The Impact of Offshore Profit Shifting on the Measurement of GDP: the case of the UK.[1]

Giordano Mion: University of Sussex, Centre for Economic performance and NIESR

Manuel Tong: NIESR

Abstract

In this paper we analyse the global distribution of profits declared by MNEs operating in the UK using the Orbis database. Our investigations cover the period 2007-2017 and focus on entities reporting non-consolidated accounts and belonging to corporate Global Ultimate Owners active worldwide. Our analyses suggest that, compared to actual declared profits, profits distributed according to a simple apportionment rule based on companies' revenues shares within each MNE group would look quite different. For example, MNEs operating in the UK reported in 2017 41 billion GBP (representing about 1.91% of UK GDP) more than what they would have reported based on our apportionment rule. We document this and other findings and while also digging deeper in terms of industry patterns and providing a number of robustness checks.

Keywords: profit shifting; intangible assets; ORBIS; apportionment.

JEL codes: E01, F23

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Executive Summary

Multinational enterprises (MNEs) operating in the globalised economy are characterised by two distinct features:

1. Their intangible assets can be located anywhere
2. They have access (through subsidiaries) to multiple heterogeneous tax locations

Those features give rise to the possibility that MNEs may assign their assets in ways that are more profitable for the company, especially with regard to legally reducing tax payments, but break the link between the location where value is created and the location where value is declared, leading to, among other consequences, the mismeasurement of MNEs' contributions to the GDP in the resident country of the MNE.

In this paper we analyse the global distribution of profits declared by MNEs operating in the UK using the Orbis database. The Orbis database is compiled by the Bureau Van Dijk from a number of sources (including company reports) and contains company-level information on various balance sheet items (including revenues, profits before tax and financial revenues and costs) and, most importantly, information allowing to identify ownership links between firms.

Our investigations cover the period 2007-2017 and focus on entities reporting non-consolidated accounts and belonging to corporate Global Ultimate Owners active worldwide. Our analyses suggest that, compared to actual declared profits, profits distributed according to a simple apportionment rule based on companies' revenues shares within each MNE group would look quite different. In particular, MNEs operating in the UK reported in 2017 41 billion GBP (representing about 1.91% of UK GDP) more than what they would have reported based on our apportionment rule. In this light, the UK was in 2017 a net winner in terms of global MNEs' profit shifting. The situation was actually reversed back in 2007, with MNEs operating in the UK reporting less profits than those arising from our apportionment rule. A closer inspection of the whole period 2007-2017 reveals a smooth change with the UK moving from a loser to a winner position mainly through changes in declared profits of UK-owned MNEs.

We subsequently extend the analysis by examining industry-specific patterns and identify the following 5 key major contributors to the positive difference between actual profits and profits based on our apportionment rule for the UK in 2017:

- "Extraction of crude petroleum and natural gas" with 7.744 billion GBP
- "Mining of metal ores" with 6.842 billion GBP
- "Telecommunications" with 6.364 billion GBP
- "Manufacture of basic pharmaceutical products and pharmaceutical preparations" with 6.188 billion GBP
- "Manufacture of coke and refined petroleum products" with 5.883 billion GBP

We also conduct a number of robustness checks concerning the apportionment rule and the companies involved in the analysis while pointing to a number of limitations of our approach

related to difficulties arising in dealing with Crown Dependencies, Branches, Special Purpose Entities and Family Trusts.

1. Introduction

Multinational enterprises (MNEs) operating in the globalised economy are characterised by two distinct features:

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Those features give rise to the possibility that MNEs may assign their assets in ways that are more profitable for the company, especially with regard to legally reducing tax payments, but break the link between the location where value is created and the location where value is declared, leading to, among other consequences, the mismeasurement of MNEs' contributions to the GDP in the resident country of the MNE.

In this respect, Guvenen et al. (2017) find that re-allocating US MNEs profits across subsidiaries on the basis of apportionment factors related to the level of economic activity of each subsidiary results in identifying `missing' $3.6 trillion of US GDP in 1994–2014, and adds 1.5 percentage points to cumulative productivity growth in the same period. The use of the apportionment factor approach has its own drawbacks in terms of quality and precision of the proposed allocations. Within this project, we aim to apply the insights of Guvenen et al. (2017) to the UK context while complementing their analysis in a number of ways, including the focus on both UK and non-UK MNE operating in the UK, as well as a detailed country breakdown of `losers' and `winners' of the offshore profit shifting game and its evolution over the time interval 2007-2017.

At this stage, we believe it is worth emphasising two key points. First, MNEs are complex organisations operating in several countries and facing several different legal, economic, and social environments. Furthermore, given that a number of common resources, like intangible assets, are shared among firms belonging to an MNE group, it is both a difficult and a debatable task, for both the MNE in question and anyone else interested in it, to assign those resources among the firms belonging to the MNE group and ultimately determine the location of profits (profits here are based on business accounts and can only be used as a proxy, as profits are not defined on a national accounts basis or have a direct link to a national accounts variable) and gross value added. While following national and international laws, taxation regimes and regulations, MNEs have the scope to operate the assignment in ways that are beneficial to the MNE group in terms of, for example, tax efficiency and currency risk management. In this respect, our analysis does not answer the question of how profits would be assigned in the absence of any profit shifting motive. However, it does provides insights about how different the assignment would be with respect to the observed one, along with the overall implications for GDP measurement, if it was linked to a more basic measure of local economic activity like the sales or the cost of employees of the companies belonging to an MNE group.

Second, our analysis is based on balance sheet and ownership information coming from the ORBIS database that is, in many respects, not comparable to national accounts concepts and

measures can only be indicative. Notwithstanding this limitation, we believe that our approach is complementary to what can be achieved by analyses based on data and methodologies more rooted into national accounts and provides a number of fresh insights into the broad issues of offshore profit shifting with particular reference to the UK.

The remainder of this paper is organised as follows. A literature review is provided in Section 2. Section 3 describes the data sources while Section 4 illustrates the data cleaning, matching and processing. Section 5 explains the apportionment rule we follow and the construction of the alternative/counterfactual distribution of profits among the companies belonging to MNEs groups. Section 6 provides our key results for the years 2007 and 2017 while Section 7 contains several in-depth analyses. Finally, Section 8 concludes.

2. Literature Review

The profit-shifting practice undertaken by Multinational Enterprises (MNEs) has been an increasing subject of interest in the economics literature, with an initial focus on its implications on countries' tax policies. Dharmapala (2014) provides a useful empirical literature survey on tax-motivated income shifting within multinationals, labelled as 'base erosion and profit shifting'. The survey highlights that more recent literature, using new and richer data sources, finds much smaller magnitudes of this practice than in earlier studies. The literature reviewed suggests that, on average, a 10-pp. increase in the tax rate difference between an affiliate's and its parent's locations would raise the pre-tax income reported by the affiliate by 8%.

Among the methodologies listed in that survey, Dharmapala (2014) presents the approach followed by Hines and Rice (1994), whereby the log of the profit of an affiliate is regressed on the tax rate differential between the affiliate's and parent's countries. Using 1982 data, these authors find that American companies seem to report extraordinarily high profit rates on real and financial investments in tax havens. This cross-sectional estimation can be adapted to a panel data analysis, controlling for affiliate and year fixed effects.

Dharmapala (2014) also highlights an alternative approach followed by Dharmapala and Riedel (2013), aiming to disentangle the profit shifting arising from a tax differential from an 'income shock' on the parent firm. Here, the affiliate's profits in a year are regressed on a variable controlling for that shock to the parent's profits and on whether the affiliate faces a lower tax rate than its parent. With a dataset of European multinational affiliates over 1995-2005, the authors find that parents' positive earnings shocks are associated with a significantly positive rise of pre-tax profits of low-tax affiliates, relative to profits before tax in high-tax subsidiaries.

Closer to the work by Guvenen et al. (2017) and, therefore, to our analysis, is Clausing (2016). She calculates how the profit distribution of US multinationals would be if there were no tax rate differences between the US and other countries, after regressing affiliate profits on tax rates. As a result, part of the lower foreign profits is attributed to the US tax base. The study finds that profit shifting, from 1983 to 2012, might be costing the US government between US$ 77 billion and US$ 111 billion in corporate tax revenue. Clausing

(2016) also warns that corporate tax base erosion is likely to be a greater issue in countries without low tax rates.

Nevertheless, the focus of our paper is on how profit shifting might affect the GDP measurement in a country, rather than on tax avoidance. Maffini and Mokkas (2011) make an analysis on how changes in tax rates affects the difference in total factor productivity (TFP) between domestic firms and those owned by multinationals. With a dataset of European manufacturing firms from 1998 to 2004, they regress a firm's TFP on whether the firm belongs to a multinational and the statutory corporate tax rate of the host country. This research finds that a 10-pp reduction in the tax rate of the host country would increase the TFP of firms owned by multinationals by about 10% relative to domestic firms, plausibly as a result of profit shifting, with an overall 44% increase in the productivity advantage of multinationals.

The works reviewed so far have relied on econometric approaches. Our project rather computes counterfactual profits of firms belonging to multinationals operating in the UK, following an apportionment rule. The formulary apportionment strategy has been applied in recent literature, including our main reference, Guvenen et al. (2017). This practice has been established in some countries' tax policies in order to more effectively tax multinationals according to their economic activity, e.g. Australia, France, Japan, Norway, the US. However, Gresik (2001) warns that multinationals, by assessing the tax policy rules by countries, including the apportionment rule, can decide where to allocate their activity and profits to their best interest. Hence, a formulary apportionment policy may lead to endogenous firm decisions.

Recent literature has adopted formulary apportionment rules to simulate the allocation of accounting variables across affiliates in an MNE. Rassier and Koncz-Bruner (2015) use formulary apportionment to measure value-added at foreign affiliates of US parent companies. They contrast this method with separate accounting, under which accounts are kept separately for each affiliate within an MNE. Thus, costs and profits are allocated based on each affiliate's purpose within the MNE's structure, rather than on the actual economic activity of the affiliate. Conversely, formulary apportionment is usually required by US state tax regulators to calculate the taxes payable to a state by an MNE operating in many states. Thus, MNEs keep consolidated accounts to allocate income based on apportionment factors like employment, property and sales.

Rassier and Koncz-Bruner (2015), by using formulary apportionment, find that overall reallocations from foreign affiliates to US parents are relatively small: less than 5% of total value added obtained for the US under separate accounting. Reallocations from other world regions, in contrast, tend to be greater than 10% of separate accounting value added. Guvenen et al. (2017) follow this approach for their US profit reallocation. In line with Rassier and Koncz (2015) findings, Lipsey (2010) find that for US MNEs' affiliates located in some tax havens, value added is exaggerated by about 4% of worldwide affiliate sales in 2005, while that exaggeration is 10% for sales. Focusing on non-resident special purpose entities (SPEs), Rassier (2014) also apply a formulary apportionment rule to find that this rule significantly reduces total US services exports and imports, but with a negligible net

exports and GDP effect. However, it does reduce total US income receipts, leading to a 1.1% fall in US gross national product.

It can be observed that researches applying formulary apportionment rules mostly address reallocations from foreign affiliates to the home parent company in one single year. Guvenen et al. (2017) move one step forward by analysing the path of profit shifting in the US over time. However, it provides no sufficient information on profit shifting from foreign multinationals to US-based affiliates. Hence, an important part of the whole picture is missing. This paper, focusing on the UK context, aims to bridge these two gaps, along with distinguishing profit shifting performances across sectors.

3. Data

3.1. Orbis

The analysis developed in Guvenen et al. (2017) builds upon data coming from a survey of US MNEs corporations and their affiliates abroad. Given the absence of comparable data for the UK, we use ORBIS, a dataset covering firms worldwide compiled by the Bureau van Dijk (BvD). The ORBIS dataset contains firm-level information from companies' balance sheets (including revenues, profits before tax and financial revenues and costs) and, most importantly, information allowing to identify ownership links between firms. Thus, we can retrieve MNEs' ownership structure across countries. Tables 1 and 2 provide an outline of the two main ORBIS datasets utilised in this project.

Table 1: ORBIS Financial Dataset

Industry - Global financials and ratio - USD
• All industrial firms: both manufacturing and non-manufacturing.
• Financial firms (banks, insurance companies) excluded.
• Around 200 countries. European countries, better represented.
• Variables: balance sheet items, income statement items and some derivative financial ratios.

Source: ORBIS

Table 2: ORBIS Ownership Links Dataset

Links (year)
• Information on the links between a firm and its owner(s) (shareholder(s)) in each year.
• Types of relation:
○ Simple shareholder

○ Domestic ultimate owner ○ Global ultimate owner
• More than one observation per firm, depending on number of owners.
• Records percentage of ownership per firm's owner.
• Distinguishes if firms' owner is a corporation: bank, financial, insurance or industrial company.

Source: ORBIS

ORBIS is a live database, meaning that the information retrieved changes depending on the date of access. For example, the 31 December 2018 version will contain 2018 data available at that point in time, plus any updates of historical data for variables like sales. For variables like ownership instead, the database will only provide the latest available information. In our 31 December 2018 example, the majority of ownership data will refer to the year 2018. To construct a reliable historical mapping of the ownership structure, it is thus necessary to rely on the separate vintages ('snapshots') of the database. ORBIS Historical is a dataset compiled from those snapshots by BvD. Using some data cleaning routines (that we describe in detail in the Section 3) we have constructed a panel of UK MNEs and their affiliates worldwide at two different points in time: 2007 and 2017. At the same time, we have, so extending the scope of the analysis beyond what was achieved by Guvenen *et al.* (2017), also considered UK affiliates of foreign MNEs (for example Starbucks operating in the UK). Finally, after building confidence on the relevance and reliability of our results for the years 2007 and 2017, we extend our investigations to the period in between 2007 and 2017, to the years 2009, 2011, 2013 and 2015 still using the Orbis data and the very same approach.

3.2. Historical ORBIS dataset

The historical ORBIS dataset is comprised of several large files each containing a different type of information. The attached excel file in the Appendix ("List of files and variables Orbis Generic LSE 20170911.xls") contains 3 sheets each describing the variables available in three separate files.

The first sheet ("Descriptive info") provides several of variables/codes identifying each firm in the dataset. The most important one is the "BvD ID number" which is a consistent (across time, countries and versions of ORBIS) firm ID used by BvD. The second sheet ("Global format incl. histo") provides the list of balance sheet variables available in the dataset. For each country, there is a separate file and, for the UK, the latest version covers 39,931,068 observations relating to several years of data and referring to firms operating in the UK (approximately 10GB of space) – this richness in data helps to support the validity of the quality of results. After evaluating the actual coverage of the different variables for several countries, we ended up working with the list indicated in Table 3.[2]

[2] Other variables were potentially very interesting, but information is missing for some of them in most instances.

Table 3: Variables retained from the ORBIS Financial Dataset

Field name	Field type - max length	BvD codes
Fixed assets	integer – 18	FIAS
Intangible fixed assets	integer – 18	IFAS
Tangible fixed assets	integer – 18	TFAS
Other fixed assets	integer – 18	OFAS
Non-current liabilities	integer - 18	NCLI
Long term debt	integer - 18	LTDB
Other non-current liabilities	integer - 18	ONCL
Current liabilities	integer - 18	CULI
Other current liabilities	integer - 18	OCLI
Number of employees	integer - 18	EMPL
Costs of employees	integer - 18	STAF
Interest paid	integer - 18	INTE
Operating revenue (Turnover)	integer - 18	OPRE
Costs of goods sold	integer - 18	COST
Gross profit	integer - 18	GROS
Other operating expenses	integer - 18	OOPE
Operating P/L [=EBIT]	integer - 18	OPPL
Financial revenue	integer - 18	FIRE
Financial expenses	integer - 18	FIEX
Financial P/L	integer - 18	FIPL
P/L before tax	integer - 18	PLBT
Taxation	integer - 18	TAXA
P/L after tax	integer - 18	PLAT

Source: ORBIS

In terms of the time span of our analysis, we have investigated the actual amount of information available in those datasets and ended up considering the period 2007-2017. Indeed, data for 2018 is incomplete while data before 2007 gets considerably sparser.

One key element of the analysis is the capacity to identify transactions among firms belonging to a MNE group that are related to intangible assets/profits shifting. In this respect, the data contained in the survey of US MNEs used by Guvenen et al. (2017) provides very detailed information, like sales to non-affiliates and direct information of financial transactions among members of a MNE group, which is not available in the ORBIS dataset. However, after carefully examining a number of actual MNE groups operating in the UK, we have come to the conclusion that the type of transactions we are interested in mainly operates through the “Financial revenue”, “Financial expenses” and related “Financial P/L” variables that are actually available in the ORBIS dataset. For example, Figure 1 below shows how Starbucks Emea LTD, the European Starbucks hub currently based in the UK, collects profits coming from the various Starbucks European companies under the heading “Financial revenue”.

These financial revenues correspond to financial expenses for the various Starbucks European companies transferring resources to Starbucks Emea LTD. In this respect, while allowing to capture the kind of transactions we are interested in, the direct use of the financial revenue and financial expenses headings has the problem of conflating those transactions with other financial transactions like, for example, the cost of financing tangible assets. Therefore we focus, as in the robustness results provided in Guvenen et al. (2017), on profits/losses before tax (obtained as operating profits plus financial profits/losses) and, once computed the overall profits/losses before tax of an MNE group, we reassign those profits/losses across subsidiaries based on an apportionment factor.

