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Abstract

This paper examines real responses of large multinational enterprises (MNEs) to tax by studying their global allocation of business functions drawing on a novel dataset of the global activities of large MNE groups. The paper first provides initial descriptive insights on the distribution of MNE business functions across jurisdictions. It subsequently explores the relationship between effective corporate taxation and the location of business functions. The findings indicate that higher average effective tax rates are associated with a lower prevalence of some business functions, particularly those related to holding or the provision of internal group financing. In contrast, more routine functions, such as sales or manufacturing, appear to be less sensitive to average effective tax rates. Finally, business functions also respond to a variety of other features of CIT systems, such as tax incentives, loss carryover provisions, or anti-avoidance rules. The results offer valuable insights into the structure of MNEs global value chains, as well as the real economic impacts of MNEs' responses to taxation.

Résumé

Ce papier s'intéresse à la manière avec laquelle les plus grands groupes multinationaux ajustent l'allocation globale de leurs fonctions supports et productives en réponse à l'environnement fiscal. Pour ce faire, cette étude s'appuie sur un jeu de donnée inédit portant sur l'activité de ces entreprises. En premier lieu, le papier propose une description de la répartition de ces fonctions à travers différents pays. Dans un second temps, il analyse le lien entre l'environnement fiscal - mesuré par le taux effectif d'imposition des bénéfices - et la prévalence de ces différentes fonctions. Les résultats suggèrent qu'un taux effectif d'imposition plus élevé est associé à une moindre prévalence de certaines fonctions, en particulier celles qui ont trait à la finance intra-groupe ou aux activités de holding. A l'inverse, la prévalence des fonctions de routine, telles que la vente ou la production manufacturière, apparait être moins sensible au niveau moyen d'imposition effective. Enfin, l'allocation de ces différentes fonctions semble aussi être façonnée par d'autres composantes du système fiscal, comme les incitations fiscales, les reports de pertes et les règles anti-abus. Ces résultats contribuent à une meilleure compréhension des chaînes de valeur globale au sein des groupes multinationaux ainsi que des effets réels de la fiscalité sur la production multinationale.

Acknowledgments

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1 Introduction

The real responses of multinational enterprises (MNEs) to taxation – as opposed to the shifting of paper profits – remain understudied. With MNEs contributing a third of world output and employing a fourth of the global labour force, understanding the role that taxation plays in MNEs' allocation decisions is useful for policymakers when shaping their tax and investment policies. The way in which tax impacts MNE investment decisions has long been the object of study (Devereux and Griffith, 2003[1]; Feld and Heckemeyer, 2011[2]). However, while there is a large body of literature on the impact of tax on MNEs assets, what is less well understood are the kinds of activities that MNEs engage in where they invest. This is partly because of the complexity and multidimensionality of the question, and partly due to the greater focus of the academic literature and debate in recent years on the shifting of paper profits from high to low tax jurisdictions (Beer, de Mooij and Liu, 2020[3]; Alstadsæter et al., 2023[4]).

This paper investigates how the business functions conducted by MNE affiliates in a jurisdiction respond to corporate taxation. To do so, the paper relies on aggregated and anonymised Country-by-Country Reporting (CbCR) data, a novel and unique data source that provides comprehensive and comparable information on the global allocation of large MNEs' business functions by jurisdiction. Specifically, in these data affiliates of covered MNEs indicate their main business functions out of a predefined list, ranging from *Manufacturing* and *Sales* to *Holdings*. The paper takes the view of an MNE as an enterprise that allocates production and activities across different jurisdictions. Different functions carry different profiles of profits and economic activity and may not respond to tax in the same way or to the same extent.[1]

The data show strong variation in the location and concentration of business functions globally. A descriptive analysis of the shares of affiliates performing a given business function in a jurisdiction shows that some functions are often bundled in one single jurisdiction and that there are striking differences in the composition of the of functions conducted by MNEs affiliates in lower versus higher taxed affiliates. In addition, some business functions are associated with higher real activity, measured by the number of employees per asset as well as the value of assets or revenue per affiliate.

Taxation is found to matter more for certain business functions than for others, contributing to differences in the composition of these functions observed across jurisdictions. The relationship between effective tax rates (ETRs) on MNE profits and the prevalence of business functions is investigated in detail using regression analysis. In this analysis, the share of affiliates performing a given business function in an Ultimate Parent Entity (UPE) – affiliate jurisdiction pair is regressed on average effective corporate tax rates while controlling for potential additional factors impacting MNEs' organisational decisions. The regression analysis points to strong variation in the sensitivity of different functions to corporate taxation. For example, the share of affiliates performing functions such as *Holding* or the provision of *Internal group finance* are negatively associated with corporate taxation. In countries with higher tax rates, MNE affiliates are more likely to conduct functions such as *Manufacturing* or *Sales*. At the same time, there is evidence for heterogeneity across income groups regarding the tax responsiveness of

[1] Notably, business functions are explicitly mentioned as a factor in the attribution of business profits in the OECD Model Tax Convention (OECD, 2017[39]).

business functions. This suggests that tax competition has distinct patterns in jurisdictions of different levels of development.

Average tax rates capture only part of the impact of tax on the composition of business functions in a jurisdiction. For some functions, such as *Manufacturing* and *Sales*, preferential rates appear to play a larger role in MNE investment decisions than the average ETR. Functions that tend to carry more risk respond not only to ETRs, but also the generosity of loss carryover rules. In addition, the tax responsiveness of MNE business functions tends to be lower in jurisdictions that have implemented base-protection measures such as thin-capitalisation rules or transfer pricing regulation.

The insights from this paper inform both tax and investment policy. The tax system is a common policy lever used to promote investment and attract business activity (Celani, Dressler and Wermelinger, 2022[5]; OECD, 2024[6]; OECD, 2023[7]). In a context of increasing prominence of industrial policy, it is key for policymakers to consider whether the kind of economic activity they seek to attract through tax policy actually responds to taxation. The responsiveness of different business functions to tax helps to understand the effect of corporate tax reforms on the real economy. This question becomes even more relevant given the changes to the international taxation of large MNEs brought by the two-pillar solution (OECD, 2021[8]).

The aggregated CbCR data on MNE business functions used for the analysis provides new information but comes with certain limitations. Most importantly, the data is aggregated at the UPE-affiliate jurisdiction level. This relatively high level of aggregation does not permit firm-level analysis which limits the potential for causal identification. In addition, the coverage of the business function data varies, and the relative novelty of the data series could imply data quality issues.

The paper is organised as follows. Section 2 reviews related literature. Section 3 presents the data. Section 4 describes the main stylized facts about the location of MNEs' business functions. Section 5 presents the regression analysis on the relationship between average ETRs and the composition of MNE business functions. Section 6 investigates the role of other tax provisions in the allocation decisions of MNEs. Section 7 discusses potential policy implications and concludes.

2 Literature review

The analysis of the relationship between the location of MNE business functions and corporate taxation conducted in this paper relates to several strands of literature. First, it relates to the literature that studies the geography of multinational production and global value chains. Second, it relates to the literature that investigates the tax sensitivity of MNEs. Third, the analysis is closely linked to the literature that investigates MNE activities in low tax jurisdictions.

