germany (2003–2013), Hungary (2000–2012), Ireland (2006–2014), Italy (2001–2014), the Netherlands (2001–2014), Norway (2000–2012), Portugal (2004–2012), and Sweden (2002–2012).

¹² In principle, the production survey for the Netherlands includes some firms below 10 employees. However, the sample is not random; hence, all firms below 10 employees have been excluded when running the MultiProd code. A second source of data (Statistics for Non-Financial Enterprises, NFO), based on both a survey of large firms and value added tax records, would also exist for the Netherlands. However, the source does not cover the universe of large businesses and the data are at the business group level and, hence, would not be comparable with the other countries, where the data are at the legal unit level.

shows that results contained in the paper are robust to both excluding the three countries where we apply our re-weighting strategy (Ireland, Italy, and the Netherlands) and excluding the four countries that present some left-censoring in the size distribution (Germany, Hungary, Ireland, and the Netherlands).¹³

Our second source relies on Orbis-Worldscope-Zephyr data. The data have the important advantage of containing detailed ownership information to distinguish firms that are truly independent and those that are part of the same business group. This allows us to calculate concentration in world regions spanning multiple countries and enables us to account for the distribution of business groups' sales across regions and industries. The ownership data have been used extensively in the academic literature on foreign ownership and international shock transmission (e.g., [Cravino and Levchenko, 2017](#)); however, they have not previously been used to measure the concentration. The business group and subsidiary financial information is primarily sourced from Orbis, which we supplement with Worldscope data for listed firms (Orbis includes both listed and non-listed). Orbis is a commercial database provided by Bureau Van Dijk (BvD) and is the largest cross-country firm-level database that is available for economic research (e.g., [Gopinath et al., 2017](#); [Alfaro and Chen, 2018](#)). Worldscope is a cross-country firm-level commercial database of listed firms provided by Thomson Reuters. The firms in Worldscope represent about 95% of the global stock market capitalization. Our primary source of parent-subsidiary ownership information is Orbis, which we supplement with data from the Zephyr Mergers & Acquisitions database, also provided by BvD. The M&A data, together with a series of automated and manual checks for the largest 1000 groups, allow us to complete and occasionally correct the ownership links available in Orbis as well as to investigate anomalous jumps in sales.¹⁴

Industries in the Orbis-based analysis are defined following the OECD STAN A64 classification, which is equivalent to 2-digit ISIC codes for most industries.¹⁵ As with MultiProd, we focus on manufacturing and non-financial market services¹⁶ and the period 2000–2014. The metrics for Europe are based on Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, the Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, and the United Kingdom, and those for North America cover the United States and Canada.

While our data are particularly well suited to analyze industry concentration in Europe, the focus of our study, they have poorer coverage of subsidiary-level information for North American firms.¹⁷ This means that most domestic activity of these business groups may be allocated to the industry of the parent firm rather than spread across domestic subsidiaries. In North America, this could potentially lead to higher measured concentration in levels and also to more pronounced absolute changes in concentration.

3. Measuring Industry Concentration

This section outlines the two concentration measures which we compute: a country-level concentration measure based on representative MultiProd firm-level data and a world region-level

13 The exercise is conservative since Hungary and Ireland present small thresholds that are unlikely to play a large role. The administrative tax data for Hungary are subject to a small revenue-based reporting threshold of around EUR 150,000. The data for Ireland do not contain firms with less than two persons engaged (as opposed to employees) in services and firms with less than three persons engaged in 2006–2007 in manufacturing.

14 Our cleaning strategy involves manually checking the trends in sales for each of the largest large groups in every industry and world region. Moreover, the cleaning of ownership links for the 300 largest groups involves manually checking around 1000 of the largest firms (with sales exceeding 1 billion Euros), semi-automated procedures based on name-matching algorithms for another 4000 large firms (exceeding 100 million Euros), and automatically correcting another 5000 firms. See [Supplementary Section A.2](#) in the Online Appendix for details on the data sources and the data cleaning.

15 The A64 classification corresponds to the most detailed industry disaggregation available in the STAN data, which we use to obtain the denominator of our concentration ratios, as discussed below. For information on the A64 and A38 classifications, see <http://www.oecd.org/sti/ind/3max.pdf>. In a robustness exercise, we re-obtained our results at the more detailed 3-digit industry level and apportion A64 industry sales from STAN to individual 3-digit industries using weights from Orbis.

16 We again exclude Manufacture of Coke and Refined Petroleum products and Real Estate.

17 This is not the case for North American business-group-level information, as Orbis and Worldscope together cover close to the universe of listed firms.

industry concentration measure based on the Orbis-Worldscope-Zephyr database. All concentration measures aim to capture the weight of the largest firms within an industry, but they can differ in several aspects: (i) definition of “largest”; (ii) definition of “firm” (i.e. plant, legal entity, or business group); (iii) definition of “industry”; and (iv) the measure of industry output that captures the activity of the whole industry. We consider each of these aspects in turn.

3.1 Definition of “largest”

Different concentration metrics differ in how they define “largest” firms, or, more specifically, in the weight they put on firms in different parts of the firm distribution. One common approach puts equal weights on a fixed number of the largest firms in terms of sales (e.g. the 4, 8, or 20 largest firms) or, alternatively, the largest X% of firms (e.g. the top 10% of firms in terms of sales). In contrast, Herfindahl index considers all firms but puts more weight on firms with greater sales. The choice between these metrics is important, as the use of Herfindahl indices or the top 10% of firms is not appropriate when the coverage of firms varies across industries or over time. We compute country-level industry concentration based on MultiProd data as the share accounted for by the top 10% of firms in terms of sales in each country and industry. Since MultiProd data are representative of the population of firms in all years, this measure is consistent over time. Formally, we compute concentration as

$$C_j^{\overline{10}} \equiv \sum_{i \in S_j^{\overline{10}}} \frac{S_{ij}}{S_j},$$

where S_{ij} indicates the sales of firm i operating in industry j , S_j the total sales in industry j , and $S_j^{\overline{10}}$ the top decile of firms in industry j ranked by sales.