Figure 1: European Starbucks hub collecting profits from other Starbucks European companies under the heading "Financial revenue"

STARBUCKS EMEA LTD
LONDON, United Kingdom

	29/09/2019 USD	30/09/2018 USD	01/10/2017 USD	02/10/2016 USD
Exchange rate: GBP/USD	12 months Unqualified Local GAAP 1.23010	12 months Unqualified Local GAAP 1.30410	12 months Unqualified Local GAAP 1.33840	12 months Unqualified Local GAAP 1.29610
∟ Operating revenue (Turnover)	245,839,182	229,686,028	226,819,927	216,089,68
∟ Sales	n.a.	n.a.	n.a.	n.a
∟ Costs of goods sold	135,680,034	90,530,666	97,905,273	73,271,12
∟ Gross profit	110,159,148	139,155,362	128,914,654	142,818,55
∟ Other operating expenses	114,858,131	106,151,183	93,166,000	86,538,00
∟ Operating P/L [=EBIT]	-4,698,982	33,004,179	35,747,316	56,280,55
∟ Financial P/L	183,372,242	221,540,615	176,803,932	161,950,29
∟ Financial revenue	183,389,464	221,764,921	176,813,301	161,951,58
∟ Financial expenses	17,221	224,305	9,369	1,29
∟ P/L before tax	178,674,490	254,544,794	212,551,248	218,230,84
∟ Taxation	9,041,235	22,378,367	5,874,236	3,376,34
∟ P/L after tax	169,633,255	232,166,427	206,677,012	214,854,50

In this respect, Guvenen et al. (2017) use either sales to non-affiliates or the cost of employees to operate the apportionment – both variables are not good proxies for allocating profits. Information on sales to non-affiliates is not available in ORBIS,[3] while information on the cost of employees is available only for a subset of firms. Therefore, in what follows we use firm revenue as a benchmark to operate the apportionment of profits. At the same time, we use the cost of employees as a robustness check.

3.3. Ownership links

The third sheet of the attached Excel file ("Complete ownership incl. histo") provides a list variables related to ownership links between firms. Information on ownership (both direct and indirect) is collected by the Bureau Van Dijk from a variety of sources including

[3] We do not necessarily believe that sales to non-affiliates is a better apportionment variable than sales. For example, while sales to not affiliates directly tackle the issue of transfer pricing, they can largely distort the contribution of companies specialising in intra-MNE operations (for example companies mainly selling vital intermediate products to other companies in the group).

companies' annual reports, private correspondence, stock exchange authorities, information providers, companies' websites, press news and telephone calls.

Contrary to the other cases, there is a corresponding ownership links file for each year and country. For example, the 2017 UK ownership links file comprises 47,449,291 observations referring to ownership links existing in the year 2017 and involving firms incorporated in the UK. The key variables in those files are the "Subsidiary BvD ID" and the "GUO 50C". The first one is the BvD ID number referring to the owned UK company, while the second one is the BvD ID number referring to the "Corporate Global Ultimate Owner", i.e., the company having 50% or more of the control (direct and indirect). After several discussions with Prof. Carlo Altomonte and Dr. Tommaso Sonno, these two variables have been identified as key to reconstruct the chain of ownership. In this respect, we have developed an algorithm allowing us to combine the information from ownership links files of several countries to reconstruct MNEs groups of interest to our analysis. Indeed, the population of interest are MNE groups that have some activities in the UK. However, we need to fully reconstruct the list of firms belonging to those groups in order to obtain information on each firm and ultimately use an apportionment rule to reassign profits within the group. Therefore, we have used information also from, for example, the 2017 ownership links file of the US, France, Italy, Japan, etc.

4. Data Cleaning, Matching and Processing

The intensive and time-consuming data cleaning, matching and processing of the historical ORBIS dataset, which we describe below, provides us with two final datasets containing the relevant balance sheet information of UK-based firms, and their respective domestic and/or foreign affiliates/parents, for the years 2007 and 2017. As already indicated above, after building confidence on the relevance and reliability of our results for the years 2007 and 2017, we also extend our investigations to the period in between 2007 and 2017 and in particular to the years 2009, 2011, 2013 and 2015.

In order to corroborate our results, we have considered, while keeping fixed the structure of ownership links reconstructed for the years 2007 and 2017, balance sheet information coming from the previous year, i.e., the year 2006 for the 2007 analysis and the year 2016 for the 2017 analysis. The reason for this exercise is as follows. As better described below, we face some missing balance sheet information issues with respect to some key variables, like profits and/or revenue, for a non-negligible share of firms. This missing information has a time pattern, differs considerably across countries and seems to be particularly problematic for small firms. In order to get a sense of whether this missing information does not drive aggregate results, we use the ownership structure of a given year (2007 or 2017) and the balance sheet information available for the previous year (2006 or 2016) to compute aggregate results. We then compare these results with those obtained by using both ownership and balance sheet information from the same year (2007 or 2017). To the extent that aggregate findings are similar between the two sets of results, we can be confident that missing data does not represent a major bias in our framework.

In this Section, we make a thorough description of the overall process, detailing each step followed, the difficulties found and their subsequent solutions. This process has involved going through the financial and ownership datasets of 189 countries, listed in Table A1 in the Appendix, each of them identified with a two-character code.

4.1. Balance Sheet Data: Keeping relevant variables and tabulations

In a preliminary stage, we started by working with the datasets corresponding to UK firms, aiming to replicate the process across the rest of countries.

First, we work with the balance sheet dataset (Industry-Global_financials_and_ratios-USD), containing information from the accounts reported by firms every year, expressed in US dollars.[4] Figure 2 illustrates the steps followed to process this original dataset. There, we spotted the necessity of harmonising the variable names to facilitate the iteration across countries. Hence, we opted for turning all variable names into lowercase names, as well as removing all the underscores and blank spaces from them. In one specific case, the Netherlands, we additionally had to adjust the names of a couple of variables.

Prior to keeping the most relevant variables, we worked with the *closingdate* variable, the date in which the account of a firm was closed. From that variable, we constructed three extra variables, containing the year, month and day of that closure, respectively. Subsequently, we dropped several variables that were not useful for the purposes of this research. Thus, the list of relevant variables we maintained is as follows:

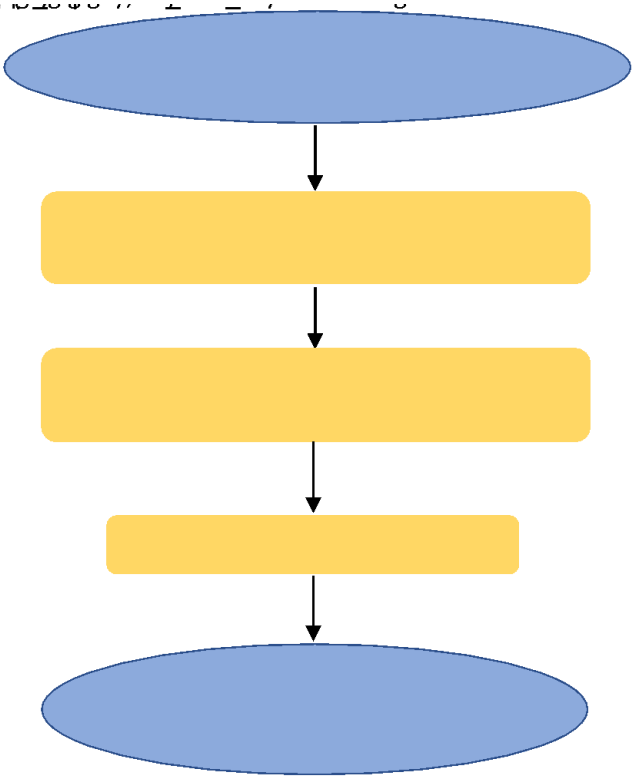
- bvdidnumber: the firm's identification code.
- year: the account's closing year.
- month: the account's closing month.
- day: the account's closing day.
- consolidationcode: code indicating the account's type of consolidation
- filingtype: the account's type of filing (more details afterwards).
- numberofmonths: the number of months covered in the account.
- Original currency (figures were converted into US dollars).
- Original units: millions, thousand, units.
- Exchange rate from original currency.
- Fixed assets.
- Intangible fixed assets.
- Tangible fixed assets.

[4] In the historical ORBIS database we use, monetary values are always expressed in current USD. We convert current USD to current GBP using the exchange rates provided within the historical ORBIS database.

- Non-current liabilities.
- Long-term debt.
- Current liabilities.
- Other current liabilities.
- Operating revenue (turnover).
- Cost of goods sold.
- Gross profit.
- Other operating expenses.
- Operating profits and losses.
- Financial revenue.
- Financial expenses.
- Financial profit and losses.
- Profit and losses before tax.
- Taxation.
- Profit and losses after tax.
- Costs of employees.
- Interest paid.

All these variables are saved in a new dataset, with the same filename, adding the term "compressed". With this new compressed file, we moved on to the next step.

Figure 2: Processing of the Balance Sheet Dataset per Country/Year



Own elaboration

4.2. Learning from the data: tabulations.

As mentioned in the ORBIS Internet User Guide, a company can register two sets of accounts: one based on "annual reports", and another one based on "local registry filings". This is the information found in the variable *filingtype*, under the labels "AR" and "LRF", respectively. These types of filings are accompanied by a level of consolidation, expressed in the *consolidationcode* variable. The balance sheet datasets distinguish six types of account consolidation:

• C1: consolidated account (mother company plus subsidiaries) without an unconsolidated companion.

• C2: consolidated account, with an unconsolidated companion.

• U1: unconsolidated account (only the concerned company), without a consolidated companion.

• U2: unconsolidated account, with a consolidated companion.

• LF: limited financials.

• NF: no financials.

Both the filing type and consolidation code are the main sources of duplicates, i.e., the presence of more than one set of accounts per firm per year in the balance sheet datasets. Some summary statistics for the UK panel show that over 90% of observations correspond to the U1 consolidation code, and a larger share of accounts come from local registry filings (LRF). By tabulating both variables together, we observe that most of the accounts based on

annual reports (AR) are consolidated accounts, without an unconsolidated companion (*consolidationcode* = "C1").

Further tabulations were made to understand the data, such as across original currencies and units of measure. However, it was much more informative to tabulate the observations across closing dates and number of months covered per account. In the case of the UK, which data ranges from 1977 to 2018, we observe an increasing data availability over time. From 2000 onwards, we count on over one million observations per year, and over two million observations from 2010. These figures vary across countries. One extreme case is the United States dataset, which vast majority of observations correspond to the year 2017.

Statistics across accounts' closing month are diverse; but, in the case of the UK for the year 2017, slightly over 40% of the accounts registered are closed in either March (24.11%) or December (17.93%). As for the number of months covered per account, over 90% of observations for the UK report a total of 12 months covered in 2017, but between 3% and 6% of accounts cover more than a year, as shown in Table 4 for both 2007 and 2017.

Table 4: Number of Months Covered per Account – UK, 2007 and 2017

	2007			2017		
Number of months	Freq.	Percent	Cum.	Freq.	Percent	Cum.
1	945	0.05	0.05	639	0.02	0.02
2	1,171	0.06	0.11	773	0.03	0.05
3	1,793	0.1	0.21	1,543	0.05	0.1
4	2,013	0.11	0.32	2,056	0.07	0.17
5	2,768	0.15	0.47	3,148	0.11	0.27
6	7,606	0.41	0.87	5,719	0.19	0.46
7	7,680	0.41	1.29	5,235	0.18	0.64
8	7,914	0.42	1.71	5,971	0.2	0.84
9	11,635	0.62	2.33	9,072	0.3	1.14
10	9,080	0.49	2.82	7,257	0.24	1.39
11	13,287	0.71	3.53	9,117	0.31	1.69
	1,671,18			2,826,19		
12	0	89.58	93.12	9	94.6	96.29
13	71,188	3.82	96.93	61,874	2.07	98.36
14	16,105	0.86	97.79	11,019	0.37	98.73
15	13,574	0.73	98.52	11,552	0.39	99.12
16	8,695	0.47	98.99	6,863	0.23	99.35
17	7,908	0.42	99.41	6,624	0.22	99.57
18	10,200	0.55	99.96	12,761	0.43	100
19	48	0	99.96	5	0	100
20	32	0	99.96	1	0	100
21	28	0	99.96	1	0	100
22	14	0	99.97	2	0	100
23	647	0.03	100	18	0	100

	1,865,51			2,987,44	
Total	1	100		9	100

Source: ORBIS. Own elaboration.

However, we consider it more informative to analyse these statistics in terms of turnover shares for a given year. Thus, Table 5 shows that the 1,671,180 accounts covering 12 months in 2007 account for 94.64% of UK's total turnover recorded in the ORBIS dataset. Likewise, the 2,826,199 accounts covering 12 months in 2017 make up 96.66%. In both years, accounts covering 15 months rank second in terms of turnover.

Table 5: Number of Months Covered per Account, Turnover Share – UK, 2007 and 2017

	2007		2017	
Number of months	Turnover Share	Cum.	Turnover Share	Cum.
1	0.00%	0.00%	0.00%	0.00%
2	0.02%	0.02%	0.00%	0.01%
3	0.03%	0.05%	0.05%	0.06%
4	0.03%	0.08%	0.02%	0.07%
5	0.04%	0.12%	0.01%	0.08%
6	0.30%	0.42%	0.12%	0.21%
7	0.24%	0.66%	0.06%	0.27%
8	0.23%	0.89%	0.10%	0.37%
9	0.77%	1.66%	0.34%	0.71%
10	0.43%	2.09%	0.13%	0.85%
11	0.36%	2.45%	0.17%	1.02%
12	94.64%	97.09%	96.66%	97.68%
13	0.39%	97.48%	0.28%	97.96%
14	0.43%	97.91%	0.32%	98.28%
15	0.90%	98.81%	0.61%	98.89%
16	0.37%	99.18%	0.27%	99.16%
17	0.22%	99.40%	0.21%	99.37%
18	0.57%	99.98%	0.63%	100.00%
19	0.00%	99.98%	0.00%	100.00%
20	0.00%	99.98%	0.00%	100.00%
21	0.01%	99.98%	0.00%	100.00%
22	0.00%	99.98%	0.00%	100.00%
23	0.02%	100.00%	0.00%	100.00%

Source: ORBIS. Own elaboration.

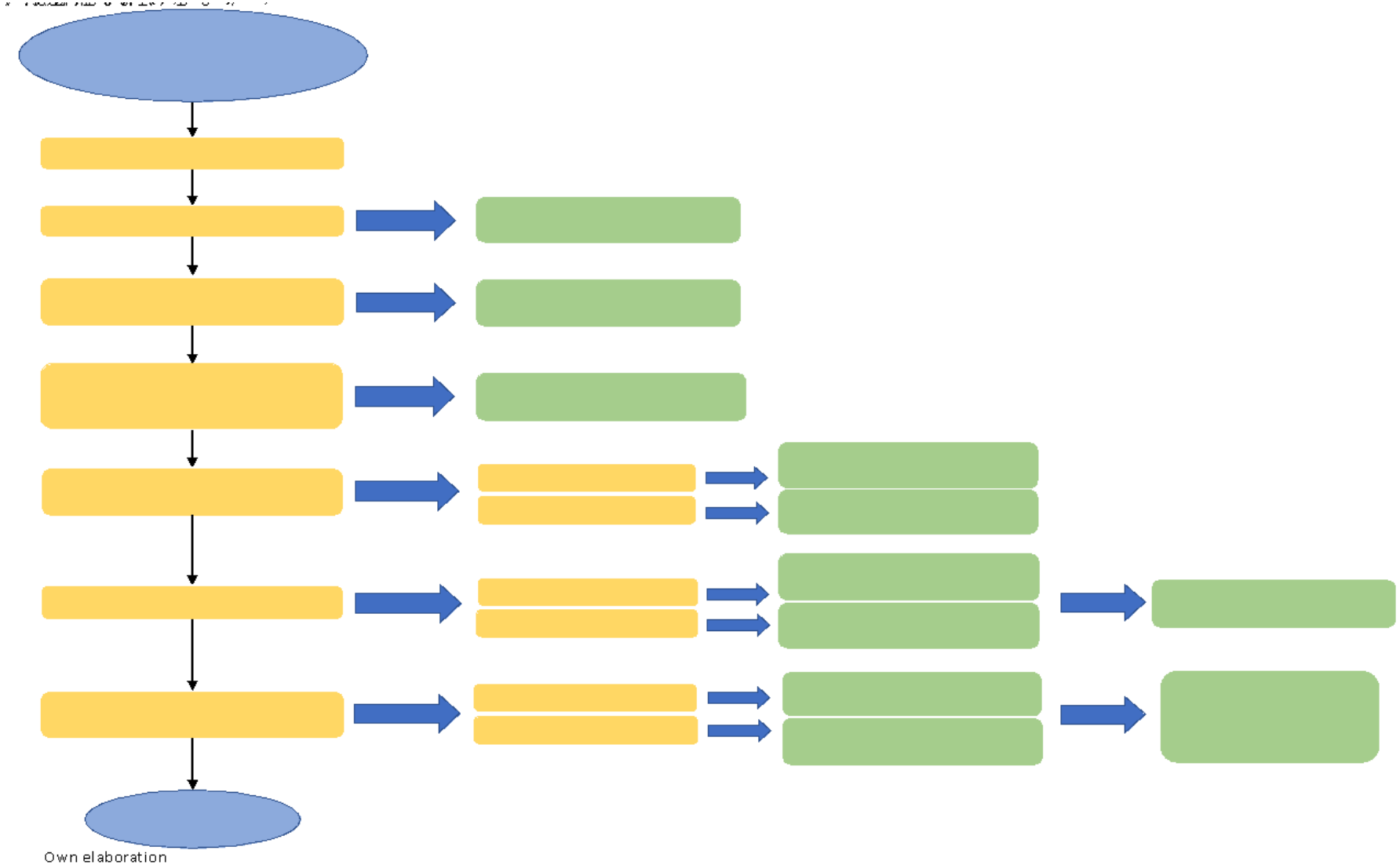
We replicate these tabulations across countries and save the outputs in log files called "Industry_Tabulations".