The way in which MNEs allocate their functions and participate in global value chains has long been a subject of study and has many determinants. MNE location decisions are a complex multidimensional problem. An extensive body of literature seeks to explain MNE decisions from the very first step of whether to export or actively invest in a foreign jurisdiction (Helpman, Melitz and Yeaple, 2004[9]) to where to locate different types of function (Belderbos et al., 2016[10]; Arkolakis et al., 2018[11]). All of these decisions lead to different patterns of how MNEs structure their production and tap into global value chains (Davies and Markusen, 2021[12]); these patterns are key to understanding MNEs' behavioural responses. Many non-tax factors underpin MNE location decisions. Antràs and Gortari (2020[13]) stress the role of trade costs in the fragmentation of the production process within MNEs. Other studies, surveyed in Kano, Tsang and Yeung (2020[14]), highlight further factors affecting MNE location decisions such as the strength of intellectual property rights, the general regulatory framework, or the level of economic development. Agglomeration effects also play a role in determining business location (Ellison, Glaeser and Kerr, 2010[15]). The analysis conducted in this paper relies on this prior work to inform the selection of control variables in the regression analysis of Sections 5 and 6

Corporate taxation affects MNE strategic location decisions; the question is how and to what extent. The literature suggests that the sensitivity of MNE investment decisions to tax may depend on several factors. First, they depend on the type of margin that is studied, since taxation influences MNE investment decisions across different margins. Devereux and Griffith (2003[1]) identify and review literature that responds to three key decisions MNEs take when engaging in foreign investment: first, whether to produce abroad or export; second, conditional on producing abroad where to locate production; and third, what the scale of investment activity would be. In a meta-study, de Mooij and Ederveen (2008[16]) uncover higher extensive than intensive margin responses of international investment to taxation. Using micro-level data, Sztajerowska (2021[17]) shows that the location decisions of MNEs both depend on the content of double-taxation agreements and international investment agreements. Second, the tax sensitivity of MNE investment depends on the characteristics of MNEs. Some studies show that the sensitivity of MNEs to tax varies with their profitability (Millot et al., 2020[18]), intangibles intensity (Becker and Riedel, 2012[19]), market power (IMF, 2019[20]), tax planning opportunities (de Mooij and Liu, 2020[21]), and financing constraints (Hanappi and Whyman, 2023[22]). Beyond the location of assets, another strand of the literature has also focused on the location of some business functions. For instance, research and development and intellectual property activities have been found to be sensitive to taxation (Bloom, Griffith and Van Reenen, 2002[23]; Guceri and Liu, 2019[24]; Gaessler, Hall and Harhoff, 2021[25]). While there is some evidence that MNE investment choices (i.e., the location of their assets) respond to taxation and that those responses vary, there is little comparative evidence on the tax sensitivities of different business functions within the MNE value chain. Much of the literature on MNE location decisions has conflated the location of MNE business functions with the location of MNEs investment. However, there is no clear link between the level of investment required and the carrying out of different business functions. This implies that the analysis

of the tax sensitivity of business functions conducted in this paper complements the existing research on the sensitivity of MNE investment to tax.

The literature has associated certain activities of MNEs with low-tax jurisdictions, but MNEs' business functions are diverse and may respond differently to tax. The strategic location of intellectual property (Karkinsky and Riedel, 2012[26]; Griffith, Miller and O'Connell, 2014[27]) or sales (Laffitte and Toubal, 2022[28]) in low-tax jurisdictions has been studied as profit shifting channels. Dyreng et al. (2015[29]) find that holding companies tend to locate in countries with low levels of equity distribution and low levels of investment risk. Most of this literature is concerned with channels or structures that may be linked to profit shifting activities, but MNEs perform a much broader set of functions and may strategically allocate them between high and low tax jurisdictions. Moreover, because much of the literature defines shifted profit based on returns on assets and employment (without accounting for the additional remuneration of certain business functions in international tax rules), the line between shifted profit and returns on real economic activity may not always be clear. A broader perspective on how tax affects where MNEs locate different types of functions is therefore still lacking. This is the gap this paper is aiming to address.

3 Data

The main source of data for this paper are anonymised and aggregated Country-by-Country Reporting statistics. Initiated as part of the OECD/G20 Base Erosion and Profit Shifting (BEPS) project, CbCR requires multinational groups which consolidated annual turnover above EUR 750 million to report their global activities on a jurisdictional basis and in a standardised manner. CbCR data contains information on key financials such as profits, related and unrelated party revenues, tangible assets, and taxes paid as well as the number of employees on a jurisdiction-by-jurisdiction basis. A key advantage of this data source compared to other information on MNEs is that CbCR covers all activities of the MNE, including in investment hubs. While the individual CbC reports are not publicly available, the OECD publishes aggregated CbCR statistics as part of its annual Corporate Tax Statistics (OECD, 2024[30]). This data is provided by tax authorities of the Ultimate Parent Entities. For each UPE jurisdiction, individual CbC reports are aggregated across all MNEs operating in each affiliate jurisdiction. The level of observation therefore is the UPE-affiliate jurisdiction level, i.e., each observation in the aggregated CbCR data contains information on the total activities of all large MNEs from one UPE jurisdiction in one affiliate jurisdiction.

Besides financial information, CbCR contains a list of all affiliates and the main business functions they perform within the MNE value chain. The main business functions of the affiliates are selected from a pre-defined list of functions (abbreviations in brackets are used throughout the paper):

1. Administrative, Management or support services (*Administration*);
2. Regulated financial services (*Finance*);
3. Holding shares or other equity instruments (*Holding*);
4. Insurance (*Insurance*);
5. Internal group finance (*Internal group finance*);
6. Holding or managing intellectual property (*IP*);
7. Manufacturing or production (*Manufacturing*);
8. Purchasing or procurement (*Purchasing*);
9. Research and development (*R&D*);
10. Sales, marketing or distribution (*Sales*);
11. Provision of services to unrelated parties (*Services*);
12. Dormant (*Dormant*);
13. Other activities (*Other*).

Each MNE affiliate can be associated with several of these business functions. The information on business functions is also contained in the aggregated CbCR statistics of many UPE jurisdictions and forms the basis of this analysis. The aggregated data indicates the number of affiliates that MNEs from a UPE jurisdiction have in a given affiliate jurisdiction and how many of those affiliates perform each of the business functions listed above.

The standardised data on the type of functions that MNE affiliates perform is unique to CbCR data. Other sources of data on the international activities of firms mainly provide information on the industry or type of affiliates but lack information on the business functions conducted by affiliates.[2]

While the data used can provide important insights on the functions of MNEs and their responses to taxation, it comes with limitations. First, given the data is anonymized and aggregated, it is impossible to identify individual MNE groups and their constituent entities, or to follow their development over time. This limits the potential for the identification of causal effects. Second, MNEs with revenues below EUR 750 million are not included in the data. At the same time, large MNEs are the focus of the debate on the impact of taxes on location decisions. Third, the CbC reports are not subject to auditing and may thus be characterised by to some discretion and reporting errors on the side of the MNEs. CbCR remains a relatively new data source such that MNEs as well as tax administrations are still improving reporting systems. Gradual improvements over time are reflected in the updated version of the CbCR guidance issued by the OECD.[3] To further alleviate data quality issues, data points that suffer from reporting errors identified at the aggregate level are removed from the dataset. Similarly, the first reporting year (2016) is excluded due to its limited coverage and potential data quality issues. Despite its shortcomings, CbCR is the best source available to study how MNEs allocate their business functions across jurisdictions, yet this data remains to date largely unexplored.[4]

The analysis is based on aggregated CbCR data for the years 2017-2021. The raw data available in the OECD Corporate Tax Statistics (2024[30]) is cleaned and prepared for the analysis. Confidentiality requirements preclude some tax authorities from providing a full breakdown of the functions of MNEs headquartered in their jurisdiction. Where MNE functions are only reported at the regional or continental level rather than the jurisdiction level, the information is dropped from the working dataset. Generally, the data does not allow suppressed and missing values to be distinguished. When within a UPE-affiliate jurisdiction pair, some business functions are reported, but information on others is missing, the missing values are replaced by zeros. This is based on the assumption that if these values are in fact suppressed for confidentiality reasons, they are likely to be small. Replacing them with zeros should therefore not introduce a significant bias in the analysis, but significantly increases the sample size. Lastly, observations are excluded if comparisons across years or with macroeconomic data suggest reporting errors, or if the average number of business functions reported per affiliate exceeds the theoretical maximum of 12 non-dormant functions, since these observations likely contain data errors.[5]

The resulting dataset used for the analysis is based on information reported by 52 different UPE jurisdictions (up to 49 within a year) with activities in over 200 affiliate jurisdictions. It contains more than 11 500 datapoints at the UPE-affiliate jurisdiction level, with an average of 2 319 UPE-affiliate jurisdiction pairs per year.[6] The aggregated data used for the analysis represents more than 6 600

[2] Bureau van Dijk's (BvD) Orbis database, for instance, provides detailed information on the affiliate sector (NACE, NAICS, US-SIC and BvD major sector), type of product and services produced by firms as well as a "peer-group" description, which often resembles industry classifications rather than the functions that the entities perform. In addition, such firm-level databases typically suffer from missing data and do not always contain the full MNE structure (Tørsløv, Wier and Zucman, 2023[40]; Fuest, Hugger and Neumeier, 2022[41]).