In the analysis based on Orbis data, we measure the concentration as the share of industry sales due to the eight largest companies (or groups) in each world region and industry.¹⁸ Formally, we define it as

$$CR8_j \equiv \sum_{i=1}^8 \frac{S_{ij}^{ORBIS}}{S_j^{STAN}}.$$

S_{ij}^{ORBIS} comes from Orbis data and designates the sales of group i in industry j , where i is among the top eight business groups in the industry. S_j^{STAN} is the total output of industry j as reported in the OECD STAN database, which is derived from national accounts.

The reason for using a different concentration measure between the two data sources lies in the limitations of each dataset. In Orbis, the sample size typically improves in later years, with smaller firms often added over time (see Bajgar *et al.*, 2020). If we measured concentration in Orbis with the measure applied to the MultiProd data, the expanding coverage would make relatively smaller firms cross the threshold of the top 10%, with the effect of spuriously reducing the measured concentration (see also Section 3.4). Focusing on the sales of the eight largest groups in each world region and industry (“CR8”) solves this issue, as large firms are consistently well covered in Orbis. The clearly defined number of groups in the Orbis-based analysis also has the additional advantage of allowing us to manually check the coverage of top firms during the sample period. At the same time, MultiProd data as used here do not include information on sales of a fixed number of the largest firms, so the concentration measure used in Orbis cannot be constructed in the MultiProd data.

3.2 Definition of “firm”: legal entity vs. business group

Another important choice is whether one considers sales of firms, business groups, or some other economic unit. Large firms operating in the same industry may not be independent of each other, but rather part of the same business group (Altomonte *et al.*, 2021). This is likely to be true

18 The results are robust to using CR4 or CR20 measures.

particularly when the concentration is measured at the level of world regions spanning multiple countries, as a business group may serve each country with a different firm.

For the analysis based on the MultiProd data, we focus on concentration measures at the country level and compute the concentration at the firm level, where a firm is defined as a legal entity. Official firm-level data typically do not contain detailed information on ownership linkages. This makes it impossible to compute concentration at the business group level, especially in a consistent way across countries. Note, however, that calculating concentration among firms rather than groups is less of a problem within countries, as it is less common for business groups to own multiple large subsidiaries in the same industry and country.¹⁹

In contrast, when calculating the concentration for Europe as a whole using Orbis data, it is essential to correctly link subsidiaries belonging to the same group, since many firms are part of the same business group even within a 2-digit industry. In Europe, the average “top 8” business group in our sample has 20 subsidiaries within the same industry (median is 9). Therefore, how a researcher treats business groups in Orbis can have a substantial impact on the resulting concentration measures. Studies have taken several approaches, each with specific limitations (see Figure 1). A first approach is to neglect business groups and focus only on individual firms (“unconsolidated” information in Orbis). As discussed, this will underestimate the concentration if multiple firms in the same industry are part of the same group. A second approach is to neglect subsidiaries and focus only on the headquarters (“consolidated” information). This will attribute the entire activity of the business group to the headquarters, overestimating (underestimating) the concentration in the headquarters (subsidiaries) industry. A third approach is to include both the activity of the business group and the firm subsidiaries. Researchers drop the firm-level information (“unconsolidated”) for headquarters—to exclude the most obvious source of double counting—but still include their subsidiaries. This will overestimate the concentration since it double-counts subsidiary revenues.²⁰

In this paper, we propose an alternative approach aimed at reducing the biases arising from the existing approaches: the business-group “aggregating” approach. It builds on the methodology of Bloom *et al.* (2013) who apportion business group sales to individual subsidiary industries and countries to measure the product market distance between business groups. We leverage the detailed Orbis-Zephyr ownership database and for each group we aggregate sales across all of its subsidiaries that operate in a given world region and industry. We consider subsidiaries to be part of the same business group if they share the same global ultimate owner, as reported in historical Orbis. BvD determines ultimate owners by constructing the tree of ownership linkages for each firm in every year. They identify each firm’s immediate shareholders and then their shareholders’ shareholders and so on. We use the ultimate owner defined using the 50.01% minimum ownership percentage, since this is a common definition of control. The aggregation is performed exclusively over *unconsolidated* accounts of the headquarters and subsidiaries.²¹

The resulting concentration is computed at the level of business group, industry, and world region.²² In the example from Figure 1, this means that the parent telecom company in Spain

19 In our analysis based on the Orbis-Worldscope-Zephyr data, the average “top 8” business group within a country-industry pair has only two subsidiaries in the same country and industry.

20 The choice of the approach can be of first-order importance to understand concentration patterns. For instance, Kalemli-Özcan *et al.* (2019) show that concentration is rising when using only “consolidated” information (second approach), while it is falling when using only “unconsolidated” information (first approach).

21 Consolidated accounts are used only to correct the unconsolidated information in cases where the total subsidiary sales exceed group sales (due to inter-company transactions) or where unconsolidated data are missing. In the latter case, if a headquarters company always reports consolidated accounts but unconsolidated accounts only in some years, we interpolate the missing years in the unconsolidated accounts based on the trends observed in the consolidated accounts, keeping the shares of unconsolidated accounts to consolidated accounts fixed. Additionally, we use consolidated accounts for independent firms (firms that are not part of a business group) and subsidiaries at the bottom of the ownership hierarchy (subsidiaries not owning further subsidiaries) that do not have unconsolidated accounts, because for such firms consolidated and unconsolidated accounts should coincide.