4.3. Balance Sheet Data: panel construction (dropping duplicates)

With the compressed balance sheet datasets, we moved on to a long and cumbersome stage: the deletion of duplicates, in order to achieve two balance sheet datasets per country, covering the 2006-2007 and 2016-2017 periods, comprising only one observation per

firm-year. We prepared two do-files, containing the same duplicate dropping process, but for each of the periods of interest separately. Figure 3 presents a scheme detailing all the steps followed to drop the duplicates until achieving the final panel.

Figure 3: Duplicate Dropping Process per Country/Year



Own elaboration

Before dealing with the duplicates, we replace the values of the *filingtype* variable when necessary, in order to harmonise the datasets and facilitate the do-files' running across countries. Then, we keep the data from the years of interest.

By observing the data in the previous stage, we distinguished the following sources of duplicates at the firm-year level: the consolidation code, the filing type, the closing year, month and day, number of months covered, as well as the original currencies and units of measure. Our strategy was to "go backwards", examining duplicates across levels of disaggregation, until getting to the most aggregated level, i.e. the firm-level one.

Firstly, we detected duplicates by the closing day of the account, i.e. same BvD ID and consolidation code, same filing type and original unit, closing on the same year and month, but on different days. In this and next stages, we count the duplicates, list them and tag them with a tag dummy. For numeric variables like the closing day, we opt for keeping the duplicates with the latest observation. Hence, we keep the latest account in a month. Once the duplicates are dropped, we also drop the tag dummy and move on to the next duplicates check.

Secondly, we examined duplicates by the number of months covered per account, i.e. same ID and consolidation code, same filing type and original unit, closing on the same year and month, but with different number of months covered. Following up on the rule stated above, we kept the duplicates with the largest number of months covered.

Subsequently, we escalated one more level and checked duplicates by filing type. We could spot observations for firms with the same consolidation code, closing year, month and original units. However, one observation of the duplicate pair was "AR" and the other one, "LRF". By tabulating the consolidation code for duplicates and considering the rule from the ORBIS Internet User Guide, we opted for keeping the "AR" duplicates, thus getting rid of the "LRF" ones.

The next step was to evaluate duplicates by original units and currencies. At that stage of analysis, we could find that there were still duplicates at the closing day and filing type levels. Hence, we proceeded by keeping the duplicates with the latest day and those accounts based on annual reports ("AR").

Right after that, we moved on to the closing month level, i.e. same ID, consolidation code and closing year, but with different closing months. This is the first stage in which we found more than one duplicate per firm-year. We discovered that at that level, there were two more sources of duplicates, apart from the closing month: the number of months covered and the filing type. Hence, we first kept the duplicates with the largest number of months covered. Then, we kept the AR duplicates, and, finally, we maintained the duplicates with the latest closing month.

Thus, the balance sheet dataset was ready for the last and most complicated stage of duplicate dropping: the analysis at the consolidation code level.

At this final stage, we initially thought that by observing a pattern in the actual balance sheet figures, we could decide which type of consolidation to maintain in the dataset.

However, by making some summary statistics per consolidation type and checking the datasets, we realised that was not very helpful, since there were no stark differences between duplicates. Additionally, when checking for duplicates, once again we obtained some triplets per firm-year.

Before deciding which type of accounts to maintain, we dropped duplicates by using some previous criteria: keeping the accounts with the largest number of months covered per firm-year, and maintaining the accounts based on annual reports (*filingtype* == "AR"). Some duplicates were eliminated, but most of them remained in the dataset. By browsing those remaining duplicates, we opted to classify the pairs and triplets by consolidation code. Thus, we generated dummies controlling for the following consolidation pairs and triplets at the firm-year level:

- C1-C2
- C1-U2
- C1-U1
- C2-U2
- C2-U1
- C1-C2-U2
- C2-U1-U2

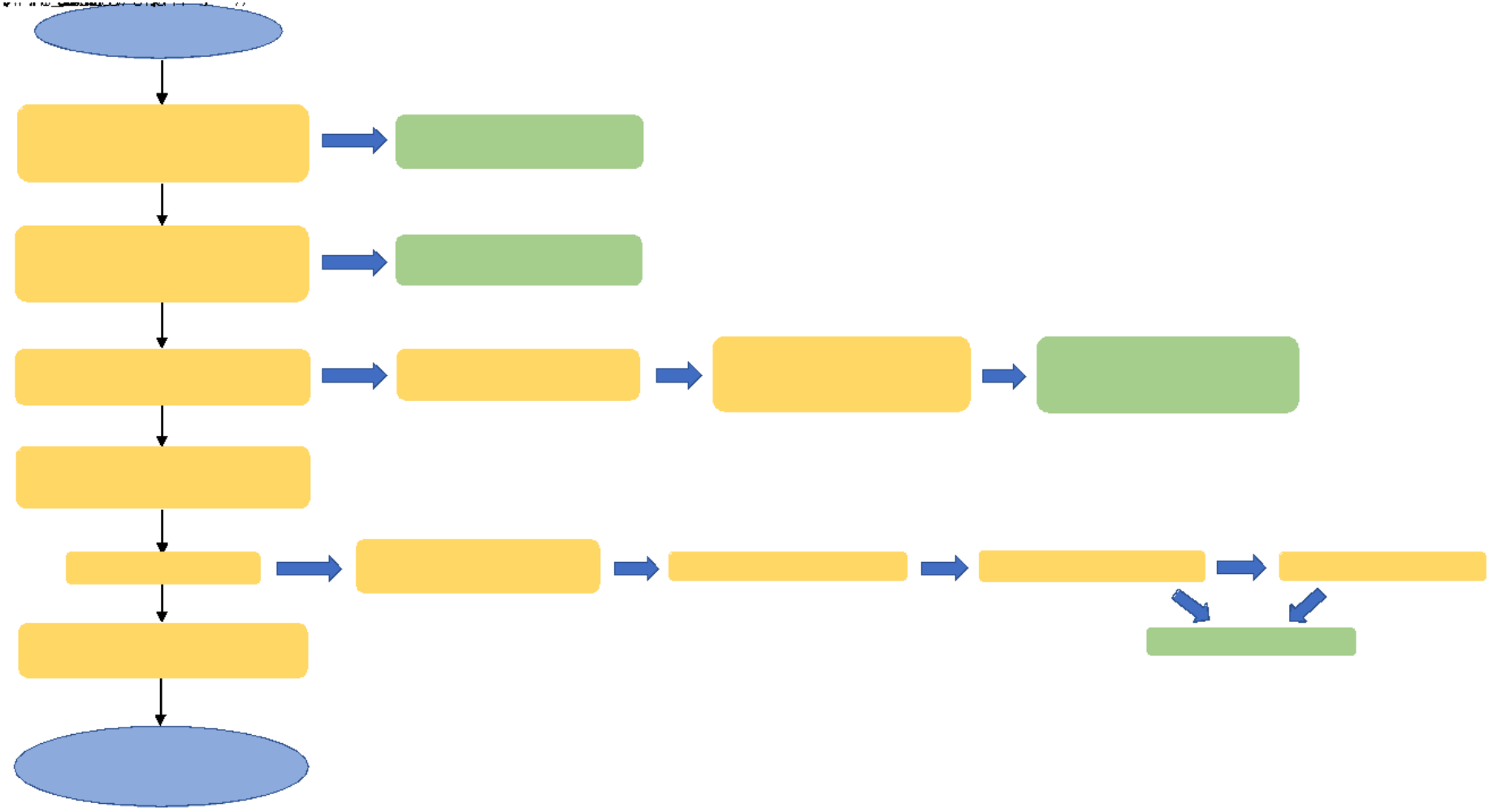
By comparing figures between consolidated and unconsolidated accounts, we concluded that U1 and U2 observations did not seem to contain reliable figures, i.e. variables that should add up together did not. Having this in mind and following the definitions of the types of accounts listed above, we decided to prefer consolidated over unconsolidated accounts. Likewise, we opted to maintain C1 over C2 accounts. Hence, for instance, in a C2-U2 pair, we keep the C2 observation; and in a C1-C2 pair, we keep the C1 observation. The same rule applies for the triplets.

This way, we finally cleaned the balance sheet dataset from every duplicate. We replicate the process for every country in the ORBIS big dataset, as well as for each of the periods considered (2006-2007 and 2016-2017). These cleaned datasets are then saved with the prefix "Industry_Panel". The duplicate dropping process for each country and period is also saved in log files named with the same prefix.

4.4. Ownership Data: Parents and Affiliates

The next step was to clean the ownership data, which links every single firm with their parent companies. Here, we work with the "Links-subsidiary" datasets provided by country and year. For each country, we count on two ownership datasets, for 2007 and 2017, respectively. Figure 4 portrays the sequence of steps followed to clean the ownership data.

Figure 4: Ownership Data Cleaning Process per Country/Year



Own elaboration

Prior to dropping observations, we amend the variable names, removing both capital letters and underscores, in order to avoid obstacles when subsequently merging and appending the datasets. A first glance at the data tells us that for every firm ID there are up to 11 observations, listing different types of parent companies, depending on their nature and ownership share. The most frequent parents found in the dataset are the domestic ultimate owners (DUO) and the global ultimate owners (GUO). That information is recorded in the variable *typeofrelation*. Given the purpose of our study, we opted to maintain in the dataset those observations in which the value of that variable starts with "GUO".

After this process, every firm ID has up to four observations, each containing one category of parent-affiliate relationship. The remaining type of relations between parents and affiliates in the dataset are the following:

- GUO25: global ultimate owner with a minimum 25% ownership share.
- GUO50: global ultimate owner with a minimum 50% ownership share.
- GUO25C: corporate global ultimate owner with a minimum 25% ownership share.
- GUO50C: corporate global ultimate owner with a minimum 50% ownership share.

We are particularly interested in retrieving the main global corporate shareholder of every single firm, i.e. the GUO50C parent company. Hence, the ideal output from this cleaning process is a dataset with only one observation per firm (*subsidiarybvdid*), including their correspondent main parent company (*guo50c*). In order to achieve this outcome, some previous cleaning is required.

The ownership dataset contains the variables *guo25*, *guo50*, *guo25c* and *guo50c*, which record the different parent companies of a subsidiary, according to the degree of ownership and type of parent. It also contains the variable *totalonlyfigures*, which reports the ownership share of every parent company of a subsidiary. In many observations, there were discrepancies between the information in the *guo* variables and *totalonlyfigures*. For instance, for one parent-affiliate relationship in which *typeofrelation* was equal to "GUO25C" and the variable *guo25c* was non-missing, *totalonlyfigures* reported an over-50% ownership share; however, the *guo50c* variable was blank. In this case, it is evident that the GUO25C parent of the affiliate is also the GUO50C. Therefore, we ran a programme in order to deal with this sort of discrepancies. A good number of observations have been affected by this adjustment. Subsequently, for every parent-affiliate pair, we proceeded to fill missing values for variables like *directonlyfigures* and *totalonlyfigures*, in order to give consistency to the dataset and avoid missing valuable information in the next stages.

After completing that cleaning and filling process, every subsidiary has up to four observations with all its ownership information available. Thus, we can keep only one observation per subsidiary. Then, from the *informationdate* variable, which contains the full recording date of the observation, we extract the first four digits which represent the recording year. These four digits are saved in the *informationyear* variable. We do this because, even though the datasets correspond to either 2007 or 2017, the actual recording year may be earlier.

We consider that the only relevant variables for our project from this dataset are *subsidiarybvdid*, *directonlyfigures*, *totalonlyfigures*, *guo25*, *guo50*, *guo25c*, *guo50c* and *informationyear*. Hence, we dropped the rest of the variables. We also made additional quality checks of the data.

In order to facilitate the merging process with the balance sheet data, we renamed the *subsidiarybvdid* variable containing the firm's ID by *bvdidnumber*, the name used in the balance sheet dataset. Additionally, we generated the variable *year*, equal to the year to which each ownership dataset belongs to, i.e., either 2007 or 2017. The ownership dataset is finally saved with the name "country-parents-affiliates-year-cleaned". This process is repeated across countries for the years 2007 and 2017, and all the details of the cleaning are saved in log files with the same name.

As a final check of our output, we were interested in knowing how many subsidiaries in our datasets had no corporate global ultimate owner, but instead an individual as an owner.[5] In this respect it is important to understand that we are considering here MNE groups, meaning a group of companies under the same ownership operating in two or more countries, and not domestic firms. Indeed, most of the domestic firms are comprised of small companies belonging to individuals. However, when considering MNE groups the situation is very different with individuals being very rarely the global ultimate owners of such groups. For example, most people would be knowledgeable of the Virgin MNE group led by the English businessman Richard Branson. However, Richard Branson is not the global ultimate owner of the Virgin MNE group but rather has a major stake in the US-based company (VIRGIN GALACTIC HOLDINGS, INC) controlling the group. In terms of quantitative importance our data, extended to include also cases where individuals as the global ultimate owner, indicate that MNE groups where the global ultimate owner is an individual account for about 0.5% of the capital, revenue and profits of all MNE groups. Therefore, excluding these MNE groups from the analysis does not affect the aggregate implications of our study.

4.5. Merging Industry Balance Sheet Panel with Ownership

This next process is rather straightforward. It is simply about merging the "Industry_Panel" with the "Parent-affilliate-cleaned" datasets for every country and period of interest. We first open the "Industry_Panel" dataset and, by using the variable *bvdidnumber*, we merge it with the "Parent-affiliate-cleaned" one.

The final merged datasets are saved with the prefix "Industry_Ownership_Panel". As mentioned earlier, this whole process is replicated for all the countries in the ORBIS dataset and for the two years/periods considered.

With these merged datasets, we produced some summary statistics per country and year of the balance sheet variables we consider most relevant for the next stages of our analysis. These variables are:

- Financial revenues.

[5] Individuals are recorded in the ORBIS database with special codes containing an asterisk character.

- Financial expenses.
- Financial profit and losses.
- Operating revenue (turnover).
- Costs of employees.

These summary statistics are saved in log files named "Summary_Statistics", done for each country and for the periods 2006-2007 and 2016-2017, separately.[6]

4.6. Crossing Information Across Countries

The final goal of our data cleaning, matching and merging process is to achieve two datasets (one for 2006-2007 and another one for 2016-2017) of firms around the world owned by either a UK or a foreign multinational, with that multinational having some activities (firms reporting profits) in the UK. These final datasets should cover both balance sheet and ownership data. Figure 5 illustrates the three steps followed in this crossing process.

For this purpose, we start in Step 1 with the merged dataset for the UK, and we keep only the *guo50c* variable, which records all the parent companies of UK-based firms. Subsequently, we drop those observations where *guo50c* is missing. We then save this file as "UK_active_companies". Therefore, this file contains all identifiable firms that own a UK company, regardless of their origin, with an ownership share above 50%.

In Step 2, we open again the UK merged dataset and keep those observations where the firm ID is missing. As a result, we get an empty dataset, saved as "UK_active_companies_year_world", which will be useful for the next stage of this process.