[3] See OECD (2024[44]) for the latest version of the CbCR guidance.

[4] A small number of papers use firm-level CbCR data to study MNE profit shifting, but do not focus on the allocation of business functions (Bratta, Santomartino and Acciari, 2021[42]; Fuest et al., 2022[43]).

[5] Entities can either be dormant or can perform all other 12 functions in parallel as the maximum. Cases where the average number of functions exceeds this maximum only relate to a very small share of the observations in the dataset.

[6] In the data reported for MNEs with UPEs in the United States (US MNEs), *Other activities* also include affiliates performing the activities of *Holding*; *Insurance*; *Internal group finance*; and *R&D*. In what follows, any analysis that refers to these business functions excludes data from US MNEs. Data from US MNEs is, however, used for all other

individual MNEs groups per year on average, comprising more than 700.000 affiliates. On average, each of these affiliates engages in 1.3 business functions.

Since affiliates can report more than one function, the analysis focuses on the share of affiliates that perform a given business function in the jurisdiction. The share of affiliates performing a given function is computed by dividing the number of affiliates performing such business function in a UPE-affiliate jurisdiction pair by the total number of affiliates in that pair. The use of the shares helps to retain comparability across jurisdictions of different sizes and to deal quantitatively with the multiple reporting of functions for a given affiliate. By construction, each of the shares is bounded between zero and one.[7] The resulting indicators capture the prevalence of business functions observed in a fixed set of affiliates. Taken together, the shares across the different functions provide insights on the composition of business functions in an affiliate jurisdiction.

The CbCR data on business functions is combined with information on effective tax rates. Most of the analysis relies on backward-looking average ETRs, calculated following the methodology of Hugger, González Cabral and O'Reilly (2023[31]). This methodology primarily relies on profits and taxes accrued taken from aggregated CbCR statistics. Profit is corrected for potential double counting of intra-company dividends in headquarter jurisdictions where dividends often accumulate and adjusted for prior period losses. The resulting ETRs aim to capture the average effective taxation of MNE profit over the investment cycle in each affiliate jurisdiction. They capture the effect of tax provisions including tax incentives or special rulings on firms' tax payments. They are also a function of the behaviour of firms in a jurisdiction and their characteristics (e.g., their pattern of profits or losses or the uptake of tax incentives).

The regression analysis relies on additional variables that capture determinants of location decisions other than corporate tax rates. These include jurisdiction-level variables as well as variables at the bilateral (UPE-affiliate jurisdiction) level following the literature on the bilateral determinants of international investment. Table A.1 in Annexe A provides summary statistics of all the variables used in the analysis. Table A.2 provides the data sources used.

business functions. Section 5.2. tests the robustness of the findings to the exclusion of US MNEs as well as to the exclusion of MNEs with UPEs in Switzerland where confidentiality considerations lead to a relatively high share of supressed datapoints.

[7] In a small number of cases, the total count of business functions is lower than the total number of affiliates in a UPE-affiliate jurisdiction pair. In such cases, the number of entities is replaced with the total count of business functions to calculate the shares ensuring the shares are bounded between zero and one. These observations are excluded from the analysis in a robustness check (see Section 5.2.1). As an additional precaution, the regression models presented in Section 5 include UPE jurisdictions-fixed-effects to neutralize potential effects of jurisdiction-specific reporting guidelines.

4 The allocation of business functions

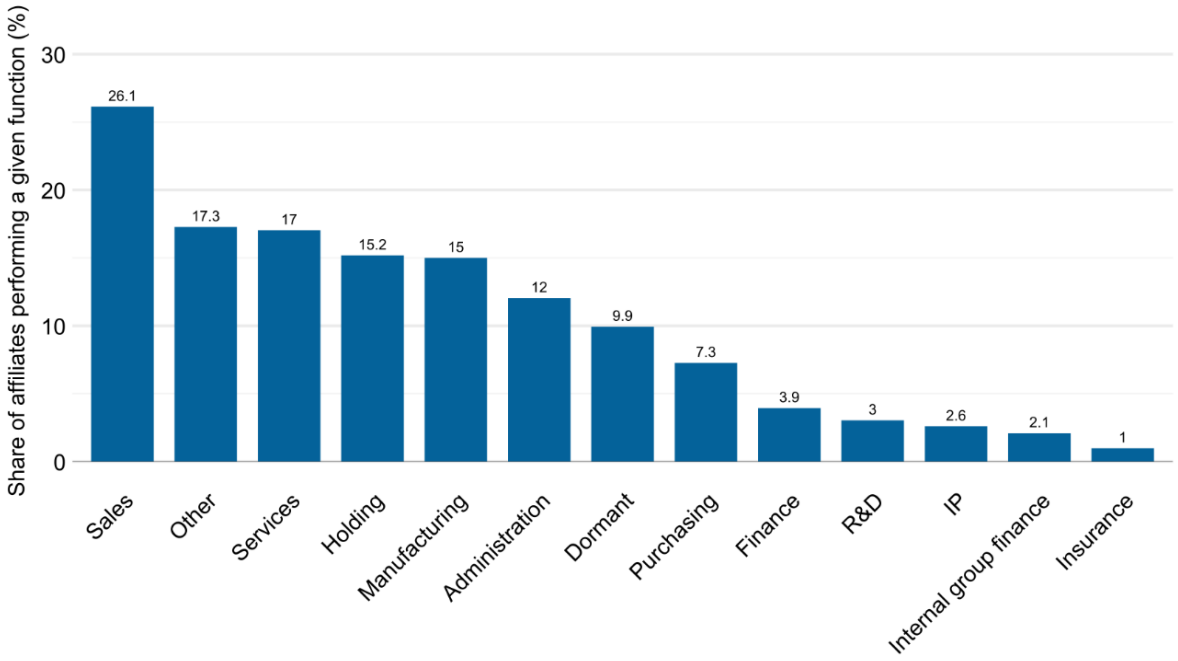
This section provides a first descriptive analysis of the data on business functions used in this paper. It looks at the prevalence of the different business functions across jurisdictions (Section 4.1), the co-location of the individual functions (Section 4.2), the correlation between business functions and economic presence in affiliate jurisdictions (Section 4.34.3), and describes the prevalence of business functions in high and low tax jurisdictions (Section 4.4).

4.1. The distribution of business functions

The prevalence of the individual business functions across the sample varies substantially. Figure 1 plots the share of all affiliates that engage in the different functions on average across the years 2017-2021. Affiliates can perform more than one main business function which implies that the shares do not need to sum to one across all functions. The most prevalent business function is *Sales,* which is conducted by around one quarter of all MNE affiliates on average. Around one in six affiliates are engaged in *Services*, and around one in seven affiliates in *Manufacturing*. Less than 5% of affiliates engage in *Finance*, hold or manage *IP*, conduct *R&D*, or engage in *Internal group finance*, or *Insurance*. MNEs report non-negligible shares of affiliates conducting *Other* and *Dormant* functions. These functions are not considered in the rest of the analysis given the lack of a meaningful economic interpretation, the likely heterogeneity of the economic activity of affiliates reported in these categories, and the lack of consistency of the reporting definition of these functions across jurisdictions.[8] While this does not restrict the number of UPE-affiliate pairs in the sample, it reduces the number of outcome variables considered. For the eleven remaining functions, the patterns observed reflect differences in the nature of functions. Functions relating to *Sales* or *Services* often need to be close to market implying a more extended network of affiliates, while other functions such as the holding of *IP* or *Internal group finance* can be more concentrated within an MNE group. More specific functions like *Insurance*, may only feature among specialised MNEs. Figure A.1 in Annexe A shows that the relative prevalence of the individual business functions is quite stable over the sample period.