22 One caveat of the aggregating approach is that by summing up sales of subsidiaries, we may overestimate group sales due to within-group transactions (which are normally excluded from sales reported in consolidated accounts). We address this issue by proportionally scaling down subsidiaries’ sales within each industry whenever the combined sales of a group’s subsidiaries in all countries and industries exceed the total group sales reported in consolidated accounts. That said, consolidated accounts are not always available, so we cannot apply this correction to all business groups and may still partially overestimate sales at the group level. However, our denominator, based on adding up industry-level sales across countries within each world region, similarly does not account for intra-group cross-border sales. The

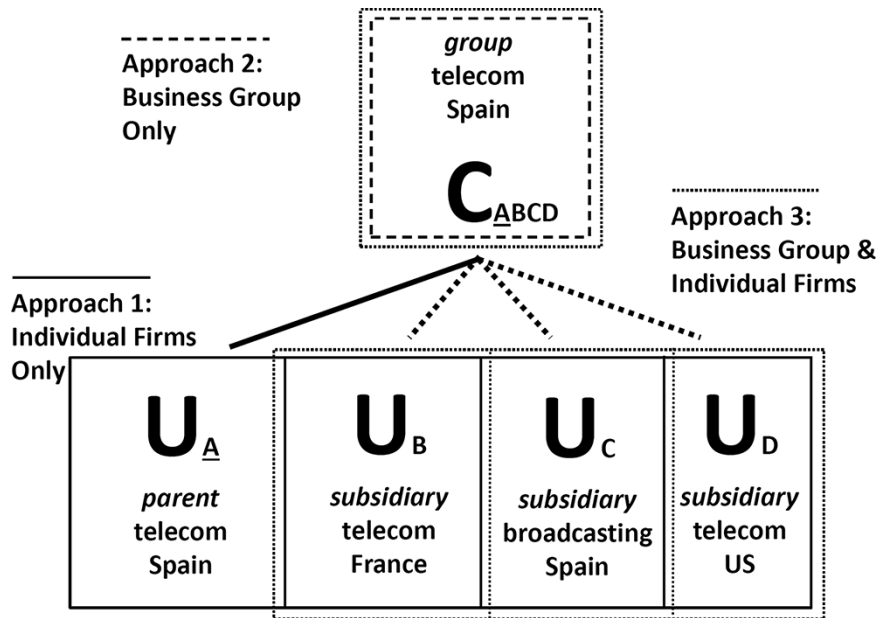


Figure 1. Approaches to selecting between business group and individual firm information in Orbis.

Note: The figure depicts an example of a hypothetical group consisting of a parent company operating in the telecom sector in Spain, with a French and US subsidiary in the same sector and a Spanish subsidiary operating in broadcasting. Information is available at the business group level ("consolidated") (C_{ABCD}) alongside information for each individual firm ("unconsolidated"), including the parent company (U_A) and the subsidiaries (U_B , U_C , and U_D). Approach 1 uses only individual firm level information ("unconsolidated"). Approach 2 uses only business-group-level information ("consolidated"). Approach 3 uses business-group-level information when available and individual-firm-level information otherwise.

and the subsidiary telecom company in France are counted in the telecom sector in Europe, the Spanish broadcasting subsidiary is counted within broadcasting in Europe, and the US telecom subsidiary is counted within telecom in North America. In contrast to the first approach above, this means that if a business group acquires one of its main competitors in the same industry, the business group's share will increase and hence the measured concentration is also likely to increase. At the same time, our approach prevents the allocation of the entire business group sales to the headquarters (second approach) or the double counting of subsidiaries' sales (third approach), even in cases where the headquarters entity only reports business group-level information.

3.3 Definition of "industry"

In the baseline results of this study we define an industry at the 2-digit level. Analyses for a single country often focus on a higher degree of disaggregation, such as 3- or 4-digit industries, since firms within more narrowly defined industries are more likely to compete with each other. However, our focus on cross-country analysis implies that we are constrained by data availability at a 2-digit level.²³ With this baseline definition of industry at hand, we investigate two levels of geographical aggregation. When using MultiProd data, we analyze industry concentration

upward biases in the numerator and denominator partly offset each other, so the overall effect is unlikely to be severe. We examine the robustness of the results to this scaling in [Supplementary Figure B.5](#) in the Online Appendix.

23 For confidentiality reasons, the MultiProd database is collected at the 2-digit level. For the analysis with Orbis data, we need total sales in each industry to compute the denominator of our concentration measures. The next subsection shows that this term needs to be computed from an external source, which is available only at the 2-digit level for all the countries and sectors analyzed in this paper. We overcome this limitation in a robustness exercise where we replicate our results at the 3-digit level.

within each single country, while we investigate industry concentration at a more aggregate world region level when using Orbis data. The latter exercise is useful especially for Europe, because the depth of the integration in the single European market is industry-specific; hence, for some industries the concentration at the aggregate European level is more appropriate, for instance, in manufacturing.²⁴

Our baseline measure of 2-digit industry concentration reflects the concentration of domestic production rather than of sales in the domestic markets. However, we present three additional exercises on the definition of the relevant output market. First, we use Orbis data to overcome the data constraints and compute industry concentration at the more disaggregated 3-digit level. Second, we control for the domestic sales of foreign competitors by adjusting manufacturing concentration for industry (net) imports, following [Amiti and Heise \(2021\)](#). Third, for the service sector, we directly compare European national and supranational concentrations within Orbis.