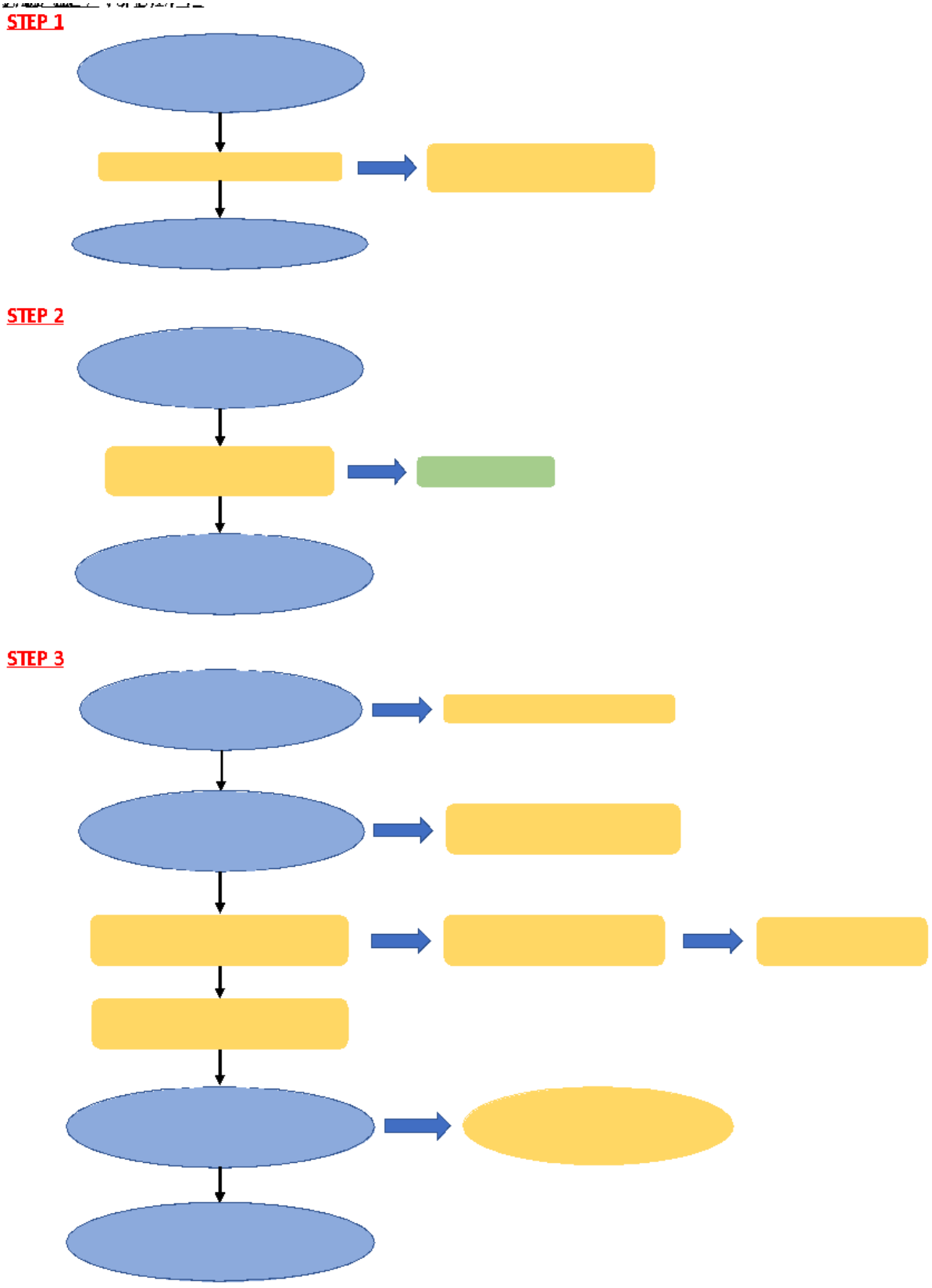
By iterating across country codes provided in the "Country_codes_and_names_ORBIS" dataset, in Step 3 we open the merged dataset of the first country in alphabetical order, according to its code. Then, we merge it with the "UK_active_companies" dataset created earlier, using *guo50c* as a merging variable. Prior to that merge, we dropped from the ownership data variables that are not anymore useful for our study. After de-stringing some balance sheet variables when necessary, we append the empty "UK_active_companies_year_world" file and save the new file with that name. In other words, we overwrote the empty file with the information from the first country.

We repeat the process with the second country and, when appending the "UK_active_companies_year_world" file, we incorporate the data from the first country. Again, we save the new file as "UK_active_companies_year_world", now containing the ownership and balance sheet data of the first two countries. It is important to clarify that throughout this process, we drop the unmerged observations, i.e. those without *guo50c* owner from the "UK_active_companies" file. We first ran this full programme for the period 2006-2007, and then replicated it for 2016-2017, so obtaining our two final datasets.[7]

[6] In our analysis we do not trim data for outliers based, for example, on sales or profits levels or changes.

[7] The various stages of data processing described in this Section were first implemented with the UK datasets only, then replicated for three additional countries (The Netherlands, Chile and the United States). Once

Figure 5: Crossing Balance Sheet and Ownership Data Across Countries



Own elaboration

confirmed the effectiveness of these programmes, we iterated them across all the countries available in the ORBIS database.

5. Apportionment Rule

We describe here how we proceed in terms of re-assigning the observed profits among the different companies belonging to each MNE group in order to obtain a counterfactual distribution across companies and ultimately across the countries in which these companies operate. As already indicated above, the goal of this exercise is to get a sense of how the distribution of profits, within each MNE group, would look like if profits were linked to a more direct measure of local economic activity like the sales or the cost of employees of each company comprising an MNE group. This ultimately allows to gauge how far is the counterfactual distribution of profits across companies, and the countries in which they operate, with respect to the actual distribution, where the latter is influenced, among others, by tax saving, legal and currency risk considerations. Figure 6 illustrates the three basic steps followed to achieve our estimations based on the apportionment rule.

We denote a firm/company (a distinct BVD ID number) with *i*, a MNE (a distinct BVD ID number of the GUO50c) with *j* and time with *t*. In our final datasets each firm *i* is associated to a unique MNE *j* at time *t*. A MNE most often files consolidated accounts covering the whole or parts of its operations and so not allowing disentangling the contribution of its comprising firms to the overall profits/losses. However, the vast majority of its subsidiaries file unconsolidated accounts and we use such unconsolidated accounts as the basis for computing aggregate profits at the MNE-level and apportion them across subsidiaries based on each subsidiary's revenue or cost of employees. One issue with this approach is that the share of profits/value pertaining to the MNE (as well as to other firms in the group filing consolidated accounts) is not taken into account in our analysis.[8] In order to provide insights into this issue, in Step 1 we have computed, for those MNE groups in which the main parent company files consolidated accounts, the total value of fixed assets, revenue, operating profits and profits before tax referring to firms filing unconsolidated account. We then compare those totals with the figures reported by the MNEs in its consolidated accounts. Considering the year 2017, fixed assets owned by affiliate firms filing unconsolidated accounts represent 89.4% of the fixed assets reported by MNE parents in their consolidates accounts. The equivalent figures for revenue and operating profits are 54.8% and 28.3% respectively. Interestingly, with regard to the latter the share increases to 58.3% when considering profits before tax, i.e., after taking into account those financial profits and losses that, as suggested above, include the within MNE-group profits transfers we are interested in.[9] The above evidence suggests two things. The first one is that our analysis has some coverage limitations. More specifically, our analysis is based on the re-assignment, via revenue apportionment, of profits before tax and, in focusing on data coming from unconsolidated accounts, we neglect some 40% of overall MNEs' before tax profits. The

[8] In general terms, it is not possible to analyse the impact of excluding firms filing consolidated accounts on profit allocation because there is no way to extrapolate, from the balance sheet data, how to allocate the overall profits reported in the consolidated account among the different firms whose activities are included in the consolidated account.

[9] When considering the year 2007 numbers are roughly comparable although somewhat smaller. For example, fixed assets owned by affiliate firms filing unconsolidated accounts represent 81.4% of the fixed assets reported by MNE parents in their consolidates accounts. The equivalent figures for revenue and profits before tax are 51.6% and 25.2% respectively.

second thing is that MNE groups seem to transfer operating profits away from the MNE parent to their subsidiaries via financial transactions before paying taxes. This feature is not directly related to the scope of our analysis but we believe it is still an interesting finding that turns out to be a consistent feature of the data also when considering information for 2007.

With the above caveats in mind, in Step 2 we compute, starting from observed profits before tax of firms *i* belonging to MNE *j* and filing unconsolidated accounts in year *t* (PBT_i), aggregate MNE *j* profits as the sum of PBT_i ($PBT_j = \sum_{i \in j} PBT_i$). We then reassign those aggregate profits across firms *i* based on, for example, the revenue share of firm *i* ($share_i = revenue_i / \sum_{i \in j} revenue_i$) in order to obtain the counterfactual profits: $PBTc_i = share_i * PBT_i$.

Once computed those counterfactual profits $PBTc_i$ at the level of the firm, we sum them across businesses located in, for example, the UK ($PBTc_{UK} = \sum_{i \in UK} PBTc_i$) and compare those aggregate counterfactual profits before tax with the observed aggregate profits before tax ($PBT_{UK} = \sum_{i \in UK} PBT_i$) of these companies. If $PBT_{UK} > PBTc_{UK}$ then within-MNE profits transfers across subsidiaries are favourable to the UK in that MNEs' subsidiaries located in the UK declare more profits liable to taxes in the UK than what they would declare if MNEs' profits were redistributed across subsidiaries in the world based on the level of economic activity of each subsidiary (revenue).

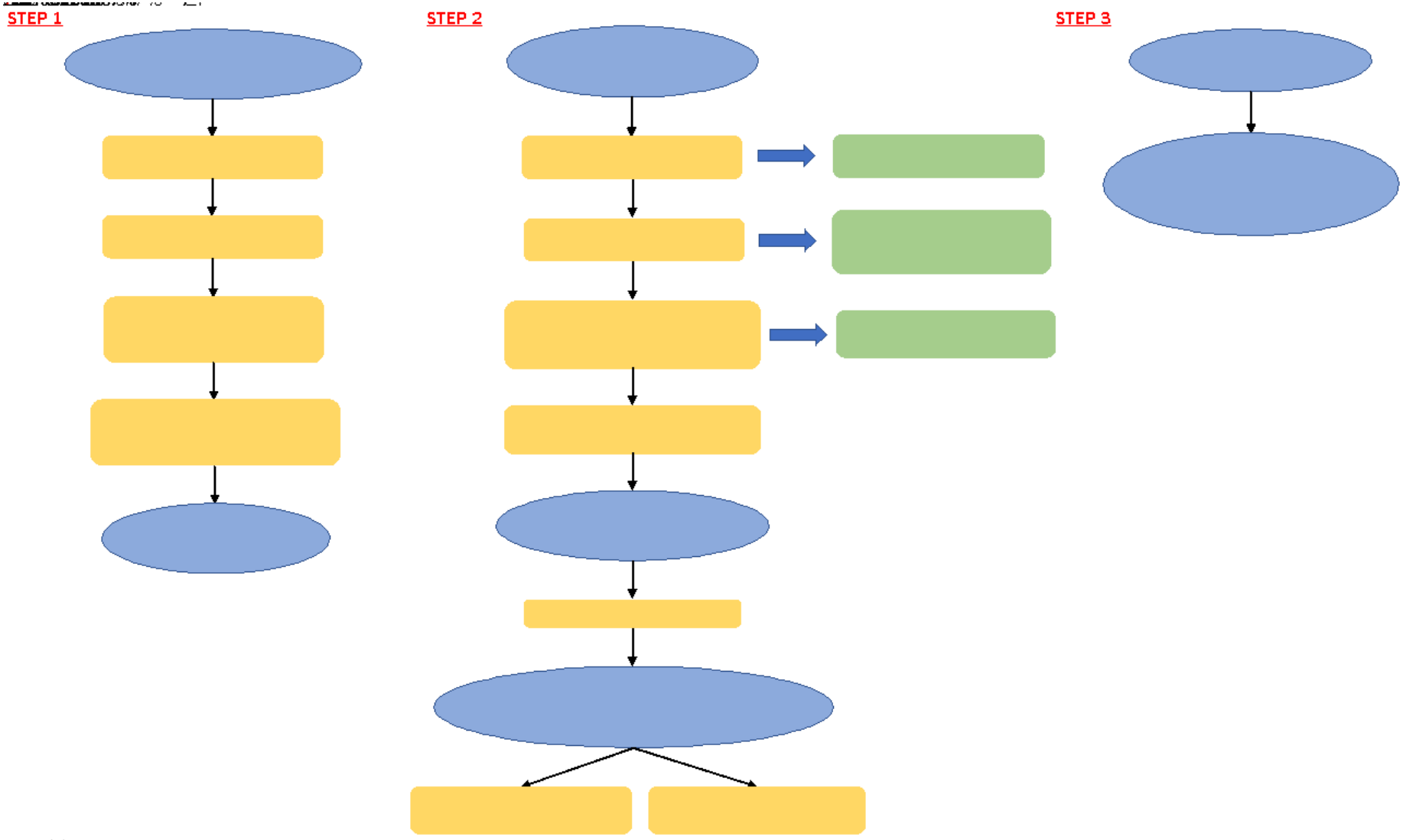
6. Baseline Results

Based on the above methodology and data we find, for the year 2017, that companies belonging to MNE groups and filing unconsolidated accounts reported in the UK some 2,658 billion GBP sales as well 189 billion GBP of operating profits and 499 billion GBP of profits before taxes. Globally, these figures amount to 19,140 billion GBP in sales, 881 billion GBP in operating profits and 1,495 billion GBP in profits before taxes. The difference between profits before taxes and operating profits (310 billion GBP for companies operating in the UK and 614 billion GBP for companies across the globe) is accounted for by those financial transactions discussed above and highlights how MNE groups seem to transfer, both for the UK and worldwide, operating profits away from the MNE parent and to their subsidiaries via financial transactions before paying taxes. The corresponding difference between profits before taxes and operating profits in 2007 is also positive and stands at 307 billion GBP for companies operating in the UK and 612 billion GBP for companies across the globe.

By means of our apportionment rule we can then answer the following question: How would the 1,495 billion GBP of profits before taxes reported worldwide in 2017, be counterfactually

distributed across companies, and so across countries, if profits were proportional to the sales reported by each company? The answer to this question is that, as far as the UK is concerned, the counterfactual profits $PBTc_{UK}$ would be 458 billion GBP, which compares with the actual reported profits, PBT_{UK}=499 billion GBP. Therefore, the difference between PBT_{UK} and $PBTc_{UK}$ stands at a positive 41 billion GBP representing about 1.91% of UK GDP in 2017 (UK GDP in 2017 was about 2,144 billion GBP). In this light, the UK was in 2017 a net winner in terms of global MNEs' profit shifting.

Figure 6: Apportionment Rule



Own elaboration

Interestingly, when considering the year 2007, the situation was reversed with actual reported profits PBT_{UK}=83 billion GBP and counterfactual profits $PBTc_{UK}$=107 billion GBP. As a result, back in 2007, the UK was a net loser in terms of global MNEs' profit shifting. In the next Section we will explore, by means of data for 2009, 2011, 2013 and 2015, the time evolution of the difference between actual and counterfactual profits for the UK.[10]

As far as other countries are concerned, the picture is quite rich and it is reported in Table A2 in the Appendix where we provide, for the year 2017, actual declared pre-tax profits PBT as well as counterfactual profits $PBTc$ and the difference between the two. In terms of sheer size of the difference between actual and counterfactual profits, the three largest winners are the Netherlands, the UK and Luxembourg while the big 3 losers are Singapore, Belgium and Italy.

Three issues are worth mentioning at this stage. First, how robust are our results with respect to the problem of missing data? As indicated above, revenue and/or profits before tax are sometimes missing within the set of firms belonging to the MNE groups under study. To gain insights on this, we use the ownership links observed in 2017 while using data on revenue and profits in 2016 to recompute our numbers. In doing so we find that results change somewhat quantitatively (which is to be expected given we use data from another year) but not qualitatively. More specifically, the difference between PBT_{UK} and $PBTc_{UK}$ still stands at a positive 25 billion GBP, while the difference is still negative when considering the ownership links observed in 2007 and data on revenue and profits in 2006.

Second, how robust are our results with respect to the variable chosen to operate the apportionment? To make progress in this direction we use information on the cost of employees, instead of revenue, to operate the apportionment.[11] In this respect our analysis does indicate that some results are fragile. For example, the UK turns from the positive difference between actual and counterfactual profits of around 41 billion GBP in 2017 to a negative difference of about 5.7 billion GBP. However, detailed results presented in Table A3 in the Appendix still confirm the Netherlands and Luxembourg as the big winners (along with Ireland), while also confirming Italy and Belgium among the big losers (along with Australia and France).

Third, how robust are our results with respect to employing a restricted group of observations featuring, for each MNE group, one consolidates account for the parent and unconsolidated accounts for the affiliates? More specifically, so far, we are using values obtained from all unconsolidated accounts of companies belonging to an MNE group including the parent/global ultimate owner. However, the most common case in the data involves the parent filing a consolidated account and the various affiliates filing mostly

[10] Our results seems to contradict recent patters in the UK balance of payments. The primary income balance in the balance of payments reflects net interest, profits and dividends and for the UK it has deteriorated in recent years. However, our analysis only covers parts of the flows of net interest, profits and dividends and so the two results are not necessarily contradicting each other.

[11] Information on the cost of employees is available only for a subset (about half) of the firms for which revenue is available. This is the main reason why we use revenue as a benchmark. In our analysis based on the cost of employees we use the cost of employees to operate the apportionment whenever possible and revenue otherwise.

unconsolidated accounts. We take this into account in Step 3 (see Figure 6), by restricting our analysis to that common case. Thus, we still find a positive difference between actual and counterfactual pre-tax profits of about 69 billion GBP in 2017 and a negative difference of about 13 billion GBP in 2007. Detailed results for this subset of observations and referring to the year 2017 are reported in Table A4 in the Appendix.