[8] A set of regressions testing the tax responsiveness of the shares of *Dormant* and *Other activities* functions all yield point estimates which are small in magnitude and not statistically significant at any conventional level (Figure A.9). This alleviates the concern that these categories could be used by MNEs to conceal profit-shifting activities.

Figure 1. Share of affiliates performing specific business functions



Note: Global shares of affiliates engaged in each business function for the sample years (2017-2021). The underlying data comes from the anonymised and aggregated CbCR statistics (OECD, 2024[30]). Some UPE jurisdictions do not report all business functions.

4.2. The co-location of MNE activity

MNEs may seek to co-locate business functions where complementarities arise. Figure 2 provides an overview of the pairwise correlation between the shares of affiliates engaging in the different business functions across UPE-affiliate jurisdiction pairs. Each dot represents a combination of two business functions. The colour of the dots indicates the sign of the correlation (green for positive, blue for negative correlations). The size of the dot indicates the strength of the correlation. As might be expected, *Sales* and *Services* related functions as well as *Manufacturing* and *Purchasing* functions are often performed in the same jurisdiction. A similar pattern appears between *R&D* and *IP* functions. In contrast, functions connected to *Sales* or *Services* are rarely located in the same jurisdiction as *Holding* functions, or other finance-related functions. These patterns are consistent across income groups as presented in Figure A.2. There are some distinct patterns, however, emerging for affiliates located in investment hubs. For these affiliates, *Holding* is negatively correlated with most other functions, suggesting that *Holding* affiliates often do not conduct any other function. In addition, *Administration, Purchasing,* and *Sales* are positively correlated in investment hubs. This could be related to regional entrepreneurs or other entities located in investment hubs that may mainly provide intra-group services.

Figure 2. Correlations between business function shares

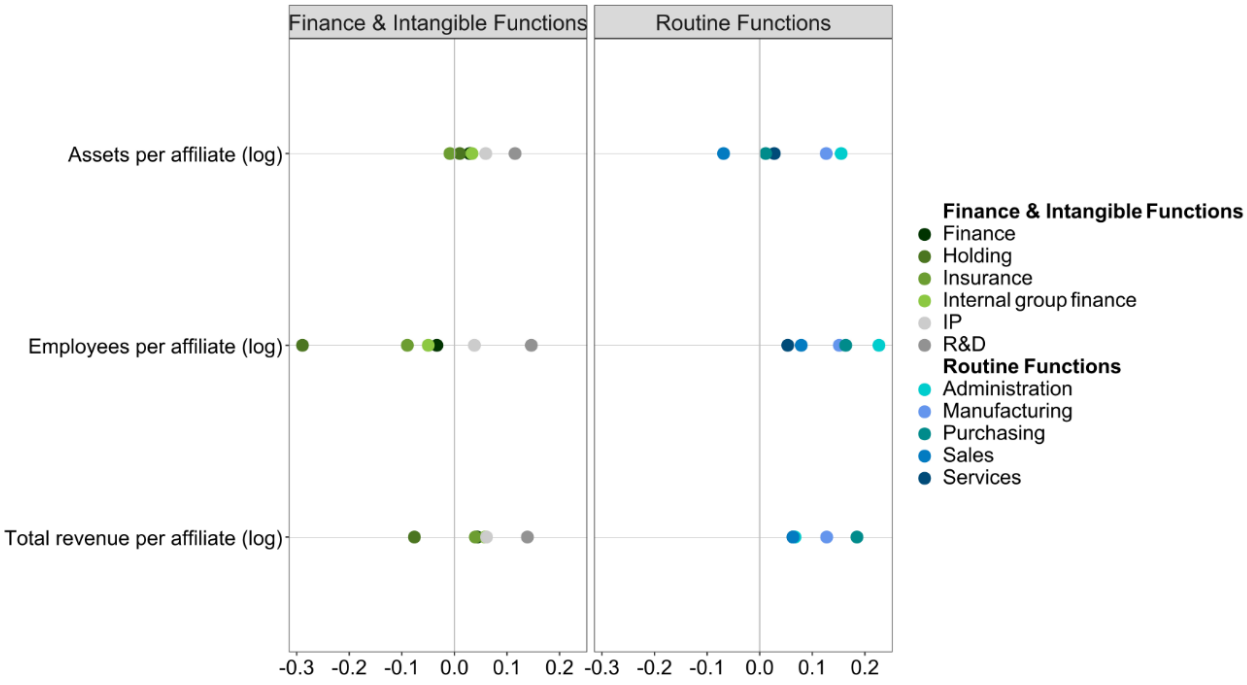
Colours indicate the sign of the correlation (blue=negative; green=positive); size indicates significance

Note: Correlations between the shares of affiliates engaging in different business functions at the UPE-affiliate jurisdiction level, indicating the extent to which business functions are co-located. The colour of the dots indicates the direction of the correlations between the shares, where green (blue) indicates positive (negative) correlations. The size of the dots indicates the statistical significance of the relationship. The underlying data comes from the anonymised and aggregated CbCR statistics (OECD, 2024[30]) and is pooled across 2017-2021. Some UPE jurisdictions do not report all business functions.

4.3. Business functions and economic presence of MNEs

MNE business functions correlate with different degrees of economic presence in affiliate jurisdictions. MNE business functions may carry different profiles of labour and capital intensity. These may play a role in shaping their responsiveness to taxation. Figure 3 describes the correlation between the share of affiliates performing each function and the labour and asset intensities (defined as log of the number of workers per affiliate and the log of assets per affiliate), and between the function shares and the log of total revenues per affiliate across UPE-affiliate jurisdiction pairs. This shows, for instance, that the share of affiliates engaged in *Manufacturing*, *Purchasing*, and *R&D* is positively correlated with labour and asset intensities. The share of affiliates engaged in *Sales* is positively correlated with labour intensity, but only weakly correlated with asset intensity. With the exception of *R&D*, more intangible or finance-related functions tend to be only weakly correlated with the labour and asset intensity, with some functions such as *Holding* showing a strong negative correlation with the labour intensity. Revenues per affiliate are positively correlated with the share of affiliates performing *Sales* and *R&D* in a jurisdiction. The co-location of functions depicted in Figure 2 may contribute to some of the outcomes observed in Figure 3 where the correlation of each activity with economic outcomes is tested on an individual basis.

Figure 3. Correlations between business function shares with measures of real economic presence



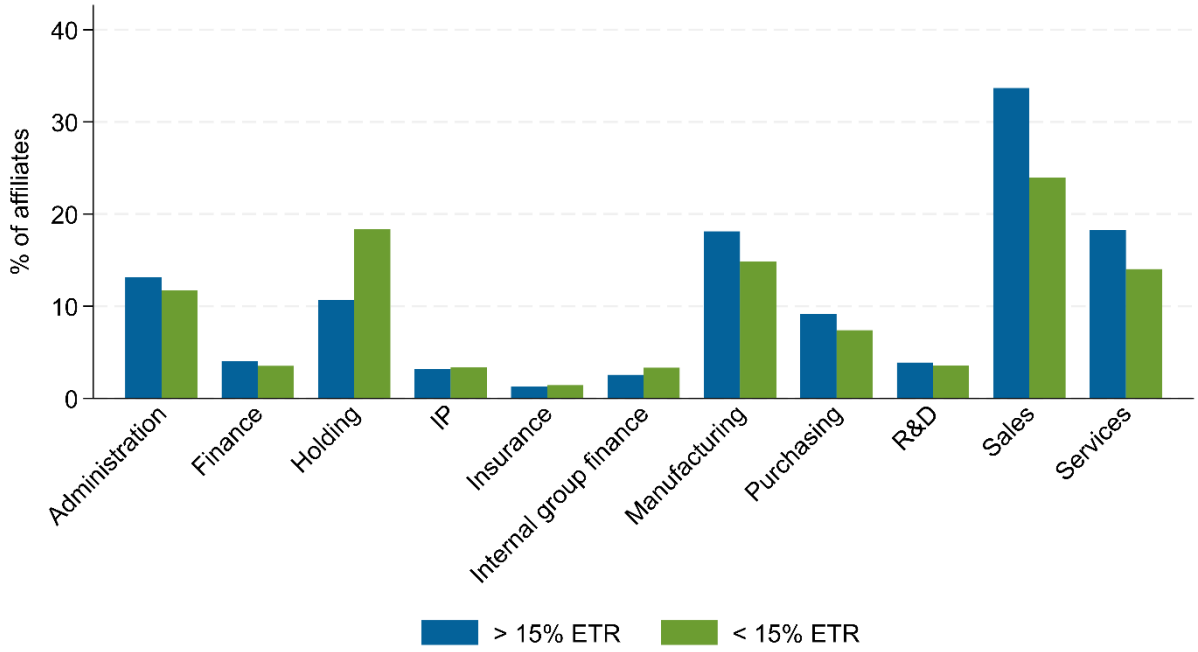
Note: Correlations between the shares of affiliates engaging in different business functions and the log of three ratios on economic outcomes at the UPE-affiliate jurisdiction level. For each business function, the share of affiliates performing such activity is correlated with each measure of economic activity. The underlying data comes from the anonymised and aggregated CbCR statistics (OECD, 2024[30]) and is pooled across 2017-2021. Some UPE jurisdictions do not report all business functions.