3.4 Industry sales

To construct shares of the largest firms in each industry, their sales need to be scaled by the total sales in each industry. In principle, this information can either be calculated by summing sales across all firms in the microdata at hand or it can come from an industry-level database such as the OECD STAN. The choice of industry denominator is non-trivial: using the total sales of firms in the data is not appropriate when the data are not representative and their coverage changes over time.

MultiProd data are representative at the country and industry levels, so we use the total firm sales for each country as calculated from the microdata.²⁵ However, in Orbis, while larger firms are generally well-covered from earlier years, smaller firms are not, with a coverage that improves over time. Therefore, the industry denominator will tend to increase over time and artificially push down trends in the resulting concentration index. For this reason, we obtain industry sales from the OECD STAN database, aggregating across countries within each world region.

[Figure 2](#) shows that the choice of denominator has a striking effect on the measured industry concentration trends using the Orbis dataset. We compare the concentration trends in Europe obtained using three different denominators: industry sales from STAN (our denominator of choice), the total sales of firms in Orbis, and the total sales of the 100 largest firms in Orbis. We find that calculating the concentration with either of the Orbis-based denominators would completely reverse the measured industry concentration trends.

4. Concentration Trends

With the concentration measures ready, we examine industry concentration trends within each country and industry (for 12 European countries, based on MultiProd data) and within each world region and industry (for Europe and North America, based on Orbis data). We first introduce our baseline results and then present a series of additional checks to demonstrate the robustness of the trends to various methodological choices.

4.1 Main Results

We show the evolution of industry concentration over time by plotting the cumulative weighted average change since year 2000. For each dataset and for each world region in the case of the Orbis-based analysis, we compute the weighted change with weights corresponding to each industry's share in the total sales across all industries within a given country (MultiProd) or world region (Orbis).²⁶ Plotting the cumulative average change allows us to use the full information in our unbalanced panels while controlling for the changing composition of the sample. In each

²⁴ See [Affeldt et al. \(2021\)](#) for a complementary analysis of concentration within narrowly defined competition markets. We acknowledge that, when drawing implications for market power and anti-trust issues, a more disaggregated definition of the relevant market is desirable. Notwithstanding, we find that our results are confirmed if not stronger when replicated at a more detailed 3-digit sectoral level.

²⁵ The industry-level aggregates computed from the MultiProd data closely match their STAN counterparts (see [Bajgar et al., 2019](#)).

²⁶ In the MultiProd data each country receives equal weight.

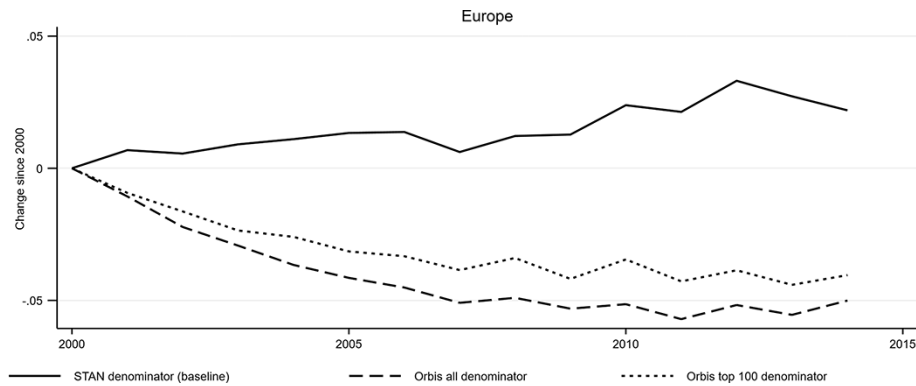


Figure 2. Concentration and the measure of total industry sales *Share of sales accounted for by 8 largest business groups in Europe.*

Note: The countries for Europe include BEL, DEU, DNK, EST, ESP, FIN, FRA, GBR, GRE, HUN, IRL, ITA, LVA, NLD, NOR, POL, PRT, SVN, and SWE. The included industries cover 2-digit manufacturing and non-financial market services. Concentration metrics reflect the share of the top eight business groups in each industry (CR8). Our baseline-preferred approach takes the measure of total industry sales, the denominator in the concentration ratio, from the OECD-STAN database. The “Orbis all” denominator reflects the total sales of all firms in that industry in Orbis. The “Orbis top 100” denominator reflects the total sales of the top 100 firms in that industry in Orbis. The graph reports the cumulative weighted average change in industry concentration, with weights given by each industry’s share in the total sales across all industries. *Source:* Orbis-Worldscope-Zephyr and OECD-STAN.

year, we calculate the average of one-year changes in industry concentration across all country-industries (MultiProd) or region-industries (Orbis) where the 1-year change is observed in a given year. Starting from year 2000, we then add up these average changes over time to obtain the cumulative average change. In a balanced sample, this approach would give identical results as simply plotting average concentration normalized to 0 in year 2000 and also to regressing industry concentration on unit and year-fixed effects and plotting the extracted year effects, again normalized to 0 in year 2000. We focus on the *changes* in industry concentration, while [Supplementary Figures B.3 and B.7](#) in the Online Appendix show the corresponding average levels.

[Figure 3](#) documents trends in concentration within each country and industry based on the MultiProd data. It shows that the concentration has increased on average across the 12 European countries considered over the period 2000–2014. In particular, the share of sales of the firms in the top decile of the sales distribution was around 4 pp higher in 2014 than in 2000. The concentration has increased both in manufacturing and in non-financial market services, although the increase in services (4.3 pp) was somewhat stronger than the increase in manufacturing (2.7 pp).