Fourth, it would be interesting to know whether the positive or negative difference between actual and counterfactual profits for the UK (as well as for other countries) in a particular year is mainly driven by UK MNE groups, i.e., the MNE groups in our analysis whose ultimate owner is a UK company, or not. To this end, we restrict the computations of actual and counterfactual profits to UK MNEs only and find that the difference between actual and counterfactual profits is a positive 43.5 billion GBP in 2017, which compares to an overall positive difference of 41 billion GBP. At the same time, we find a negative difference of 1.7 billion GBP in 2007 for UK MNE groups, which compares to an overall negative difference of 24 billion GBP. Therefore, the bottom line is that UK MNE groups are not entirely driving the aggregate positive or negative difference between actual and counterfactual profits for the UK. Table A5 in the Appendix provides a detailed analysis by country referring to UK MNE groups in 2017. Interestingly, Table A5 indicates a much more modest positive difference between actual and counterfactual profits in favour of the Netherlands and Luxembourg.

7. Additional results and robustness

In this Section we provide a few additional results to both highlight particular aspects and provide robustness. We deal with:

- Provide results for other years in the interval 2007-2017
- Explore industry patterns
- Handling separately the Crown Dependencies of Guernsey, the Isle of Man and Jersey as well as Branches
- Look more closely at/discuss Special Purpose Entities and Family Trusts in the UK

7.1. Profit Shifting in the UK between 2007 and 2017

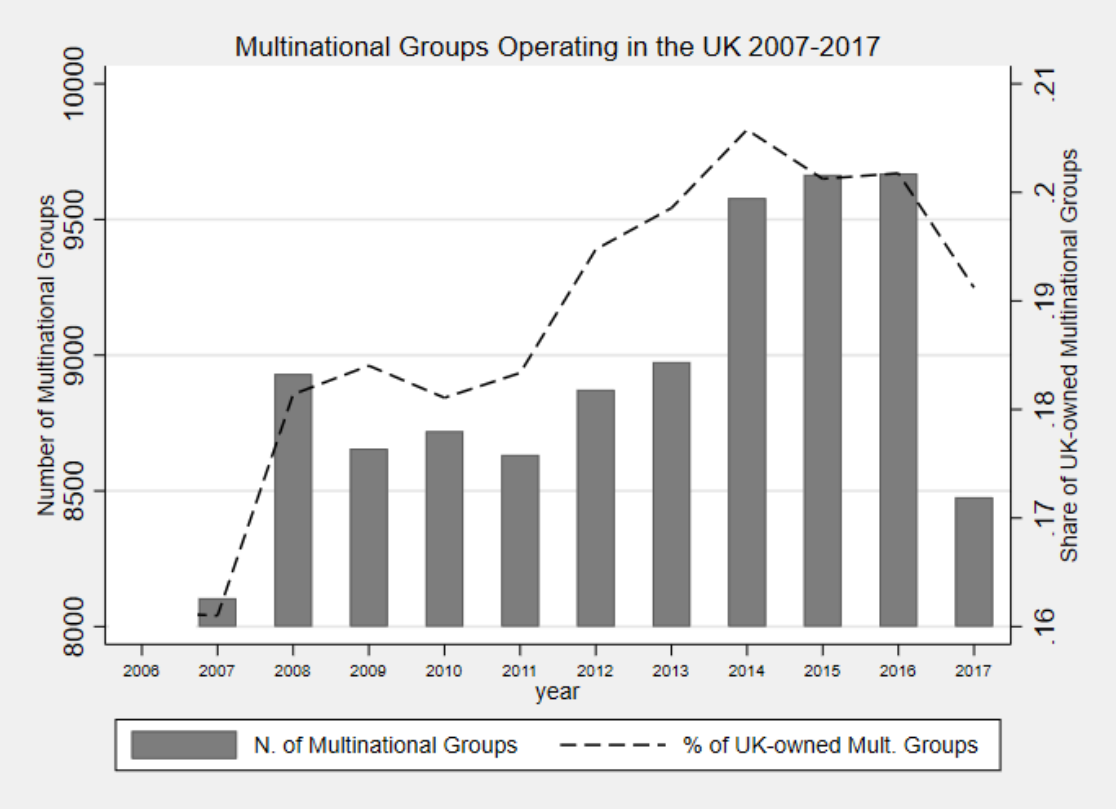
To begin with, Figure 7 provides the number of MNE groups operating in the UK between 2007 and 2017 as well as the share of such MNE groups that is accounted for by UK MNE groups. In this respect, the data for 2008, 2010, 2012, 2014 and 2016 is obtained from ownership links observed in the subsequent year while data for 2007, 2009, 2011, 2013, 2015 and 2017 is obtained from ownership links observed in the same year.

Figure 7 highlights an increase in the number of MNE groups operating in the UK (indicated by bars with the relevant scale on the left axis) from about 8,000 in 2007 to more than 9,500 in 2016 and a drop in 2017 to around 8,500.[12] At the same time, the share of MNE groups

[12] The drop in 2017 is likely to simply reflect an issue of data availability rather than an actual drop in the number of MNE groups. As highlighted above, ORBIS is a live dataset and the vintage we use (31 December

that is accounted for by UK-owned MNE groups (indicated by a dashed line with the relevant scale on the right axis) is roughly in between 16% and 20% and overall increasing over the period 2007-2017.

Figure 7: Number of Multinational Groups Operating in the UK between 2007 and 2017



In terms of actual and counterfactual profits, as well as their difference, Figure 8 depicts their patterns across time. Actual profits are indicated with a dashed line while counterfactual profits are indicated with a dotted line and the scale of both measures is provided on the right axis in billion GBP. Actual and counterfactual profits range in between about 100 to 500 billion GBP over the period 2007-2017, with the lower bound corresponding to the financial crisis in 2007-2008. The difference between actual and counterfactual profits is indicated in Figure 8 by bars with the left axis providing the relevant scale in billion GBP. As can be appreciated from Figure 8, the difference was negative in 2007 and 2008 and turned to positive, while remaining overall stable around 40 billion GBP ever after, starting from 2009. These results suggest that the pattern of profit shifting in the UK has completely reversed in 2009 with the UK moving from a loser to a winner position.

2018) has less missing information referring to, for example, the year 2016 than the year 2017. Future vintages of ORBIS will likely have less missing information related to the year 2017 than the vintage we use.

Figure 8: Profit Shifting in the UK between 2007 and 2017. Actual Profits, Counterfactual Profits and Profits Difference (Values are reported in billion GBP)

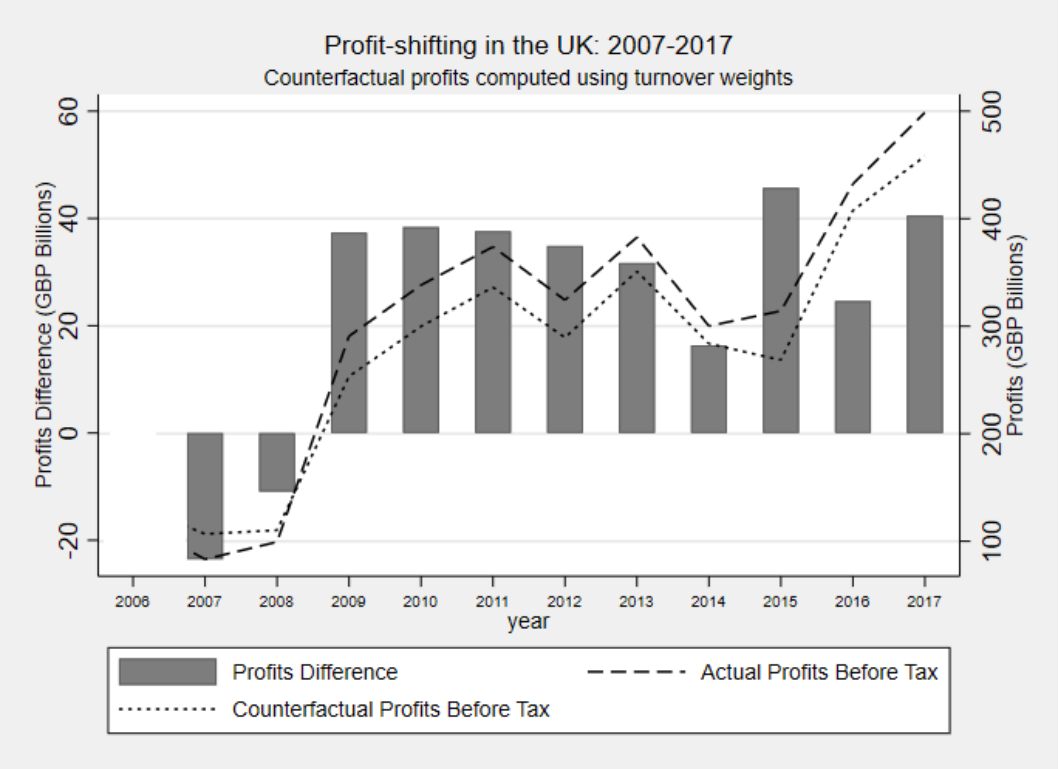
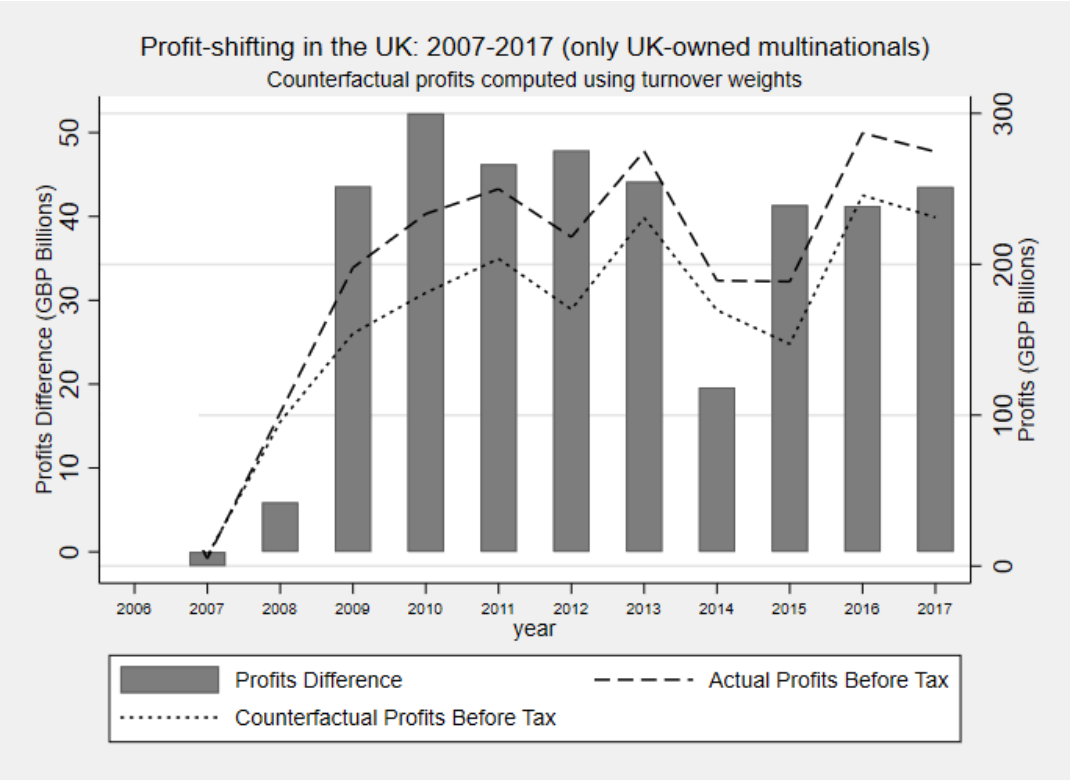


Figure 9: Profit Shifting in the UK between 2007 and 2017 (only UK-owned multinationals). Actual Profits, Counterfactual Profits and Profits Difference (Values are reported in billion GBP)



The break in 2009 can be further observed in Figure 10 where we report actual and counterfactual profits, as well as their difference, for UK MNE groups only over 2007-2017. Furthermore, by comparing Figures 9 and 10, it is possible to appreciate that the positive difference between actual and counterfactual profits enjoyed by the UK ever since 2009 is almost entirely driven by UK MNE groups.

7.2. Industry Patterns of Profit Shifting in the UK in 2017

In order to gain further insights into the positive difference between actual and counterfactual profits for the UK in 2017 we report in Table 6 below a breakdown, by 2-digit NACE rev 2 industries, based on the main activity of the parent company (GUO50C global ultimate owner of a group)r.[13] More specifically, Table 6 provides, for each 2-digit NACE rev 2 code, the number of MNE groups operating in the UK, the number of UK-owned MNE groups operating in the UK, the number of affiliates in the UK, actual profits, counterfactual profits and their difference. The last row of the Table further provides columns totals.[14]

From a quantitative point of view, Table 6 indicates that the most important contributors to the positive difference between actual and counterfactual profits for the UK in 2017 are:

[13] We assign the industry code 0 to those cases where there is no information on the industry affiliation of the parent company. Although sizeable in terms of number of MNE groups, number of affiliates and profits, industry 0 contributes very little to the aggregate difference between actual and counterfactual profits for the UK in 2017.

[14] We also report in Table A7 in the Appendix the aggregate value of sales by 2-digit NACE rev 2 industries (again based on the main activity of the parent company) of companies that are based in the UK and belong to MNE groups operating in the UK.

- “Extraction of crude petroleum and natural gas” with 7.744 billion GBP
- “Mining of metal ores” with 6.842 billion GBP
- “Telecommunications” with 6.364 billion GBP
- “Manufacture of basic pharmaceutical products and pharmaceutical preparations” with 6.188 billion GBP
- “Manufacture of coke and refined petroleum products” with 5.883 billion GBP

At the same time, some industries are characterized by large negative differences like “Financial service activities” (a negative 8.775 billion GBP), “Manufacture of basic metals” (a negative 3.681 billion GBP) and “Manufacture of machinery and equipment n.e.c.” (a negative 2.181 billion GBP). Concerning the interpretation of the large negative profit difference for “Financial service activities”, it is important to highlight that this industry does bring, thanks to the activity of various MNE groups, substantial benefits to the UK economy including, as indicated in Table 6, some 80 billion GBP of profits declared in the UK (the largest single industry figure). However, what the negative 8.775 billion GBP profit difference suggests, is that based on a revenue allocation profits declared in the UK would be higher for this particular industry.

Table A6 in the Appendix provides complementary information by focusing on the same industry breakdown of Table 6 while focusing on UK MNE groups. As can be appreciated from Table A6, the top 5 industries contributing to the overall positive difference between actual and counterfactual profits are the same 5 listed above, even though their relative ranking is somewhat different. At the same time, the large negative entry for “Financial service activities” is confirmed and of very similar magnitude with respect to Table 6.

Table 6: Profit-shifting in the UK by Industry in 2017 (Values are reported in billion GBP)

NACE rev2 code	Industry description	Number of Multinational Groups Operating in the UK by Industry	Number of UK-Owned Multinational Groups Operating in the UK by Industry	Number of affiliates in the UK by Industry	Actual Profits Before Tax	Counterfactual Profits Before Tax	Profits Difference
0	Not specified	1129	230	4113	14.480	14.170	0.310
1	Crop and animal production, hunting and related service activities	35	7	119	0.433	0.401	0.032
2	Forestry and logging	2	1	4	0.003	0.010	-0.008
3	Fishing and aquaculture	2	0	6	0.133	0.099	0.034
5	Mining of coal and lignite	7	2	34	2.190	1.413	0.778
6	Extraction of crude petroleum and natural gas	49	12	321	23.310	15.570	7.744
7	Mining of metal ores	32	10	126	21.540	14.700	6.842
8	Other mining and quarrying	19	5	40	0.159	0.857	-0.698
9	Mining support service activities	79	17	448	-1.044	-1.203	0.159
10	Manufacture of food products	137	19	852	9.977	7.789	2.188
11	Manufacture of beverages	47	9	291	16.480	12.940	3.541
12	Manufacture of tobacco products	6	2	115	28.730	26.750	1.979
13	Manufacture of textiles	30	8	67	0.027	0.122	-0.095
14	Manufacture of wearing apparel	49	8	142	1.445	1.619	-0.175
15	Manufacture of leather and related products	17	1	34	-0.034	0.149	-0.183
16	Manufacture of wood and of products of wood and cork, except furniture	15	3	46	0.220	0.191	0.030
17	Manufacture of paper and paper products	54	7	258	3.169	2.667	0.503
18	Printing and reproduction of recorded media	26	2	181	-1.353	-0.788	-0.565
19	Manufacture of coke and refined petroleum products	31	2	245	19.360	13.480	5.883