4.4. Business functions and taxation

Some business functions are more frequently conducted in lower taxed subgroups. Before moving to a regression framework, Figure 4 provides descriptive evidence on the global allocation of business functions of large MNEs and their taxation using additional data from the OECD's aggregated CbCR statistics.[9] The figure distinguishes between subgroups with ETRs below 15% and subgroups with ETRs above 15%. An MNE subgroup comprises all affiliates of an MNE that are active in one jurisdiction. Affiliates in subgroups with ETRs below 15% are more likely to conduct *Holding* functions, or to provide *Internal group finance*. The share of *Holding* in subgroups with ETRs below 15% is more than 70% higher than in subgroups with ETRs below 15%. In contrast, *Manufacturing*, *Sales*, and *Services* related functions are more prevalent in higher taxed affiliates. This high-level descriptive analysis provides suggestive evidence that certain functions may be more responsive to low corporate tax rates than others. The broad pattern also holds when splitting the sample between business functions performed in investment hubs and functions performed in non-hub jurisdictions (Figure A.3). Nevertheless, the patterns observed could also reflect the impact of non-tax factors. To differentiate more clearly between tax and non-tax factors, Section 5 proposes a structured regression framework.

[9] This part of the descriptive analysis draws on data taken from Table IV of the OECD's aggregated CbCR statistics. This table is based on the same data as the aggregated CbCR used in the rest of this paper (Table I with key financials and business functions by jurisdiction), but the data is grouped by bins of the backward-looking ETR of the MNE subgroup. MNE subgroups with negative taxes paid, or other groupings reported in Table IV that do not fit in one of the two categories used are excluded from this analysis.

Figure 4. Prevalence of business functions in MNE subgroups, disaggregated by ETR



Note: Shares of affiliates performing a given business functions, split between subgroups with ETRs above and below 15%. Subgroups with negative profits or negative taxes are excluded from the sample. The underlying data comes from the anonymised and aggregated CbCR statistics (OECD, 2024[30]) and is pooled across years 2017-2021.

5 The responsiveness of business functions to corporate taxation

This section explores the relationship between the composition of MNE business functions and the average corporate tax burden in a more structured framework. A regression-based analysis is used to estimate how strongly the allocation of business functions responds to corporate taxation. Section 5.1 presents the baseline model and results. Robustness tests and alternative specifications are discussed in Sections 5.2. Section 5.3 looks at potential heterogeneities across jurisdiction groups.

5.1. Baseline specification

The baseline analysis investigates the relationship between average ETRs and the prevalence of business functions in a UPE-affiliate jurisdiction pair. The baseline analysis relies on the data at the UPE-affiliate year level and uses an Ordinary Least Square (OLS) specification. The dependent variable is the share of affiliates in each UPE-affiliate jurisdiction pair-year combination that perform a given business function.[10] The regressions are run separately for each of the business functions. Observations are weighted based on the number of affiliates they represent to account for the fact that the datapoints can contain very different informational value. Some only represent a small number of affiliates, while others represent hundreds or thousands of affiliates. The baseline regression model explored in this paper takes the following form:

$$Share_{kijt} = \alpha + \beta_1 \tau_{jt} + \beta_2 X_{jt} + \beta_3 Y_{ij} + \text{domestic}_{ij} + \gamma_t + \mu_i + \epsilon_{kijt} \quad (1)$$

where, $Share_{kijt}$ refers to the share of affiliates performing function k for the combination of UPE i and affiliate jurisdiction j in year t; τ_{jt} represents the effective corporate tax rate applied in affiliate jurisdiction j and year t. X_{jt} and Y_{ij} are vectors comprising a number of non-tax factors that might impact the location decisions of MNEs at the affiliate-year level and at the affiliate-UPE jurisdiction pair level, respectively. The dummy domestic_{ij} takes the value 1 if the jurisdiction is the UPE jurisdiction to control for potential headquarter effects. γ_t and μ_i are year and UPE-jurisdiction fixed effects, respectively.

The explanatory variable of main interest is the effective tax rate τ_{jt} which captures the effective corporate tax burden in the affiliate jurisdiction. As described in Section 3, the main measure for the effective taxation in a jurisdiction is the average backward-looking ETR, based on Hugger, González Cabral and O'Reilly (2023[31]). The coefficient β_1 measures how the share of affiliates performing function k in UPE-affiliate jurisdiction pair ij and year t changes with a change in the average ETR by one percentage point. As such, the coefficient can be interpreted as evaluating the effect of corporate taxation on the composition of business functions in an existing set of affiliates in a jurisdiction. It could be interpreted similar to an intensive-margin response of business functions to tax, since it captures the

[10] Note that this approach implies that predicted values for the dependent variable are not necessarily bound between 0 and 1. In this sense, the model resembles a linear probability model with similar caveats around the interpretation of coefficients. Section 5.2.3proposes a fractional logit approach which yields coefficients bounded between 0 and 1.

decision of which function to perform in an affiliate. In contrast, the approach taken does not isolate the extensive margin response of whether to establish an affiliate with a certain function in a jurisdiction.

Additional covariates aim to control for some potential factors other than tax that could impact the geographical allocation of MNE business functions. The set of covariates selected capture key dimensions that might impact the distribution of MNE functions (see Section 2), while offering broad geographical coverage. The vector X_{jt} comprises a set of controls at the affiliate jurisdiction-year level: To capture market size, the log of GDP is included. The log of GDP per capita proxies income and the development level of affiliate jurisdictions. Factor endowment in terms of labour force is proxied by the log of population and its square; the percentages of the population with access to electricity and the internet are included to control for infrastructure endowment. The growth rate of GDP measures the state of the economy. The quality of government institutions is proxied by indices for the control of corruption and the rule of law. The affiliate jurisdiction's credit rating and inflation rates measure economic risk which is closely related to capital costs. The Freedom House index is included to control for political stability. The vector Y_{ij} adds further controls at the bilateral UPE-affiliate jurisdiction level that are often used in the trade literature to proxy for the trade costs between jurisdictions. These additional controls are the log of the geographical distance between the UPE and the affiliate jurisdiction, as well as dummies for a common land border, common official language, and a common colonial history.[11] Table A.1 provides summary statistics on all variables used and Table A.2 gives an overview on the data sources.

The baseline estimates suggest that the prevalence of only some business functions is significantly explained by average corporate tax rates. Figure 5 summarises the coefficient estimates for the average ETR for the individual regressions on the shares of affiliates performing the different business functions. Table A.3 in Annexe A shows the full set of coefficient estimates, including all control variables. According to these estimates, the share of affiliates performing *Holding* or *Internal group finance* is higher, the lower the average ETR of the affiliate jurisdiction. The coefficients on the average ETR in the regressions for *IP, R&D, and Purchasing* also yield negative coefficients, but are not statistically significant. In contrast, affiliates in jurisdictions with higher average ETRs are more likely to perform functions such as *Manufacturing* or *Sales*.