[Figure 4](#) displays the average change in concentration measured as the share of sales of the eight largest business groups within each world region and industry using the Orbis-STAN data. In line with the MultiProd-based measures, [Figure 4](#) offers evidence of a noticeable increase in industry concentration in Europe, and it also documents an increase in North America. Over the period 2000–2014, industry concentration increased, on average by 2.2 pp in Europe, compared to around 6.8 pp in North America, approximately equivalent to a 12% and 21% increase, respectively (see [Figure 6](#)). In Europe, the overall increase was similar in manufacturing and in non-financial market services, but the increase in services was spread over the entire sample period whereas in manufacturing it was concentrated in later years. In North America, the concentration rise appears to be somewhat stronger in services than in manufacturing.²⁷

²⁷ [Autor *et al.* \(2017\)](#); [Autor *et al.* \(2020\)](#) find an increase in the concentration for the United States of comparable magnitude and on average stronger in services than in manufacturing. [Supplementary Table B.1](#) in the Online Appendix reports the cumulative change in industry concentration between 2000 and 2014 for each of the detailed 2-digit sectors included in our analysis. Examples of sectors that display similar patterns between Europe and the United States include the increase in concentration in textiles, machinery equipment, wholesale trade, publishing, audiovisual and broadcasting, architectural, and engineering services. The changes in concentration are typically higher in the United States,

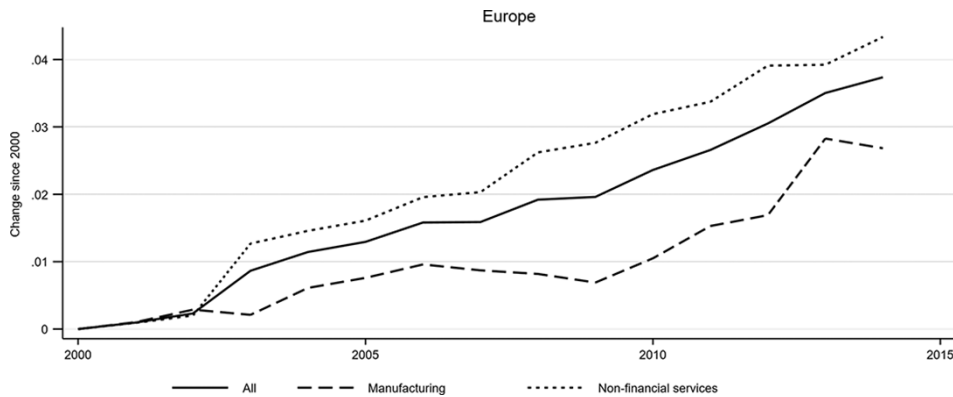


Figure 3. Share of sales accounted for by 10% largest firms in selected European countries.

Note: The countries included are BEL, DEU, DNK, FIN, FRA, HUN, IRL, ITA, NLD, NOR, PRT, and SWE. Included industries cover 2-digit manufacturing and non-financial market services. Concentration metrics reflect the share of sales of the firms in the top decile of the sales distribution in each country and 2-digit industry. The graph reports the cumulative weighted average change in industry concentration, with equal country weights and industry weights given by each industry's share in the total sales across all industries within a given country. *Source:* OECD MultiProd v1.1.

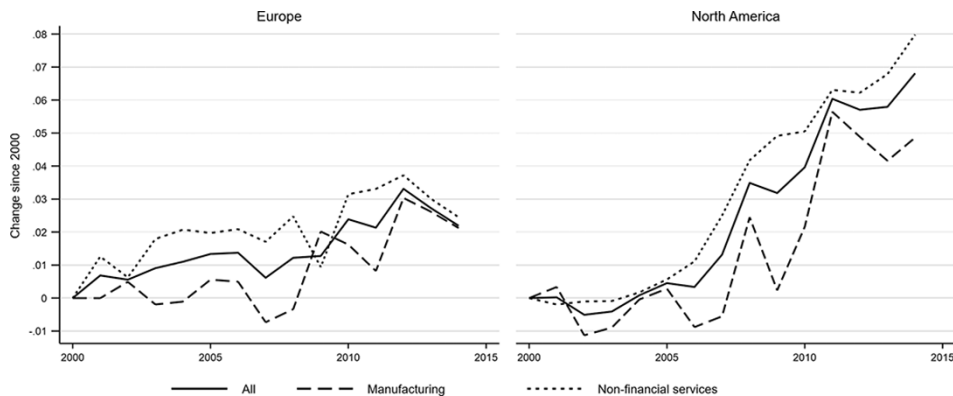


Figure 4. Share of sales accounted for by eight largest business groups in Europe and North America.

Note: The countries include BEL, DEU, DNK, EST, ESP, FIN, FRA, GBR, GRE, HUN, IRL, ITA, LVA, NLD, NOR, POL, PRT, SVN, and SWE for Europe and CAN and USA for North America. The included industries cover 2-digit manufacturing and non-financial market services. Concentration metrics reflect the share of the top eight business groups in each industry (CR8). The graph reports the cumulative weighted average change in industry concentration, with weights given by each industry's share in the total sales across all industries within a given world region. *Source:* Orbis-Worldscope-Zephyr and OECD-STAN.

4.2 Robustness

In this section we examine the robustness of the baseline concentration metrics to the main methodological choices adopted in the paper. In particular, we show that the average patterns of industry concentration in Europe (and North America) are not affected by (i) industry weighting; (ii) the definition of top firms; and (iii) the definition of the relevant output market. We then outline the additional robustness exercises that are contained in the Online Appendix.

including well-known examples such as retail trade and air transport in which concentration has increased markedly in the United States, but barely so in Europe.