20	Manufacture of chemicals and chemical products	203	27	939	19.940	16.900	3.040
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	158	19	598	36.110	29.920	6.188
22	Manufacture of rubber and plastic products	75	11	202	0.495	0.609	-0.115
23	Manufacture of other non-metallic mineral products	55	7	314	1.043	1.488	-0.444
24	Manufacture of basic metals	111	16	243	-6.240	-2.559	-3.681
25	Manufacture of fabricated metal products, except machinery and equipment	111	22	438	0.911	1.923	-1.012
26	Manufacture of computer, electronic and optical products	431	41	1493	14.360	14.370	-0.016
27	Manufacture of electrical equipment	104	17	284	2.444	2.294	0.151
28	Manufacture of machinery and equipment n.e.c.	301	25	1174	9.684	11.870	-2.181
29	Manufacture of motor vehicles, trailers and semi-trailers	112	10	477	15.030	13.080	1.956
30	Manufacture of other transport equipment	52	7	398	3.873	3.566	0.307
31	Manufacture of furniture	22	3	70	0.943	0.759	0.184
32	Other manufacturing	139	32	267	0.623	0.784	-0.162
33	Repair and installation of machinery and equipment	10	4	52	0.036	0.033	0.003
35	Electricity, gas, steam and air conditioning supply	55	9	697	25.980	26.780	-0.796
36	Water collection, treatment and supply	7	1	121	0.739	0.847	-0.108
37	Sewerage	1	0	3	-0.092	-0.034	-0.057
38	Waste collection, treatment and disposal activities; materials recovery	6	3	51	-0.068	-0.034	-0.033
39	Remediation activities and other waste management services	3	3	20	-0.066	-0.034	-0.031
41	Construction of buildings	55	17	379	0.534	0.714	-0.180
42	Civil engineering	27	4	291	-0.425	0.200	-0.625
43	Specialised construction activities	21	7	37	0.065	0.061	0.004
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	33	9	190	1.130	1.350	-0.220
46	Wholesale trade, except of motor vehicles and motorcycles	342	99	1249	5.648	5.606	0.041
47	Retail trade, except of motor vehicles and motorcycles	125	29	675	13.610	11.870	1.736

49	Land transport and transport via pipelines	39	14	305	1.414	2.361	-0.947
50	Water transport	56	8	250	0.010	0.134	-0.124
51	Air transport	30	6	104	1.177	0.876	0.301
52	Warehousing and support activities for transportation	54	13	253	1.573	1.513	0.060
53	Postal and courier activities	7	0	74	0.728	0.614	0.114
55	Accommodation	37	12	248	2.227	2.121	0.105
56	Food and beverage service activities	22	8	135	6.915	4.113	2.802
58	Publishing activities	214	42	712	5.947	5.807	0.140
59	Motion picture, video and television programme production, sound recording etc	20	8	204	1.350	0.743	0.608
60	Programming and broadcasting activities	31	5	402	24.480	21.110	3.372
61	Telecommunications	105	24	643	-1.253	-7.616	6.364
62	Computer programming, consultancy and related activities	311	56	868	6.833	8.111	-1.278
63	Information service activities	41	12	145	1.506	1.125	0.381
64	Financial service activities, except insurance and pension funding	1163	142	5372	80.380	89.160	-8.775
65	Insurance, reinsurance and pension funding, except compulsory social security	108	15	1501	24.240	24.770	-0.531
66	Activities auxiliary to financial services and insurance activities	197	28	1086	16.990	15.720	1.278
68	Real estate activities	162	35	1517	5.093	5.590	-0.498
69	Legal and accounting activities	51	20	210	0.592	0.482	0.110
70	Activities of head offices; management consultancy activities	594	115	2409	5.907	5.610	0.297
71	Architectural and engineering activities; technical testing and analysis	94	24	402	1.035	1.036	-0.001
72	Scientific research and development	37	12	122	1.581	1.156	0.425
73	Advertising and market research	40	12	606	-1.619	-0.621	-0.998
74	Other professional, scientific and technical activities	110	35	566	6.952	4.440	2.511
75	Veterinary activities	5	4	7	-0.007	-0.010	0.003
77	Rental and leasing activities	47	11	177	0.943	0.996	-0.053

78	Employment activities	51	25	281	0.520	0.742	-0.222
79	Travel agency, tour operator and other reservation service and related activities	47	15	287	1.960	0.616	1.344
80	Security and investigation activities	13	4	105	1.319	1.117	0.202
81	Services to buildings and landscape activities	11	4	261	3.213	2.597	0.616
82	Office administrative, office support and other business support activities	276	92	1002	6.694	6.313	0.381
84	Public administration and defence; compulsory social security	5		46	2.461	2.414	0.047
85	Education	21	6	47	0.010	0.010	0.000
86	Human health activities	29	6	242	0.043	-0.047	0.090
87	Residential care activities	2	2	2	0.014	0.013	0.000
88	Social work activities without accommodation	15	1	64	0.074	0.085	-0.011
90	Creative, arts and entertainment activities	3	2	1	0.001	0.001	0.001
92	Gambling and betting activities	8	2	26	1.043	0.968	0.075
93	Sports activities and amusement and recreation activities	32	10	137	0.380	0.226	0.155
94	Activities of membership organisations	33	8	167	0.176	0.260	-0.084
96	Private households for own use	30	15	266	0.343	0.288	0.055
98	Undifferentiated goods- and services-	1	1	1	0.000	0.000	0.000
	TOTAL	8477	1621	39357	498.778	458.239	40.562

7.3. Crown Dependencies, Branches, Special Purpose Entities and Family Trusts

In the ORBIS data, firms based in the Crown Dependencies of Guernsey, the Isle of Man and Jersey are considered UK firms and so allocated a BvD ID code starting with "GB". However, in National Statistics analyses Crown Dependencies are typically treated as a separate entity and not as part of the UK. Fortunately, it is possible to single out Crown Dependency businesses in the ORBIS data thanks to the initial four letters of their BvD ID code that, for such businesses, should be "GBGG", or "GBIM" or "GBJE".

At the same time, the ORBIS data is also `contaminated' by branches. More specifically, a branch is not a legal entity like a subsidiary company. For this reason, it is not necessary to file a separate account. For instance, there is no requirement for a branch of an overseas limited company in the UK to file its accounts separately from its overseas parent entity. Thus, many overseas firms will have to file their accounts in the UK for the whole of their business, including that of their UK branches, so creating issues for our apportionment procedure. However, as in the case of Crown Dependency businesses, it is possible to single out branches operating in the UK in the ORBIS data thanks to the initial four letters of their BvD ID code that, for such entities, should be "GBFC", or "GBSF" or "GBNF". Furthermore, the vast majority of branches (both UK-based branches of non-UK companies as well as foreign-based branches of UK companies) should already be excluded from our analysis because we focus on entities reporting non-consolidated accounts.

In order to gauge the importance of branches and Crown Dependency businesses in generating our key result of a positive 41 billion GBP difference between actual and counterfactual profits for the UK in 2017 we proceed as follows. First, we assign branches operating in the UK and Crown Dependency businesses to a new `fictitious' country we denote with the code "GX". Second, we apply our standard apportionment procedure while aggregating results at the country level. In doing so, we find that the UK still enjoys a positive 38 billion GBP difference between actual and counterfactual profits in 2017. In this light, branches and Crown Dependency businesses do not seem to be driving our key result.

Two other `problematic' cases are represented by Special Purpose Entities (SPE) and Family Trusts (FT). In particular, SPEs are firms belonging to MNE groups that, loosely speaking, report little employment and large sales. Therefore, any apportionment using either employment or sales could under-/over-estimate the allocation to these entities. SPE are not very common in countries like the US whereas the UK is among the list of countries where such entities are prevalent but not to the same extent as in offshore financial centres. Unfortunately, the information on employment available in ORBIS is not comprehensive enough to allow identifying SPE and so we cannot account for their specific role in our analysis. As for FT, the problem with these entities is that they are often the object of substantial profit shifting within the businesses controlled by a family group in order to save on taxes. However, as indicated above, the vast majority of MNE groups and their assets are in the hands of a corporate global ultimate owner rather than a family or an individual. At the same time, the goal of our analysis is not to reconstruct what the allocation of profits would be in the absence of tax minimizing incentives to shift profits but rather to reconstruct what the allocation of profits would be if profits were directly linked to sales (or

employment costs). Nonetheless, it is recognised that SPEs and FTs do have substantial cross-border flows.

8. Conclusions

In this paper we analyse the global distribution of profits declared by MNEs operating in the UK using the Orbis database. Our investigations cover the period 2007-2017 and focus on entities reporting non-consolidated accounts and belonging to corporate Global Ultimate Owners active worldwide.

Our analyses suggest that, compared to actual declared profits, profits distributed according to a simple apportionment rule based on revenues would look quite different. In particular, MNEs operating in the UK reported in 2017 41 billion GBP (representing about 1.91% of UK GDP) more than what they would have reported based on our apportionment rule. Therefore, if profits among MNEs' affiliates were distributed according to our apportionment rule, UK GDP (measured using the income approach) would have been lower by 41 billion GBP. In this light, the UK was in 2017 a net winner in terms of global MNEs' profit shifting. The situation was actually reversed back in 2007, with MNEs operating in the UK reporting less profits than those arising from our apportionment rule. A closer inspection of the whole period 2007-2017 reveals a smooth change with the UK moving from a loser to a winner position mainly through changes in declared profits of UK-owned MNEs. We subsequently extend the analysis by examining some industry-specific patterns while pointing to a number of limitations of our approach related to difficulties arising in dealing with Crown Dependencies, Branches, Special Purpose Entities and Family Trusts. At the same time, we should highlight that our results hinge on using revenue to apportion profits because, when using the cost of employees, we find somewhat different patterns.

We believe that our findings are important for two reasons. First, they have clear implications for UK GDP measurement and in particular for the contribution to UK GDP of MNEs groups. Second, they provide some insights into how MNEs groups' network of affiliates and operations seems to (based on our apportionment rule) be systematically advantaging/disadvantaging certain countries.

In terms of directions for further research, we believe it would be extremely valuable and interesting to study more systematically the comparability of MNEs data coming from company accounts like Orbis to data obtained from more standard national accounts sources. For example, in our analysis we have considered a 50% ownership threshold to both identify MNEs groups and keep track of their affiliates and investments. However, a lower threshold (like the 10% used to identify FDI in national accounts) could be meaningfully explored with the additional complication that the same company might now be within the sphere of influence of more than one MNEs group. However, we believe that despite the challenges and complications ahead, this could represent an important step forward into the direction of more reliable and comprehensive data on the activities of MNEs and their contribution to the economy.

References

Clausing, K. A. (2016). "The effect of profit shifting on the corporate tax base in the United States and beyond." Available at SSRN 2685442.

Dharmapala, D. (2014). "What do we know about base erosion and profit shifting? A review of the empirical literature." Fiscal Studies **35**(4): 421-448.

Dharmapala, D. and N. Riedel (2013). "Earnings shocks and tax-motivated income-shifting: Evidence from European multinationals." Journal of Public Economics **97**: 95-107.

Gresik, T. A. (2001). "The taxing task of taxing transnationals." Journal of Economic Literature **39**(3): 800-838.

Guvenen, F., et al. (2017). Offshore profit shifting and domestic productivity measurement, National Bureau of Economic Research.

Hines Jr, J. R. and E. M. Rice (1994). "Fiscal paradise: Foreign tax havens and American business." The Quarterly Journal of Economics **109**(1): 149-182.

Lipsey, R. E. (2010). "Measuring the location of production in a world of intangible productive assets, FDI, and intrafirm trade." Review of Income and Wealth **56**: S99-S110.

Maffini, G. and S. Mokkas (2011). "Profit shifting and measured productivity of multinational firms." Oxford Bulletin of Economics and Statistics **73**(1): 1-20.

Rassier, D. G. (2014). "Formulary measures for the US current account: accounting for transactions attributable to special purpose entities of multinational enterprises." Journal of Economic and Social Measurement **39**(4): 257-281.

Rassier, D. G. and J. Koncz-Bruner (2015). "A formulary approach for attributing measured production to foreign affiliates of US parents." Measuring Globalization: Better Trade Statistics for Better Policy, ed. by SN Houseman, and MJ Mandel: 229-262.

Appendix

List of files and variables Orbis Gen

Table A1: List of countries covered in the analysis

Country_code	Country_name
AE	United Arab Emirates
AF	Afghanistan
AG	Antigua and Barbuda
AI	Anguilla
AL	Albania
AM	Armenia
AO	Angola
AR	Argentina
AT	Austria
AU	Australia
AW	Aruba
AZ	Azerbaijan
BA	Bosnia and Herzegovina
BB	Barbados
BD	Bangladesh
BE	Belgium
BF	Burkina Faso
BG	Bulgaria
BH	Bahrain
BI	Burundi
BJ	Benin
BM	Bermuda
BN	Brunei Darussalam
BO	Bolivia, Plurinational State of
BR	Brazil
BS	Bahamas
BT	Bhutan
BV	Bouvet Island
BW	Botswana
BY	Belarus
BZ	Belize
CA	Canada
CD	Congo, the Democratic Republic of the
CF	Central African Republic
CG	Congo

CH	Switzerland
CI	Côte d'Ivoire
CL	Chile
CM	Cameroon
CN	China
CO	Colombia
CR	Costa Rica
CU	Cuba
CV	Cape Verde
CW	Curaçao
CY	Cyprus
CZ	Czech Republic
DE	Germany
DJ	Djibouti
DK	Denmark
DM	Dominica
DO	Dominican Republic
DZ	Algeria
EC	Ecuador
EE	Estonia
EG	Egypt
ER	Eritrea
ES	Spain
ET	Ethiopia
FI	Finland
FJ	Fiji
FR	France
GA	Gabon
GB	United Kingdom
GD	Grenada
GE	Georgia
GH	Ghana
GI	Gibraltar
GM	Gambia
GN	Guinea
GQ	Equatorial Guinea
GR	Greece
GT	Guatemala
GW	Guinea-Bissau
GY	Guyana
HK	Hong Kong
HN	Honduras
HR	Croatia
HU	Hungary
ID	Indonesia
IE	Ireland

II	International Institutions
IL	Israel
IN	India
IQ	Iraq
IR	Iran, Islamic Republic of
IS	Iceland
IT	Italy
JM	Jamaica
JO	Jordan
JP	Japan
KE	Kenya
KG	Kyrgyzstan
KH	Cambodia
KM	Comoros
KN	Saint Kitts and Nevis
KR	Korea, Republic of
KV	Kosovo
KW	Kuwait
KY	Cayman Islands
KZ	Kazakhstan
LA	Lao People's Democratic Republic
LB	Lebanon
LC	Saint Lucia
LI	Liechtenstein
LK	Sri Lanka
LR	Liberia
LS	Lesotho
LT	Lithuania
LU	Luxembourg
LV	Latvia
LY	Libya
MA	Morocco
MC	Monaco
MD	Moldova, Republic of
ME	Montenegro
MG	Madagascar
MH	Marshall Islands
MK	Macedonia, the Former Yugoslav Republic of
ML	Mali
MM	Myanmar
MN	Mongolia
MR	Mauritania
MT	Malta
MU	Mauritius
MW	Malawi
MX	Mexico

MY	Malaysia
MZ	Mozambique
NA	Namibia
NG	Nigeria
NI	Nicaragua
NL	Netherlands
NO	Norway
NP	Nepal
NZ	New Zealand
OM	Oman
PA	Panama
PE	Peru
PG	Papua New Guinea
PH	Philippines
PK	Pakistan
PL	Poland
PS	Palestine, State of
PT	Portugal
PY	Paraguay
QA	Qatar
RO	Romania
RS	Serbia
RU	Russian Federation
RW	Rwanda
SA	Saudi Arabia
SC	Seychelles
SD	Sudan
SE	Sweden
SG	Singapore
SI	Slovenia
SK	Slovakia
SL	Sierra Leone
SN	Senegal
SO	Somalia
SS	South Sudan
ST	Sao Tome and Principe
SV	El Salvador
SY	Syrian Arab Republic
SZ	Swaziland
TD	Chad
TG	Togo
TH	Thailand
TM	Turkmenistan
TN	Tunisia
TR	Turkey
TT	Trinidad and Tobago

TW	Taiwan, Province of China
TZ	Tanzania, United Republic of
UA	Ukraine
UG	Uganda
US	United States
UY	Uruguay
UZ	Uzbekistan
VC	Saint Vincent and the Grenadines
VE	Venezuela, Bolivarian Republic of
VG	Virgin Islands, British
VN	Vietnam
WS	Samoa
YE	Yemen
ZA	South Africa
ZM	Zambia
ZW	Zimbabwe

Table A2: Actual and counterfactual profits of MNE groups operating in the UK in 2017 (using revenue to operate the apportionment). Values are reported in billion GBP

year	country	actual profits	counterfactual profits	Difference
2017	AE	0.000	0.000	0.000
2017	AI	0.000	0.000	0.000
2017	AL	-0.017	0.012	-0.030
2017	AO	0.000	0.000	0.000
2017	AR	0.108	-0.067	0.175
2017	AT	12.450	11.310	1.135
2017	AU	97.080	114.700	-17.650
2017	AW	0.000	0.000	0.000
2017	AZ	0.000	0.000	0.000
2017	BA	0.050	0.131	-0.081
2017	BB	0.000	0.000	0.000
2017	BE	21.680	42.820	-21.130
2017	BF	0.000	0.000	0.000
2017	BG	1.430	2.002	-0.572
2017	BH	0.000	0.000	0.000
2017	BI	0.000	0.000	0.000
2017	BJ	0.000	0.000	0.000
2017	BM	0.000	0.000	0.000
2017	BN	0.000	0.000	0.000
2017	BR	7.568	7.344	0.223
2017	BS	0.000	0.000	0.000