The relationships of the different functions with tax rates need to be interpreted jointly. Since the majority of affiliates only conduct a single business activity, a higher share of affiliates performing one function to some degree mechanically reduces the share of affiliates performing other functions.[12] This implies that positive coefficients should not be interpreted in the sense that some functions seek higher tax rates, but rather that tax might play a smaller role in the allocation decisions for these functions relative other functions, potentially because non-tax factors are more relevant.

In addition, the regression results are in line with the co-location of certain functions. In countries with lower ETRs, MNEs affiliates typically tend to be more specialised in *Holding* and *Internal group finance*, at the expense of *Sales, Services* and *Manufacturing* functions. These results are in line with the co-location of e.g. *Sales* and *Services* functions on the one hand. and more finance-oriented functions on the other as reported in Section 4.2.

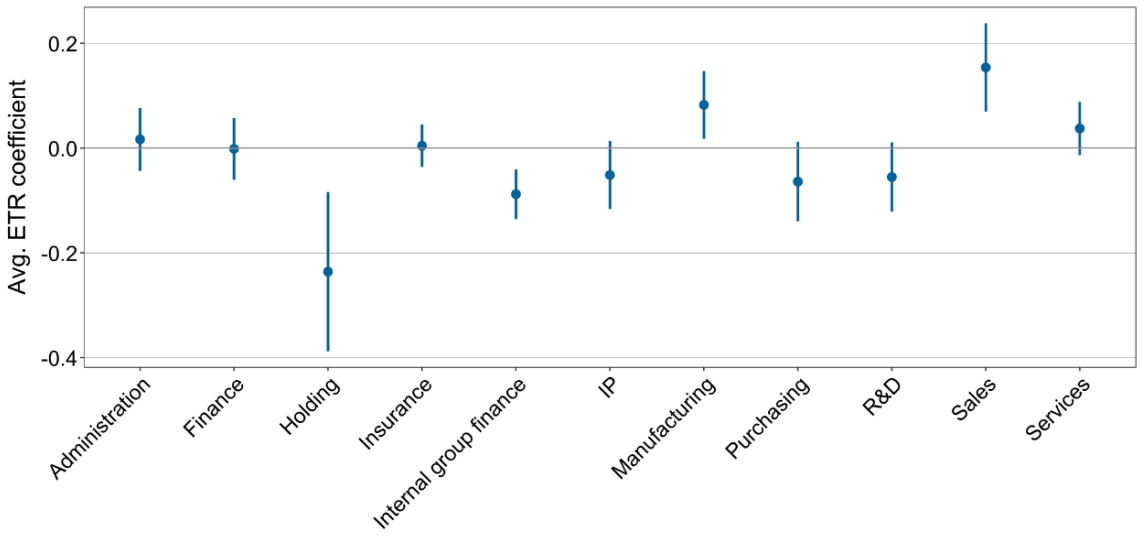
Overall, the regression analysis points towards an allocation of more routine functions in higher taxed jurisdictions, while more finance-related functions tend to be located in jurisdictions with lower average ETRs. This interpretation is corroborated by a modified version of the baseline regression which divides all functions into functions more associated with activities pertaining to finance and intangibles and other, arguably more routine, functions. The combined share of entities performing finance

[11] Where individual observations for the baseline control variables are missing, they have been imputed using data from other years, or information from other jurisdictions in the same World Bank income group. In a series of robustness checks, additional covariates are included in the model.

[12] It is worth recalling that on average, affiliates perform only 1.3 functions.

and intangible or routine functions in a given UPE-affiliate jurisdiction pair is then used as dependent variable. As Figure A.4 shows, entities performing more finance and intangible (routine) functions are more likely to be located in jurisdictions with lower (higher) ETRs.

Figure 5. Effective tax rates and business functions – Baseline regressions



Note: Point estimates of the regression coefficients for the standardised average ETR with respect to each business function, as well as the respective 95% confidence intervals. Each coefficient is estimated in a separate regression, following Equation (1). Full regression tables are presented in Table A.3 in Annexe A.

5.2. Alternative specifications and robustness

This section tests whether the estimates obtained from the baseline model are robust to the use of alternative estimation models. First, the robustness of the baseline results is tested with alternative sample constructions and additional control variables. Second, a series of approaches aims to alleviate potential endogeneity concerns regarding the use of the average ETR as a regressor. Third, the robustness of the results is assessed on the basis of alternative estimation strategies.

5.2.1. Sample and variable selection

The results presented in the previous section are robust to several alternative choices regarding the construction of the sample. The estimation model of Section 5.1 is applied to alternative samples where different groups of observations are excluded relative to the sample used in the baseline estimates. Figure A.5 contains the coefficient estimates of the average ETR for the alternative samples.[13] Model 1 contains the baseline specification for ease of comparison. Model 2 excludes UPE-affiliate pairs where the total count of business functions is lower than the total number of affiliates (see Section 3). Model 3 excludes observations of MNEs with UPE in the United States to test whether the results are robust to

[13] The exact coefficient estimates on the key variables of interest for all robustness tests reported in this subsection are shown in Annex B.

differences in the aggregation of certain business activities in the US data.[14] Model 4 removes observations relating to MNEs with UPE in Switzerland. Due to confidentiality concerns, the number of supressed values is relatively high in this data which could lead to a bias in the estimations. Lastly, Model 5 removes domestic affiliates and thus focuses on the effects of taxation on the allocation of foreign affiliates. Across the four models with reduced samples, the coefficient estimates are very similar to the baseline confirming the robustness of the main results to alternative sample specifications. Notably, the statistically significant negative results for *Holdings* and I*nternal group finance* remain so, as do the positive coefficients for *Manufacturing* and *Sales* (with the exception of *Manufacturing* in Model 2, which falls just below the threshold for statistical significance).

The results are also robust to the addition of further control variables. The sample period in the paper is too short to exploit within-country variation in the effective taxation of MNEs to identify the tax sensitivity of MNE business functions. The cross-country comparison used instead offers a greater source of variation with respect to effective tax levels but comes at the cost of potential country-level confounders. To alleviate omitted variable concerns, the baseline model incorporates a wide set of regressors to control for non-tax factors that could affect MNE location decisions. Given the wide geographical coverage of the CbCR data, the baseline regressors are also chosen due to their wide country coverage.

Additional control variables with reduced geographical coverage restrict the number of observations but help to evaluate potential omitted variable bias. Figure A.6 shows the coefficient estimates for the average ETR if further control variables at the affiliate jurisdiction-year level are added (see Table A.2 for an overview on the additional controls). Model 1 again shows the baseline results. Model 2 includes the secondary school enrolment rate, the MNE wage level, the number of days required to start a business and the number of business procedures required to do so, the unemployment rate and the Gini coefficient as additional jurisdiction-level controls. The inclusion of these control variables reduces the sample size by around 8% given their somewhat reduced coverage. Model 3 adds the 10-year lag of affiliate jurisdictions' sectoral shares of gross output among domestic firms to control for the historic specialisation of economies. These shares are computed using data from the OECD AMNE database for 19 broad industries (ISIC letter level). It aims to capture the *ex-ante* specialization of domestic companies, which can foster foreign investment. Activities of domestic MNEs are excluded from the regression sample. Given the limited coverage of the AMNE dataset, this third set of controls reduces the sample size by around 40% compared to the baseline. The addition of this proxy for historic industry structure can also help to reduce potential reverse causality concerns relating to the potential of dominant industries shaping a jurisdiction's tax policy. As shown in Figure A.6, the patterns on the tax sensitivity of the composition of MNE affiliate functions observed in the baseline estimates are again robust to the inclusion of these additional sets of regressors.