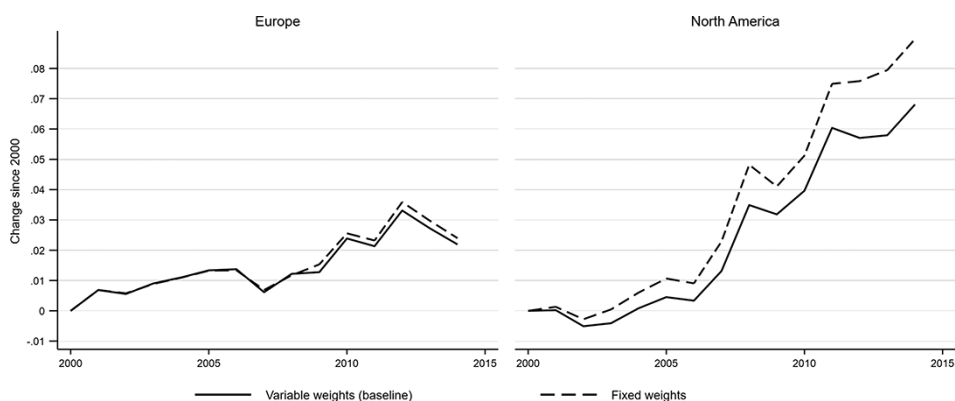


Figure 5. Share of sales accounted for by eight largest business groups in Europe and North America—Impact of industry weighting.

Note: The countries include BEL, DEU, DNK, EST, ESP, FIN, FRA, GBR, GRE, HUN, IRL, ITA, LVA, NLD, NOR, POL, PRT, SVN, and SWE for Europe and CAN and USA for North America. The included industries cover 2-digit manufacturing and non-financial market services. Concentration metrics reflect the share of the top eight business groups in each industry (CR8). The graph reports the cumulative weighted average change in industry concentration, with weights given by each industry's share in the total sales across all industries within a given world region. The baseline trends allow for weights to vary over time, while in the 'Fixed weights' case the weights are kept constant to their initial level. *Source:* Orbis-Worldscope-Zephyr and OECD-STAN.

In the baseline results we allow for the industry weights to vary over time. Here we show that the average patterns of industry concentration are not a result of a change in industry composition. [Figure 5](#) compares the baseline results with the case in which industry weights are kept constant to their initial level. Industry reallocation does not explain the increasing trend in industry concentration in Europe and even tends to reduce the overall increase in North America. [Supplementary Figure B.2](#) in the Online Appendix shows that industry composition does not play a major role in explaining industry concentration patterns also when using MultiProd data. The overall increase in industry concentration is somewhat smaller, but it remains sizable and close in magnitude to the change in concentration obtained with Orbis data.

Our findings are robust across concentration metrics with varying definitions of top firms. In [Figure 6](#), we show concentration metrics calculated using the sales of the top four, top eight, and top 20 firms in each 2-digit region-industry (CR4, CR8, and CR20, respectively). Clearly, the industry sales share of the top 20 firms will always be larger than the top four. To ensure comparability across the different metrics, we show proportional changes in concentration by plotting the cumulative weighted average log change in the sales shares of the largest firms (the previous figures displayed absolute changes in the concentration). [Figure 6](#) reveals that the proportional concentration changes are similar whether we look at the largest 4, 8, or 20 firms, although the proportional increase for the broadest set of 20 largest firms has been slightly stronger in Europe and weaker in North America.

While industry concentration has implications for factor and inputs markets, we complement the baseline results with three additional exercises that modify the definition of the relevant output market.

First, we acknowledge that firms might compete in more disaggregated industries and re-obtain our results at the 3-digit industry level. To do so we need to overcome the data constraint of having aggregate industry sales available at the 2-digit only. We therefore apportion the total industry sales from STAN to individual 3-digit industries using shares constructed using the sales of the firms present in the Orbis database. As long as 3-digit industries within the same 2-digit sector are equally represented in Orbis, our approach provides a reliable picture of concentration over time. [Figure 7](#) shows that the trends in concentration are comparable to our baseline results, with a larger increase notably in Europe, where the share of sales of the top eight business groups is approximately 6 pp larger by the end of the period.

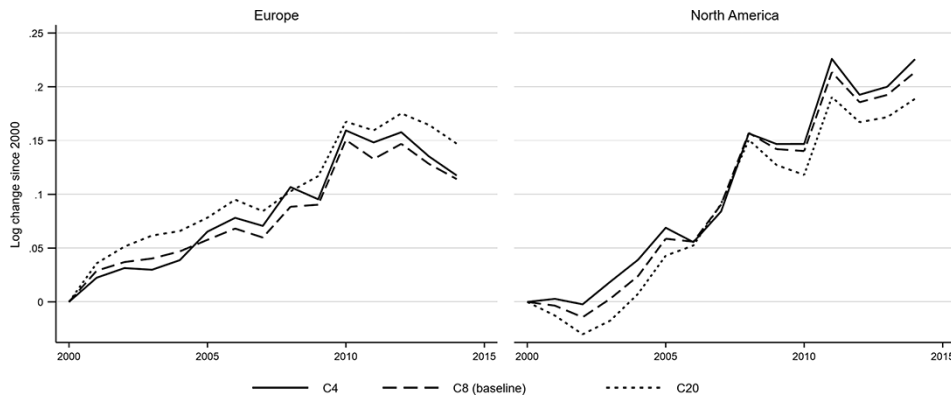


Figure 6. Top 4, 8, and 20 business groups.