2017	BW	0.000	0.000	0.000
2017	BY	0.000	0.000	0.000
2017	BZ	0.000	0.000	0.000
2017	CA	0.000	0.000	0.000
2017	CD	0.000	0.000	0.000
2017	CF	0.000	0.000	0.000
2017	CG	0.000	0.000	0.000
2017	CH	0.140	0.057	0.084
2017	CI	0.008	0.004	0.003
2017	CL	0.131	0.133	-0.002
2017	CN	190.800	175.500	15.320
2017	CO	3.334	8.046	-4.712
2017	CU	0.000	0.000	0.000
2017	CW	0.000	0.000	0.000
2017	CY	-0.618	-0.687	0.069
2017	CZ	10.600	12.690	-2.089
2017	DE	25.650	26.930	-1.276
2017	DJ	0.000	0.000	0.000
2017	DK	14.770	30.520	-15.750
2017	DM	0.000	0.000	0.000
2017	DZ	0.000	0.000	0.000
2017	EE	0.366	0.893	-0.527
2017	EG	1.077	1.025	0.052
2017	ER	0.000	0.000	0.000
2017	ES	20.850	33.290	-12.440
2017	ET	0.000	0.000	0.000
2017	FI	9.810	13.160	-3.346
2017	FR	118.000	101.900	16.090
2017	GA	0.256	0.117	0.139
2017	GB	498.800	458.200	40.560
2017	GI	0.000	0.000	0.000
2017	GM	0.000	0.000	0.000
2017	GN	0.000	0.000	0.000
2017	GQ	0.000	0.000	0.000
2017	GR	0.737	0.922	-0.185
2017	HK	0.000	0.000	0.000
2017	HR	0.521	0.768	-0.247
2017	HU	5.268	7.930	-2.662
2017	ID	0.000	0.000	0.000
2017	IE	60.750	56.190	4.561
2017	IL	0.000	0.000	0.000
2017	IN	4.368	6.175	-1.807
2017	IQ	0.000	0.000	0.000
2017	IR	1.753	1.752	0.000
2017	IS	0.395	0.640	-0.244
2017	IT	30.030	48.320	-18.290

2017	JM	0.000	0.000	0.000
2017	JO	0.000	0.000	0.000
2017	JP	47.950	45.520	2.426
2017	KE	0.000	0.000	0.000
2017	KM	0.000	0.000	0.000
2017	KN	0.000	0.000	0.000
2017	KR	6.295	9.198	-2.903
2017	KV	0.001	0.001	0.000
2017	KW	0.000	0.000	0.000
2017	KY	0.000	0.000	0.000
2017	KZ	3.143	2.612	0.531
2017	LB	0.000	0.000	0.000
2017	LI	0.000	0.000	0.000
2017	LK	-0.026	-0.045	0.018
2017	LR	0.000	0.000	0.000
2017	LS	0.000	0.000	0.000
2017	LT	0.363	0.400	-0.037
2017	LU	19.710	3.072	16.640
2017	LV	0.111	0.312	-0.200
2017	LY	0.000	0.000	0.000
2017	MA	0.036	-0.013	0.049
2017	MC	0.000	0.000	0.000
2017	MD	0.001	0.000	0.000
2017	ME	0.032	0.059	-0.027
2017	MG	0.000	0.000	0.000
2017	MH	0.000	0.000	0.000
2017	MK	0.139	0.218	-0.079
2017	ML	0.000	0.000	0.000
2017	MR	0.000	0.000	0.000
2017	MT	1.860	0.926	0.933
2017	MU	0.018	0.028	-0.010
2017	MW	0.021	-0.098	0.119
2017	MX	3.208	3.114	0.095
2017	MY	0.000	0.002	-0.002
2017	NA	0.000	0.000	0.000
2017	NG	0.000	0.000	0.000
2017	NL	90.660	49.450	41.210
2017	NO	44.320	30.710	13.610
2017	NZ	1.462	1.846	-0.384
2017	OM	0.000	0.000	0.000
2017	PA	0.000	0.000	0.000
2017	PE	0.047	-0.006	0.053
2017	PH	0.000	0.000	0.000
2017	PK	0.127	0.169	-0.042
2017	PL	7.628	13.320	-5.690
2017	PT	4.636	6.887	-2.251

2017	PY	0.000	0.000	0.000
2017	QA	0.000	0.000	0.000
2017	RO	2.972	6.387	-3.415
2017	RS	0.713	0.994	-0.281
2017	RU	30.920	34.690	-3.767
2017	RW	0.000	0.000	0.000
2017	SA	0.000	0.000	0.000
2017	SC	0.000	0.000	0.000
2017	SD	0.000	0.000	0.000
2017	SE	33.480	36.840	-3.355
2017	SG	44.700	69.550	-24.850
2017	SI	0.647	1.008	-0.361
2017	SK	2.637	4.096	-1.460
2017	SL	0.000	0.000	0.000
2017	SS	0.000	0.000	0.000
2017	ST	0.000	0.000	0.000
2017	SZ	0.000	0.000	0.000
2017	TD	0.000	0.000	0.000
2017	TG	0.000	0.000	0.000
2017	TH	0.008	0.003	0.005
2017	TN	-0.002	0.001	-0.002
2017	TR	3.850	4.653	-0.803
2017	TT	0.000	0.000	0.000
2017	TW	1.674	2.491	-0.817
2017	TZ	0.000	0.000	0.000
2017	UA	0.836	1.310	-0.473
2017	US	2.192	2.186	0.007
2017	UY	0.310	0.186	0.125
2017	VC	0.000	0.000	0.000
2017	VG	0.000	0.000	0.000
2017	VU	0.000	0.000	0.000
2017	WW	0.000	0.000	0.000
2017	YY	0.000	0.000	0.000
2017	ZA	0.000	0.000	0.000
2017	ZM	0.000	0.000	0.000
2017	ZW	0.000	-0.021	0.021

Table A3: Actual and counterfactual profits of MNE groups operating in the UK in 2017 (using the cost of employees to operate the apportionment). Values are reported in billion GBP

year	country	actual profits	counterfactual profits	Difference
2017	AE	0.000	0.000	0.000
2017	AI	0.000	0.000	0.000
2017	AL	-0.017	0.151	-0.169

2017	AO	0.000	0.000	0.000
2017	AR	0.108	0.196	-0.088
2017	AT	12.450	14.090	-1.639
2017	AU	97.080	117.000	-19.910
2017	AW	0.000	0.000	0.000
2017	AZ	0.000	0.000	0.000
2017	BA	0.050	0.108	-0.058
2017	BB	0.000	0.000	0.000
2017	BE	21.680	35.160	-13.480
2017	BF	0.000	0.000	0.000
2017	BG	1.430	2.028	-0.598
2017	BH	0.000	0.000	0.000
2017	BI	0.000	0.000	0.000
2017	BJ	0.000	0.000	0.000
2017	BM	0.000	0.000	0.000
2017	BN	0.000	0.000	0.000
2017	BR	7.568	-5.737	13.300
2017	BS	0.000	0.000	0.000
2017	BW	0.000	0.000	0.000
2017	BY	0.000	0.000	0.000
2017	BZ	0.000	0.000	0.000
2017	CA	0.000	0.000	0.000
2017	CD	0.000	0.000	0.000
2017	CF	0.000	0.000	0.000
2017	CG	0.000	0.000	0.000
2017	CH	0.140	0.120	0.020
2017	CI	0.008	0.004	0.004
2017	CL	0.131	0.051	0.080
2017	CN	190.800	169.000	21.760
2017	CO	3.334	13.010	-9.677
2017	CU	0.000	0.000	0.000
2017	CW	0.000	0.000	0.000
2017	CY	-0.618	-0.444	-0.174
2017	CZ	10.600	10.810	-0.209
2017	DE	25.650	29.930	-4.282
2017	DJ	0.000	0.000	0.000
2017	DK	14.770	20.580	-5.812
2017	DM	0.000	0.000	0.000
2017	DZ	0.000	0.000	0.000
2017	EE	0.366	0.854	-0.488
2017	EG	1.077	0.961	0.116
2017	ER	0.000	0.000	0.000
2017	ES	20.850	32.160	-11.310
2017	ET	0.000	0.000	0.000
2017	FI	9.810	10.320	-0.509
2017	FR	118.000	138.900	-20.890

2017	GA	0.256	0.053	0.203
2017	GB	498.800	504.500	-5.676
2017	GI	0.000	0.000	0.000
2017	GM	0.000	0.000	0.000
2017	GN	0.000	0.000	0.000
2017	GQ	0.000	0.000	0.000
2017	GR	0.737	2.239	-1.503
2017	HK	0.000	0.000	0.000
2017	HR	0.521	0.896	-0.375
2017	HU	5.268	6.596	-1.328
2017	ID	0.000	0.000	0.000
2017	IE	60.750	31.140	29.610
2017	IL	0.000	0.000	0.000
2017	IN	4.368	11.870	-7.506
2017	IQ	0.000	0.000	0.000
2017	IR	1.753	1.646	0.106
2017	IS	0.395	0.790	-0.394
2017	IT	30.030	49.820	-19.790
2017	JM	0.000	0.000	0.000
2017	JO	0.000	0.000	0.000
2017	JP	47.950	32.360	15.590
2017	KE	0.000	0.000	0.000
2017	KM	0.000	0.000	0.000
2017	KN	0.000	0.000	0.000
2017	KR	6.295	6.981	-0.686
2017	KV	0.001	0.021	-0.020
2017	KW	0.000	0.000	0.000
2017	KY	0.000	0.000	0.000
2017	KZ	3.143	2.819	0.324
2017	LB	0.000	0.000	0.000
2017	LI	0.000	0.000	0.000
2017	LK	-0.026	-0.056	0.030
2017	LR	0.000	0.000	0.000
2017	LS	0.000	0.000	0.000
2017	LT	0.363	1.722	-1.359
2017	LU	19.710	-0.799	20.510
2017	LV	0.111	1.550	-1.438
2017	LY	0.000	0.000	0.000
2017	MA	0.036	-0.044	0.080
2017	MC	0.000	0.000	0.000
2017	MD	0.001	0.010	-0.009
2017	ME	0.032	0.067	-0.035
2017	MG	0.000	0.000	0.000
2017	MH	0.000	0.000	0.000
2017	MK	0.139	0.133	0.005
2017	ML	0.000	0.000	0.000

2017	MR	0.000	0.000	0.000
2017	MT	1.860	1.262	0.597
2017	MU	0.018	0.082	-0.064
2017	MW	0.021	-0.222	0.243
2017	MX	3.208	2.098	1.110
2017	MY	0.000	0.011	-0.011
2017	NA	0.000	0.000	0.000
2017	NG	0.000	0.000	0.000
2017	NL	90.660	50.410	40.250
2017	NO	44.320	34.650	9.672
2017	NZ	1.462	1.746	-0.284
2017	OM	0.000	0.000	0.000
2017	PA	0.000	0.000	0.000
2017	PE	0.047	-0.006	0.053
2017	PH	0.000	0.000	0.000
2017	PK	0.127	0.127	0.000
2017	PL	7.628	9.749	-2.122
2017	PT	4.636	6.326	-1.690
2017	PY	0.000	0.000	0.000
2017	QA	0.000	0.000	0.000
2017	RO	2.972	5.591	-2.618
2017	RS	0.713	1.236	-0.523
2017	RU	30.920	38.740	-7.820
2017	RW	0.000	0.000	0.000
2017	SA	0.000	0.000	0.000
2017	SC	0.000	0.000	0.000
2017	SD	0.000	0.000	0.000
2017	SE	33.480	33.890	-0.411
2017	SG	44.700	52.400	-7.698
2017	SI	0.647	0.843	-0.196
2017	SK	2.637	4.048	-1.412
2017	SL	0.000	0.000	0.000
2017	SS	0.000	0.000	0.000
2017	ST	0.000	0.000	0.000
2017	SZ	0.000	0.000	0.000
2017	TD	0.000	0.000	0.000
2017	TG	0.000	0.000	0.000
2017	TH	0.008	0.029	-0.021
2017	TN	-0.002	0.000	-0.002
2017	TR	3.850	2.529	1.321
2017	TT	0.000	0.000	0.000
2017	TW	1.674	2.473	-0.798
2017	TZ	0.000	0.000	0.000
2017	UA	0.836	1.114	-0.278
2017	US	2.192	1.722	0.470
2017	UY	0.310	0.456	-0.146

2017	VC	0.000	0.000	0.000
2017	VG	0.000	0.000	0.000
2017	VU	0.000	0.000	0.000
2017	WW	0.000	0.000	0.000
2017	YY	0.000	0.000	0.000
2017	ZA	0.000	0.000	0.000
2017	ZM	0.000	0.000	0.000
2017	ZW	0.000	-0.023	0.023

Table A4: Actual and counterfactual profits of MNE groups operating in the UK in 2017 and where the parent files a consolidated account (using the cost of employees to operate the apportionment). Values are reported in billion GBP

year	country	actual profits	counterfactual profits	Difference
2017	AE	0.000	0.000	0.000
2017	AI	0.000	0.000	0.000
2017	AL	-0.024	0.017	-0.041
2017	AR	0.087	-0.033	0.120
2017	AT	9.791	9.440	0.350
2017	AU	27.680	37.770	-10.100
2017	BA	0.024	0.139	-0.115
2017	BE	15.540	37.500	-21.960
2017	BF	0.000	0.000	0.000
2017	BG	0.917	1.990	-1.073
2017	BH	0.000	0.000	0.000
2017	BI	0.000	0.000	0.000
2017	BJ	0.000	0.000	0.000
2017	BM	0.000	0.000	0.000
2017	BR	5.484	5.730	-0.245
2017	BW	0.000	0.000	0.000
2017	CA	0.000	0.000	0.000
2017	CD	0.000	0.000	0.000
2017	CF	0.000	0.000	0.000
2017	CG	0.000	0.000	0.000
2017	CH	0.134	0.055	0.079
2017	CI	0.008	0.004	0.003
2017	CL	0.131	0.125	0.005
2017	CN	73.350	68.190	5.162
2017	CO	3.003	6.511	-3.508
2017	CU	0.000	0.000	0.000
2017	CW	0.000	0.000	0.000
2017	CY	-0.034	0.001	-0.035
2017	CZ	6.967	9.975	-3.008
2017	DE	19.390	22.810	-3.417
2017	DJ	0.000	0.000	0.000

2017	DK	10.800	20.850	-10.050
2017	EE	0.304	0.455	-0.150
2017	EG	0.000	0.000	0.000
2017	ER	0.000	0.000	0.000
2017	ES	14.030	25.970	-11.940
2017	ET	0.000	0.000	0.000
2017	FI	9.161	12.590	-3.427
2017	FR	91.990	85.330	6.657
2017	GA	0.256	0.117	0.139
2017	GB	411.400	342.700	68.770
2017	GI	0.000	0.000	0.000
2017	GM	0.000	0.000	0.000
2017	GN	0.000	0.000	0.000
2017	GQ	0.000	0.000	0.000
2017	GR	0.701	0.780	-0.079
2017	HK	0.000	0.000	0.000
2017	HR	0.387	0.744	-0.357
2017	HU	5.528	7.471	-1.943
2017	ID	0.000	0.000	0.000
2017	IE	54.310	46.950	7.359
2017	IL	0.000	0.000	0.000
2017	IN	2.714	6.226	-3.512
2017	IQ	0.000	0.000	0.000
2017	IS	0.101	0.484	-0.383
2017	IT	18.500	39.340	-20.840
2017	JM	0.000	0.000	0.000
2017	JO	0.000	0.000	0.000
2017	JP	27.800	30.870	-3.074
2017	KE	0.000	0.000	0.000
2017	KM	0.000	0.000	0.000
2017	KR	6.169	8.450	-2.280
2017	KV	0.001	0.001	0.000
2017	KW	0.000	0.000	0.000
2017	KY	0.000	0.000	0.000
2017	KZ	1.593	1.356	0.237
2017	LB	0.000	0.000	0.000
2017	LI	0.000	0.000	0.000
2017	LK	0.003	0.004	-0.001
2017	LR	0.000	0.000	0.000
2017	LS	0.000	0.000	0.000
2017	LT	0.275	0.305	-0.029
2017	LU	11.240	0.845	10.390
2017	LV	0.139	0.283	-0.144
2017	LY	0.000	0.000	0.000
2017	MA	0.036	-0.035	0.071
2017	MC	0.000	0.000	0.000

2017	MD	0.000	0.000	0.000
2017	ME	0.027	0.059	-0.032
2017	MG	0.000	0.000	0.000
2017	MH	0.000	0.000	0.000
2017	MK	0.135	0.246	-0.111
2017	ML	0.000	0.000	0.000
2017	MR	0.000	0.000	0.000
2017	MT	1.358	0.715	0.643
2017	MU	0.019	0.025	-0.006
2017	MW	0.000	0.000	0.000
2017	MX	1.513	0.588	0.926
2017	MY	0.000	0.000	0.000
2017	NA	0.000	0.000	0.000
2017	NG	0.000	0.000	0.000
2017	NL	78.440	42.500	35.940
2017	NO	37.020	27.020	9.997
2017	NZ	0.794	1.362	-0.568
2017	OM	0.000	0.000	0.000
2017	PA	0.000	0.000	0.000
2017	PE	0.011	0.007	0.004
2017	PH	0.000	0.000	0.000
2017	PK	0.127	0.219	-0.093
2017	PL	6.127	12.360	-6.234
2017	PT	3.464	5.201	-1.737
2017	PY	0.000	0.000	0.000
2017	QA	0.000	0.000	0.000
2017	RO	2.546	6.596	-4.049
2017	RS	0.600	0.946	-0.345
2017	RU	21.190	24.520	-3.326
2017	RW	0.000	0.000	0.000
2017	SA	0.000	0.000	0.000
2017	SC	0.000	0.000	0.000
2017	SD	0.000	0.000	0.000
2017	SE	27.570	27.810	-0.233
2017	SG	36.940	62.160	-25.220
2017	SI	0.546	0.897	-0.351
2017	SK	2.135	3.519	-1.384
2017	SL	0.000	0.000	0.000
2017	SS	0.000	0.000	0.000
2017	ST	0.000	0.000	0.000
2017	SZ	0.000	0.000	0.000
2017	TD	0.000	0.000	0.000
2017	TG	0.000	0.000	0.000
2017	TH	0.006	0.003	0.003
2017	TN	-0.002	0.001	-0.002
2017	TR	1.096	1.727	-0.631