5.2.2. Endogeneity concerns

A second set of robustness tests seeks to address endogeneity concerns regarding our main explanatory variable: the average ETR at the jurisdictional level. The average backward-looking ETR used may be best suited to capture the actual tax burden on MNEs in a jurisdiction, reflecting both tax rates and tax base definitions. However, there could be issues relating to reverse causality where MNE business structures influence average ETRs, e.g., if certain functions are benefiting from preferential tax regimes, or for example if asset-intensive functions benefit from higher depreciation allowances. Additional analysis of such potential endogeneities can help to alleviate such concerns. The results of this analysis are summarised in Figure A.7 with Model 1 repeating the baseline results. Model 2 uses an alternative approach to construct the average backward-looking ETR. It adapts the approach taken in Dowd,

[14] In the data available for the United States, *Internal group finance*, *Insurance*, *Holding or managing intellectual property*, and *R&D*, are subsumed into *Other activities*. If there are systematic differences between US and non-US MNEs in how the allocation of these business functions responds to taxation, it would be revealed in this Model 3.

Landefeld and Moore (2017[32]), and calculates the average ETR for each UPE-affiliate jurisdiction pair only using other observations for the same affiliate jurisdiction. This ensures that the business structure of a particular UPE-affiliate pair does not unduly influence the ETR used in the regression for the same observation. The results using these alternative backward-looking ETRs are very similar to those from the baseline specification.

The results are also broadly maintained when using an instrumental variable (IV) approach. A second approach to addressing potential endogeneity concerns regarding the average ETR used is to instrument for the ETR in the analysis. The instrument used is the forward-looking effective average tax rate (EATR). Forward-looking EATRs are taken from the OECD Corporate Tax Statistics (OECD, 2024[30]). These EATRs are synthetic indicators that summarise the impact of certain provisions in the tax system on a hypothetical investment. As model-based indicators, forward-looking EATRs are not able to capture the full effect of all provisions in the tax system and may not perfectly measure the actual tax burden of MNEs in a jurisdiction. At the same time, the current composition of MNE activities in a jurisdiction has no direct impact on the forward-looking EATRs since they solely reflect legal rates applying *de jure* to all taxpayers, regardless of the activities performed in the jurisdiction. This reduces the potential for reverse causality issues. The significant correlation between the forward-looking EATR and the backward-looking average ETR described in Table B.8. indicates the relevance of the instrument.[15] The exclusion restriction condition associated with the choice of forward-looking rates as an instrument for backward-looking rates relies on the assumption that MNEs are not able to influence their forward-looking EATR and that the effect of the forward-looking effective tax rate on the nature of MNEs activity in a jurisdiction is entirely channelled through the effective rate actually paid by the MNEs.

The IV exercise confirms the broad patterns observed in the baseline. These results are presented in Model 3 of Figure A.7. Model 4 contains the reduced form estimation using the forward-looking EATR directly as a regressor, again yielding similar patterns. The use of the forward-looking EATR also alleviates concerns regarding the potential impact of double counted profits on the backward-looking ETRs based on CbCR data. While profits in headquarter entities are corrected for double counting, issues might remain in particular for affiliates performing *Holding* functions. Since forward-looking rates are not based on reported profits, but are a model-based indicator, double counting does not play a role in their construction. The fact that the coefficients of the reduced form estimate, including the coefficient in the regression for *Holding* functions, are similar to those of the baseline suggests that the double counting corrections applied in the calculation of the backward-looking rates are generally sufficient.[16]

5.2.3. Alternative estimation strategies

Finally, the results are also robust to the use of alternative estimation techniques, both regarding the econometric estimator and the construction of the dependent variable. All the above regressions are estimated at the UPE-affiliate jurisdiction level and rely on an OLS approach. While working with the initial data structure and OLS estimators facilitates the interpretation of the results, alternative specifications can be better suited to account for the specificities of the empirical design and data used. Figure A.8 displays baseline estimates alongside four alternative specifications.

[15] The forward-looking EATRs utilised in this paper capture the baseline tax treatment of non-residential structures, tangible assets and acquired software, and differences in the financing of the investment. The macroeconomic parameters are fixed across jurisdictions and controlled for the in the regression separately. Data used refers to years 2017-2021 and is available for more than 80 jurisdictions. Regression-based imputations are used for missing data.

[16] An additional test of this specific issue examines whether the results might be driven by a relationship between the average ETR and the number of functions conducted by each affiliate. There is, however, no statistically significant relationship between average ETRs and the number of functions conducted per affiliate.

The first additional specification is a fractional logit model. The baseline regression is re-run using a fractional logit model (Model 2 in Figure A.8), given that all function-specific regressions tested in this paper use the shares of affiliates that engage in a business function as dependent variables. These shares are bounded between 0 and 1. To better cater for this type of share data, Papke and Wooldridge (1996[33]) propose the use of fractional logit models that yield predicted values that are also bounded between 0 and 1. The magnitudes of the coefficients in the baseline regression and using the fractional logit are not directly comparable given the differences in the underlying estimating methods. However, the direction of the signs and the significance of the results can be compared. For all business functions, the direction of their relationship with the backward-looking ETR remains very similar to the OLS estimation.

In addition, the baseline regression is re-run using the log of the number of affiliates performing a business function in an UPE-affiliate jurisdiction pair as dependent variable instead of a share. In these regressions, a control is added for the log of the total number of affiliates observed in that country-pair. This only marginally changes the interpretation of the tax coefficient. It now describes the relationship between average ETRs and the number of affiliates performing a function in a UPE-affiliate jurisdiction pair, for a given number of affiliates in the pair. In that sense, it still reflects the relationship of ETRs with the composition of MNEs business functions in a jurisdiction. While this alternative way of describing the relationship between effective taxation and business functions yields tax elasticities that can be more easily interpreted, it precludes the use of observations in which no affiliates perform a given function, or the inclusion of zero-tax jurisdictions due to the log specification. This results in differences in sample sizes across the regressions for the individual functions. Still, the results remain very close to the baseline ones (Model 3 in Figure A.8), though some results fall below the threshold for statistical significance. Finally, the results are qualitatively similar when the individual UPE-affiliate pairs are unweighted in the regressions and when the sample is collapsed at the affiliate jurisdiction level (Models 4 and 5 in Figure A.8).

5.3. Heterogeneous responses across income groups

The impact of taxation on the composition of business functions within jurisdictions could differ across jurisdictions with different levels of development. To study such heterogeneity, the estimation model is extended with an additional interaction term between the average ETR and a dummy for upper middle income jurisdictions, as well as an interaction between the average ETR and a dummy for a combined group of lower and lower middle income jurisdictions. The income group dummies are also included in the model individually. The grouping is based on the World Bank classification of income groups for the year 2019, representing the middle of our sample period. Lower middle and low income jurisdictions are combined to achieve a sufficient group size. The coefficient on the average ETR represents the relationship between the ETR and the shares of affiliates conducting a business function in the comparison group of high income jurisdictions. The coefficients on the interaction terms between the income group dummies and the average ETR reflect the additional effects of effective taxation on the composition of business functions in upper middle income jurisdictions and lower and low income jurisdictions.