Note: The countries include BEL, DEU, DNK, EST, ESP, FIN, FRA, GBR, GRE, HUN, IRL, ITA, LVA, NLD, NOR, POL, PRT, SVN, and SWE for Europe and CAN and USA for North America. The included industries cover 2-digit manufacturing and non-financial market services. Concentration metrics reflect the share of the top 4, 8, and 20 firms in each industry (CR4, CR8, and CR20, respectively). To ensure comparability across different metrics, these reflect proportional changes; the graph reports the cumulative weighted average log change in industry concentration, with weights given by each industry's share in the total sales across all industries within a given world region. *Source:* Orbis-Worldscope-Zephyr and OECD-STAN.

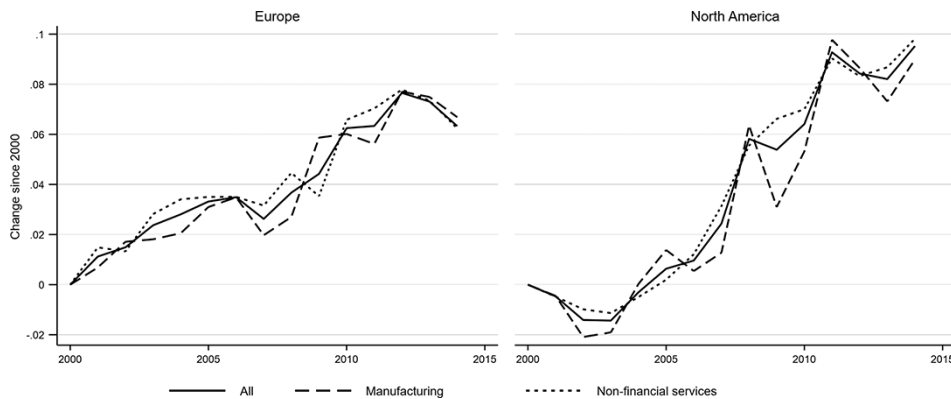


Figure 7. Share of sales accounted for by eight largest business groups in Europe and North America—3-digit industry definition.

Note: The countries include BEL, DEU, DNK, EST, ESP, FIN, FRA, GBR, GRE, HUN, IRL, ITA, LVA, NLD, NOR, POL, PRT, SVN, and SWE for Europe and CAN and USA for North America. The included industries cover 3-digit manufacturing and non-financial market services. Concentration metrics reflect the share of the top eight business groups in each industry (CR8). The graph reports the cumulative weighted average change in industry concentration, with weights given by each industry's share in the total sales across all industries within a given world region. *Source:* Orbis-Worldscope-Zephyr and OECD-STAN.

Second, for industries where products are more tradable, (domestic) industry concentration may overstate the actual concentration in the industry if the sales of foreign competitors are not accounted for. [Figure 8](#) displays the average change in concentration in manufacturing when we adjust the denominator for industry (net) imports. Consistent with [Amiti and Heise \(2021\)](#), we find that the increase in industry concentration is dampened in North America, while the opposite is true for Europe.²⁸

²⁸ A caveat to this exercise is that we do not have access to firm-level trade data so we cannot adjust the numerator for exports of domestic firms. However, [Amiti and Heise \(2021\)](#) show, for the United States, that subtracting firms' exports from their total shipments makes little difference to the trend in concentration.

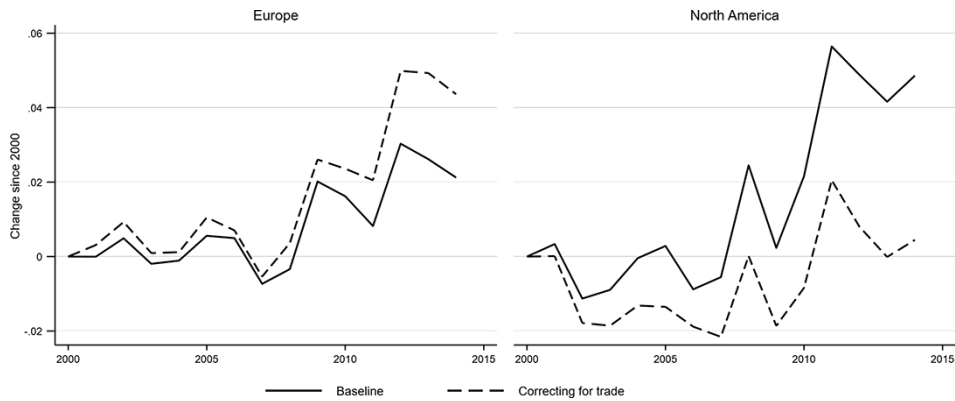


Figure 8. Share of sales accounted for by eight largest business groups in Europe and North America—Trade adjustment in manufacturing.

Note: The countries include BEL, DEU, DNK, EST, ESP, FIN, FRA, GBR, GRE, HUN, IRL, ITA, LVA, NLD, NOR, POL, PRT, SVN, and SWE for Europe and CAN and USA for North America. The included industries cover 2-digit manufacturing. Concentration metrics reflect the share of the top eight business groups in each industry (CR8). The graph reports the cumulative weighted average change in industry concentration, with weights given by each industry's share in the total sales across all industries within a given world region. The denominator of the baseline concentration measure is given by industry output. The denominator of the trade-corrected measure is given by industry output plus imports minus exports. *Source:* Orbis-Worldscope-Zephyr and OECD-STAN.