2017	TT	0.000	0.000	0.000
2017	TW	0.761	1.105	-0.343
2017	TZ	0.000	0.000	0.000
2017	UA	0.437	0.905	-0.468
2017	US	0.000	0.000	0.000
2017	UY	0.176	0.218	-0.042
2017	VG	0.000	0.000	0.000
2017	ZA	0.000	0.000	0.000
2017	ZM	0.000	0.000	0.000
2017	ZW	0.000	-0.023	0.023

Table A5: Actual and counterfactual profits of UK-owned MNE groups in 2017 (using revenue to operate the apportionment). Values are reported in billion GBP

Year	country	actual profits	counterfactual profits	Difference
2017	AE	0.000	0.000	0.000
2017	AL	-0.002	-0.007	0.005
2017	AR	0.003	0.005	-0.002
2017	AT	0.565	0.974	-0.409
2017	AU	6.865	12.270	-5.410
2017	BA	-0.001	0.039	-0.041
2017	BE	0.583	6.664	-6.082
2017	BF	0.000	0.000	0.000
2017	BG	0.084	0.243	-0.159
2017	BI	0.000	0.000	0.000
2017	BJ	0.000	0.000	0.000
2017	BM	0.000	0.000	0.000
2017	BR	0.314	0.537	-0.223
2017	BW	0.000	0.000	0.000
2017	CA	0.000	0.000	0.000
2017	CD	0.000	0.000	0.000
2017	CG	0.000	0.000	0.000
2017	CH	0.000	0.000	0.000
2017	CI	0.000	0.000	0.000
2017	CL	0.000	0.000	0.000
2017	CN	1.726	2.515	-0.789
2017	CO	0.124	0.420	-0.296
2017	CU	0.000	0.000	0.000
2017	CY	0.001	0.006	-0.005
2017	CZ	0.228	1.023	-0.795
2017	DE	-1.341	1.146	-2.488
2017	DJ	0.000	0.000	0.000
2017	DK	1.328	4.549	-3.221
2017	EE	0.026	0.099	-0.074

2017	EG	0.000	0.000	0.000
2017	ER	0.000	0.000	0.000
2017	ES	3.424	3.948	-0.524
2017	ET	0.000	0.000	0.000
2017	FI	0.095	0.338	-0.242
2017	FR	3.946	6.446	-2.500
2017	GA	0.000	0.000	0.000
2017	GB	274.600	231.000	43.540
2017	GM	0.000	0.000	0.000
2017	GN	0.000	0.000	0.000
2017	GR	0.037	0.045	-0.008
2017	HK	0.000	0.000	0.000
2017	HR	-0.011	0.091	-0.102
2017	HU	0.617	1.405	-0.788
2017	IE	8.560	9.826	-1.265
2017	IL	0.000	0.000	0.000
2017	IN	-0.358	0.362	-0.720
2017	IS	-0.002	0.221	-0.223
2017	IT	2.163	3.762	-1.598
2017	JO	0.000	0.000	0.000
2017	JP	0.068	0.298	-0.230
2017	KE	0.000	0.000	0.000
2017	KR	0.606	0.893	-0.288
2017	KV	0.000	0.000	0.000
2017	KW	0.000	0.000	0.000
2017	KZ	0.279	0.290	-0.011
2017	LI	0.000	0.000	0.000
2017	LK	0.000	0.000	0.000
2017	LR	0.000	0.000	0.000
2017	LS	0.000	0.000	0.000
2017	LT	0.015	0.033	-0.018
2017	LU	1.355	-0.153	1.508
2017	LV	0.015	0.026	-0.011
2017	MA	0.008	-0.038	0.046
2017	MC	0.000	0.000	0.000
2017	MD	0.000	0.000	0.000
2017	ME	0.000	0.000	0.000
2017	MG	0.000	0.000	0.000
2017	MK	0.085	0.150	-0.064
2017	ML	0.000	0.000	0.000
2017	MT	0.279	0.112	0.168
2017	MU	0.000	0.001	0.000
2017	MW	0.000	0.000	0.000
2017	MX	0.150	1.649	-1.500
2017	MY	0.000	0.000	0.000
2017	NA	0.000	0.000	0.000

2017	NG	0.000	0.000	0.000
2017	NL	18.620	13.910	4.715
2017	NO	2.114	1.782	0.332
2017	NZ	0.077	0.249	-0.173
2017	OM	0.000	0.000	0.000
2017	PE	0.000	0.000	0.000
2017	PK	0.123	0.157	-0.034
2017	PL	0.672	2.990	-2.318
2017	PT	0.215	1.605	-1.391
2017	PY	0.000	0.000	0.000
2017	QA	0.000	0.000	0.000
2017	RO	0.166	1.015	-0.849
2017	RS	0.001	0.076	-0.075
2017	RU	0.999	2.211	-1.212
2017	RW	0.000	0.000	0.000
2017	SA	0.000	0.000	0.000
2017	SC	0.000	0.000	0.000
2017	SD	0.000	0.000	0.000
2017	SE	3.375	3.997	-0.622
2017	SG	7.238	19.690	-12.450
2017	SI	0.038	0.147	-0.108
2017	SK	0.135	0.461	-0.326
2017	SS	0.000	0.000	0.000
2017	SZ	0.000	0.000	0.000
2017	TD	0.000	0.000	0.000
2017	TG	0.000	0.000	0.000
2017	TR	0.037	0.215	-0.178
2017	TW	0.230	0.600	-0.370
2017	TZ	0.000	0.000	0.000
2017	UA	-0.004	0.109	-0.113
2017	US	0.000	0.000	0.000
2017	UY	0.005	0.009	-0.003
2017	ZA	0.000	0.000	0.000
2017	ZM	0.000	0.000	0.000
2017	ZW	0.000	0.000	0.000

Table A6: Profit-shifting in the UK by Industry in 2017; only UK-Owned Multinationals (Values are reported in billion GBP)

NACE rev2 code	Industry description	Number of UK-Owned Multinational Groups Operating in the UK by Industry	Number of affiliates in the UK by Industry	Actual Profits Before Tax	Counterfactual Profits Before Tax	Profits Difference
0	Not specified	230	1600	2.857	3.021	-0.164
1	Crop and animal production, hunting and related service activities	7	41	0.102	0.097	0.005
2	Forestry and logging	1	1	0.002	0.002	0.000
5	Mining of coal and lignite	2	11	1.817	1.156	0.661
6	Extraction of crude petroleum and natural gas	12	179	20.350	12.950	7.393
7	Mining of metal ores	10	82	21.280	14.580	6.700
8	Other mining and quarrying	5	13	0.089	0.692	-0.604
9	Mining support service activities	17	172	-2.769	-2.613	-0.156
10	Manufacture of food products	19	163	6.398	4.912	1.486
11	Manufacture of beverages	9	105	8.485	7.379	1.106
12	Manufacture of tobacco products	2	95	29.440	25.820	3.614
13	Manufacture of textiles	8	26	-0.005	0.011	-0.016
14	Manufacture of wearing apparel	8	70	2.020	1.769	0.251
15	Manufacture of leather and related products	1	0	0.000	0.000	0.000
16	Manufacture of wood and of products of wood and cork, except furniture	3	7	0.003	0.004	-0.001
17	Manufacture of paper and paper products	7	92	1.785	1.342	0.443
18	Printing and reproduction of recorded media	2	23	0.044	0.045	-0.001
19	Manufacture of coke and refined petroleum products	2	117	14.060	9.913	4.146
20	Manufacture of chemicals and chemical products	27	213	9.952	8.901	1.051
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	19	168	33.950	26.090	7.861

22	Manufacture of rubber and plastic products	11	49	0.161	0.149	0.011
23	Manufacture of other non-metallic mineral products	7	44	0.192	0.172	0.020
24	Manufacture of basic metals	16	14	0.129	0.072	0.057
25	Manufacture of fabricated metal products, except machinery and equipment	22	107	0.315	0.314	0.001
26	Manufacture of computer, electronic and optical products	41	240	5.632	4.332	1.300
27	Manufacture of electrical equipment	17	27	0.015	0.019	-0.004
28	Manufacture of machinery and equipment n.e.c.	25	159	0.951	0.926	0.025
29	Manufacture of motor vehicles, trailers and semi-trailers	10	82	6.472	4.187	2.285
30	Manufacture of other transport equipment	7	134	1.111	1.082	0.030
31	Manufacture of furniture	3	9	0.504	0.494	0.009
32	Other manufacturing	32	62	0.331	0.257	0.074
33	Repair and installation of machinery and equipment	4	39	0.013	0.017	-0.004
35	Electricity, gas, steam and air conditioning supply	9	291	17.920	17.610	0.315
36	Water collection, treatment and supply	1	34	0.520	0.508	0.012
38	Waste collection, treatment and disposal activities; materials recovery	3	43	-0.066	-0.033	-0.033
39	Remediation activities and other waste management services	3	20	-0.066	-0.034	-0.031
41	Construction of buildings	17	196	0.245	0.204	0.041
42	Civil engineering	4	77	0.245	0.242	0.004
43	Specialised construction activities	7	17	0.023	0.025	-0.002
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	9	98	0.794	0.736	0.058
46	Wholesale trade, except of motor vehicles and motorcycles	99	383	3.111	2.508	0.603
47	Retail trade, except of motor vehicles and motorcycles	29	265	3.652	3.681	-0.029
49	Land transport and transport via pipelines	14	178	1.335	1.139	0.196
50	Water transport	8	114	-0.189	-0.138	-0.051
51	Air transport	6	40	0.383	0.381	0.002
52	Warehousing and support activities for transportation	13	94	0.225	0.198	0.027
55	Accommodation	12	112	1.393	1.298	0.095
56	Food and beverage service activities	8	61	4.110	2.202	1.907

58	Publishing activities	42	253	2.320	1.734	0.586
59	Motion picture, video and television programme production, etc	8	58	0.254	0.176	0.078
60	Programming and broadcasting activities	5	222	24.440	20.880	3.558
61	Telecommunications	24	221	-7.425	-12.610	5.190
62	Computer programming, consultancy and related activities	56	227	2.575	2.705	-0.130
63	Information service activities	12	40	0.095	0.068	0.027
64	Financial service activities, except insurance and pension funding	142	1674	21.910	30.700	-8.783
65	Insurance, reinsurance and pension funding, except compulsory social security	15	590	10.250	8.671	1.576
66	Activities auxiliary to financial services and insurance activities	28	317	6.652	6.094	0.557
68	Real estate activities	35	1037	3.538	3.377	0.161
69	Legal and accounting activities	20	155	0.606	0.519	0.087
70	Activities of head offices; management consultancy activities	115	1091	1.522	1.346	0.176
71	Architectural and engineering activities; technical testing and analysis	24	129	0.393	0.189	0.204
72	Scientific research and development	12	45	0.106	0.052	0.053
73	Advertising and market research	12	308	-2.414	-1.295	-1.120
74	Other professional, scientific and technical activities	35	311	0.699	1.411	-0.712
75	Veterinary activities	4	6	-0.007	-0.010	0.003
77	Rental and leasing activities	11	70	0.825	0.827	-0.002
78	Employment activities	25	175	0.645	0.578	0.067
79	Travel agency, tour operator and other reservation service and related activities	15	155	0.927	0.756	0.171
80	Security and investigation activities	4	82	1.229	0.966	0.263
81	Services to buildings and landscape activities	4	245	3.054	2.460	0.594
82	Office administrative, office support and other business support activities	92	483	1.529	1.629	-0.100
85	Education	6	12	0.001	-0.001	0.002
86	Human health activities	6	16	-0.013	-0.001	-0.012
87	Residential care activities	2	2	0.014	0.013	0.000
88	Social work activities without accommodation	1	11	0.010	0.010	0.000

90	Creative, arts and entertainment activities	2	0	0.000	0.000	0.000
92	Gambling and betting activities	2	10	1.052	0.958	0.093
93	Sports activities and amusement and recreation activities	10	38	0.095	-0.121	0.215
94	Activities of membership organisations	8	24	0.043	0.055	-0.012
96	Other personal service activities	15	241	0.338	0.288	0.050
98	Private households for own use	1	1	0.000	0.000	0.000
	TOTAL	1621	14416	274.580	231.041	43.533

Table A7: Sales by Industry in 2017 (Values are reported in billion GBP)

NACE rev2 code	Industry description	Number of affiliates in the UK by Industry	Sales
0	Not specified	4113	186.960
1	Crop and animal production, hunting and related service activities	119	5.696
2	Forestry and logging	4	0.290
3	Fishing and aquaculture	6	0.757
5	Mining of coal and lignite	34	6.098
6	Extraction of crude petroleum and natural gas	321	150.072
7	Mining of metal ores	126	45.357
8	Other mining and quarrying	40	65.137
9	Mining support service activities	448	40.891
10	Manufacture of food products	852	93.571
11	Manufacture of beverages	291	59.805
12	Manufacture of tobacco products	115	112.083
13	Manufacture of textiles	67	2.271
14	Manufacture of wearing apparel	142	9.849
15	Manufacture of leather and related products	34	2.494

16	Manufacture of wood and of products of wood and cork, except furniture	46	1.887
17	Manufacture of paper and paper products	258	17.169
18	Printing and reproduction of recorded media	181	7.303
19	Manufacture of coke and refined petroleum products	245	178.556
20	Manufacture of chemicals and chemical products	939	99.573
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	598	111.333
22	Manufacture of rubber and plastic products	202	9.749
23	Manufacture of other non-metallic mineral products	314	64.082
24	Manufacture of basic metals	243	20.072
25	Manufacture of fabricated metal products, except machinery and equipment	438	25.574
26	Manufacture of computer, electronic and optical products	1493	118.585
27	Manufacture of electrical equipment	284	29.506
28	Manufacture of machinery and equipment n.e.c.	1174	96.800
29	Manufacture of motor vehicles, trailers and semi-trailers	477	157.809
30	Manufacture of other transport equipment	398	65.250
31	Manufacture of furniture	70	4.305
32	Other manufacturing	267	9.403
33	Repair and installation of machinery and equipment	52	0.592
35	Electricity, gas, steam and air conditioning supply	697	177.369
36	Water collection, treatment and supply	121	10.094
37	Sewerage	3	0.139
38	Waste collection, treatment and disposal activities; materials recovery	51	1.841
39	Remediation activities and other waste management services	20	0.606
41	Construction of buildings	379	14.995
42	Civil engineering	291	16.230
43	Specialised construction activities	37	1.595
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	190	26.602
46	Wholesale trade, except of motor vehicles and motorcycles	1249	144.851
47	Retail trade, except of motor vehicles and motorcycles	675	226.525
49	Land transport and transport via pipelines	305	22.637

50	Water transport	250	13.333
51	Air transport	104	19.773
52	Warehousing and support activities for transportation	253	15.341
53	Postal and courier activities	74	11.953
55	Accommodation	248	15.449
56	Food and beverage service activities	135	19.231
58	Publishing activities	712	36.361
59	Motion picture, video and television programme production, sound recording etc	204	8.357
60	Programming and broadcasting activities	402	63.926
61	Telecommunications	643	342.107
62	Computer programming, consultancy and related activities	868	54.828
63	Information service activities	145	4.515
64	Financial service activities, except insurance and pension funding	5372	427.083
65	Insurance, reinsurance and pension funding, except compulsory social security	1501	196.098
66	Activities auxiliary to financial services and insurance activities	1086	72.997
68	Real estate activities	1517	42.483
69	Legal and accounting activities	210	7.810
70	Activities of head offices; management consultancy activities	2409	81.351
71	Architectural and engineering activities; technical testing and analysis	402	21.034
72	Scientific research and development	122	5.816
73	Advertising and market research	606	37.574
74	Other professional, scientific and technical activities	566	45.238
75	Veterinary activities	7	0.011
77	Rental and leasing activities	177	10.022
78	Employment activities	281	15.891
79	Travel agency, tour operator and other reservation service and related activities	287	46.005
80	Security and investigation activities	105	7.877
81	Services to buildings and landscape activities	261	15.077
82	Office administrative, office support and other business support activities	1002	55.979
84	Public administration and defence; compulsory social security	46	7.765

85	Education	47	0.569
86	Human health activities	242	9.804
87	Residential care activities	2	0.048
88	Social work activities without accommodation	64	1.294
90	Creative, arts and entertainment activities	1	0.005
92	Gambling and betting activities	26	1.035
93	Sports activities and amusement and recreation activities	137	7.214
94	Activities of membership organisations	167	4.636
96	Private households for own use	266	6.374
98	Undifferentiated goods- and services-	1	0.070