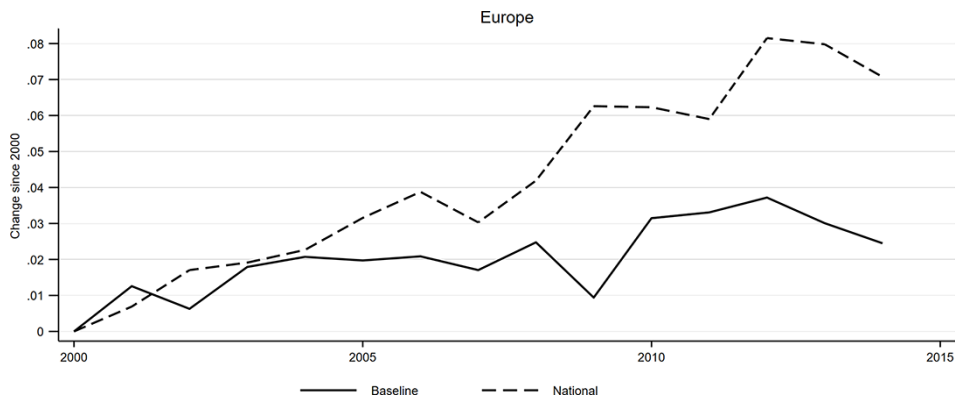


Figure 9. Share of sales accounted for by eight largest business groups in Europe—National concentration in market services.

Note: The countries include BEL, DEU, DNK, EST, ESP, FIN, FRA, GBR, GRE, HUN, IRL, ITA, LVA, NLD, NOR, POL, PRT, SVN, and SWE. The included industries cover 2-digit non-financial market services. Concentration metrics reflect the share of the top eight business groups in each industry (CR8) within Europe as a whole (Baseline) or within each country (National). The graph reports the cumulative weighted average change in industry concentration, with weights given by each industry's share in the total sales across all industries within Europe. *Source:* Orbis-Worldscope-Zephyr and OECD-STAN.

Third, the supranational geographical level may not be appropriate for less-tradable products or services where the relevant output market may be more local. This is particularly true for services in Europe for which the single market is far from being completed and national markets remain the relevant ones (even more so for new European Union members before the 2004 enlargement). The evidence at the national level from the MultiProd data already addresses this point, but [Figure 9](#) complements that by directly comparing national and supranational concentration in market services using Orbis data. The average increase in the national industry concentration has been stronger, in line with the stronger increase in market services found with MultiProd data.

Finally, the Online Appendix contains additional exercises to establish the robustness of the results. [Supplementary Section B.1](#) shows that the results obtained with MultiProd data are robust to excluding countries where data are subject to left-censoring in the size distribution, excluding countries where data are based on re-weighting, and only including countries for which there exist administrative data covering the universe of firms. In addition, in [Supplementary Section B.2](#), we show that the industry concentration trends obtained with Orbis data are robust to the scaling strategy adopted in the “aggregating” approach to define business groups and that this approach is superior to alternative simpler strategies such as using unconsolidated financial data only. We further show that our manual and semi-automated cleaning strategy is important and that a simple winsorizing strategy in terms of firms’ sales would eliminate all the relevant information. We then provide evidence that the increase in industry concentration is primarily driven by multinational groups, in line with the evidence in [Kalemlı-Özcan et al. \(2019\)](#).

5. Conclusions

Industry concentration represents an intuitive measure of structural changes taking place in the economy. In this paper, we show that, despite the measure’s conceptual simplicity, computing it correctly requires care. We highlight two issues which, if ignored, could lead to a misleading picture of concentration trends: representativeness and the presence of multiple subsidiaries that form part of the same business group.

We present novel evidence on industry concentration at both the country and world-region levels. When calculating industry concentration within individual countries, we ensure representativeness by exploiting unique data for the universe of firms with more than one employee in 12 European countries. At the supranational level (i.e. at the European level), we develop a novel methodology for calculating industry concentration using detailed cross-country data on the subsidiaries of business groups. We combine a commercial cross-country database that offers a comprehensive coverage of large firms (but not smaller ones) with representative information on industry output from national accounts, which is crucial to obtain a reliable picture of the evolution of industry concentration in Europe. The evidence at both levels of aggregation consistently indicates that industry concentration has increased in Europe since 2000 in both manufacturing and non-financial market services.

The findings in this paper indicate that the increase in industry concentration is not a US-specific phenomenon, but rather a general trend under way in many advanced economies, together with the increase in mark-ups ([Calligaris et al., 2018](#); [De Loecker et al., 2020](#)), declining business dynamism ([Decker et al., 2014](#); [Decker et al., 2016](#); [Calvino et al., 2015](#); [Akcigit and Ates, 2021](#)), a growing productivity gap between leaders and laggards ([Andrews et al., 2016](#); [Berlingieri et al., 2017](#)), and a decline in the labor share of income ([Karabarbounis and Neiman, 2014](#); [ILO and OECD, 2015](#)). This suggests that the causes of the increase in concentration are also likely to be more general (e.g. technological change and/or globalization), although purely domestic factors may also be at play, as indicated by the fact that the concentration increase in Europe appears less pronounced than that documented (in this paper and other studies) for the United States. A fruitful avenue for future research would expand the empirical evidence on the link between the observed concentration changes and factors that may be driving it, such as globalization (e.g., [Ghemawat and Ghadar, 2006](#); [Autor et al., 2020](#)); technological change (e.g., [Dosi et al., 2008](#)); structural change (e.g., [Nuvolari and Russo, 2021](#)); and rise in intangible capital ([Bajgar et al., 2021](#)) and so on.

Supplementary Data

[Supplementary data](#) are available at *Industrial and Corporate Change* online.

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