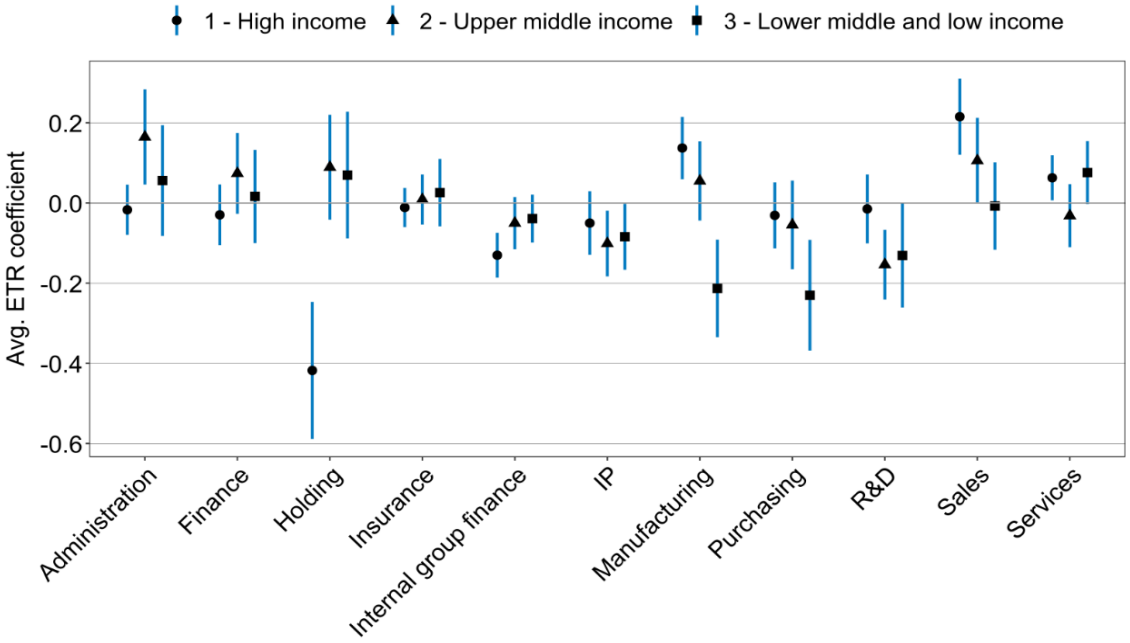
The additional interaction terms suggest that there exists some heterogeneity in the tax responsiveness of functions across income groups. The results for each income group are visualised by Figure 6. The figure shows the combined coefficient of the linear term and the relevant interaction term for each income group. Table A.4 contains the detailed regression results. The confidence intervals indicate the relevant joint significances. The results for high income jurisdictions are largely comparable to the results of the baseline model. This is due to the significant weight of high income jurisdictions in the baseline regressions reflecting the strong concentration of MNE activities in this jurisdiction group. The results also point towards considerable differences in the tax responsiveness for some functions across income groups. For upper middle income jurisdictions, the combined coefficients of the average ETR, in the regressions for *Holding*, *Internal group finance*, *Manufacturing*, *Sales* and *Services* are all not jointly significant at the 5% level. At the same time, higher average ETRs in upper middle income jurisdictions

are associated with lower shares of *IP* and *R&D* functions as the combined coefficients for these functions are jointly significant. Within the group of lower middle- and low-income countries, the share of entities engaged in *Holding* and *Internal group finance* does not change with different effective tax levels. In contrast to high income countries, however, there is a significant negative relationship between average ETRs and the share of entities engaged in *Manufacturing*. These findings point towards distinct patterns of tax competition between jurisdictions of different development levels. In high income jurisdictions, tax competition mainly seems to revolve around intangible and finance-related functions such as *Holding* and *Internal group finance* – functions that could be associated with profit shifting activities. Within the group of lower income jurisdictions, the prevalence of these functions does not respond to effective tax levels, while the shares of more routine functions such as *Manufacturing* are negatively correlated with average ETRs.

6 The role of other tax provisions

Average ETRs are the result of a wide range of domestic tax provisions, but do not provide insights on the impact of individual features of CIT systems. This section complements the previous analysis based on average ETRs with information on several dimensions of CIT systems to illustrate how individual provisions can interact with average ETRs in their impact on MNE location decisions. To this end, Section 6.1 uses a proxy to study the relevance of tax incentives and preferential tax regimes, Section 6.2 investigates to role of loss carryover rules, and Section 6.3 assesses the impact of base protection measures such as thin-capitalisation rules and transfer pricing regulations.

Figure 6. Effective tax rates and business functions – Income group heterogeneity



Note: Point estimates of the regression coefficients for the standardised average ETR with respect to each business function, as well as the respective 95% confidence intervals. The coefficients shown are the combined point estimates of the interaction terms for income groups as reported in Table A.4. Confidence intervals are based on joint significances of the relevant coefficients for each income group. Coefficients for each function are estimated in a separate regression. Income groups are defined based on GDP per capita as per the Atlas classification of the World Bank of 2019.

6.1. Tax incentives

Many jurisdictions offer tax incentives to promote and attract MNE investment. Tax incentives create favourable tax treatment for some activities or entities compared to the standard tax system. The use of tax incentives is widespread across jurisdictions and can generate low-taxed profit, also in jurisdictions

with high average tax rates (Hugger, González Cabral and O'Reilly, 2023[31]). Depending on the design of an incentive, the resulting preferential rate might matter more for the allocation of individual business functions than the average tax treatment of MNE profit in a jurisdiction.

Drawing on information on the distribution of ETRs within a jurisdiction this section investigates whether the availability of preferential tax rates impacts the composition of MNE functions in affiliate jurisdictions. Specifically, the fifth percentile of the ETR distribution taken from Hugger, Gonzalez Cabral and O'Reilly (2023[31]) is included as an additional regressor in the estimation model. The difference between the fifth percentile and the average ETR may be understood to proxy for the impact of tax incentives. The larger the difference between the two rates, the more generous the tax incentives offered in a jurisdiction. As jurisdictions offer many and often overlapping incentives, measures targeting particular tax incentives may only offer a partial picture of the tax incentive offered in a given jurisdiction. Some tax incentives also do not feature in the law but are signed in private contracts between the MNE and the tax administration. A key advantage of the fifth percentile variable is that it is comparable across the broad set of affiliate jurisdictions in the sample which may offer various types of tax incentives.

The estimations suggest that functions that are likely to be tangible-asset-intensive respond more to the lower end of ETR distributions, rather than average tax rates. The results are summarised in Table A.5.[17] For most functions, the coefficient on the average ETR retains the sign and significance level of the baseline model. The coefficient of the fifth percentile of the ETR distribution tends to be negative for functions that could be more asset-intensive, such as *Manufacturing, Purchasing,* and *Sales*, while it is positive for functions such as *Finance, Holding, Internal group Finance* and *Insurance.* This result nuances the findings of Section 5 that found little responsiveness of e.g. *Manufacturing* and *Sales* to taxation, but strong responses for some of the functions such as *Holding* and *Internal group finance*. This suggests that tax incentives do not seem to play a major role for the allocation of some functions that may be less asset intensive as they tend to be located in jurisdictions with lower average ETRs. In contrast, for functions that may be more asset intensive and that are more likely located in jurisdictions with higher average ETRs, reduced effective rates available under incentive regimes seem to matter more. The significant negative coefficient for the fifth percentile of the ETR distribution combined with a zero effect of the average ETR for *R&D* activities is also in line with the widespread use of incentives targeting such activities (González Cabral et al., 2023[34]; OECD, 2024[6]).

6.2. Loss carryover rules

Many jurisdictions allow companies to offset profits with losses from other years in the determination of the tax base, but the generosity of such rules varies across jurisdictions. To assess the impact of the generosity of loss carryover rules in affiliate jurisdictions, the baseline model is extended by a dummy for comparably generous loss carry forward regulation. The dummy splits the jurisdictions into groups based on the median number of years that loss carry-forwards are allowed.[18] The information on loss carryover regulation is taken from EY Worldwide Corporate Tax Guides, complemented with additional information from PwC, KPMG and Deloitte tax guides, and information from websites of tax authorities and investment agencies of individual jurisdictions.

The estimates suggest that the generosity of loss carry-forward rules plays a larger role for functions which may also carry more risk. The estimation results of Table A.6 show a positive and

[17] Results are robust to the use the median of the ETR distribution in affiliate jurisdictions instead of the average ETR in combination with the fifth percentile.

[18] The median number of years for which loss carry-forwards are allowed in the sample is five. The dummy takes the value of one if loss carry-forwards are allowed for a longer period, including infinite loss carry-forwards. While some jurisdictions also allow loss carry-backs, the use of loss carry-forwards is much more frequent.

highly significant coefficient on the dummy for generous loss carry-forward rules for *Finance, Holding,* and *Internal group finance.* More generous loss carry-forward rules thus increase the share of entities in a jurisdiction performing these functions which may be more finance oriented. For other more routine functions the inverse relationship is observed, with negative significant coefficients on the dummy for generous loss carry-forwards for *Manufacturing, Purchasing,* and *Sales.* The result of a higher importance of loss carryover rules for the more finance-oriented functions is in line with the idea that MNEs successfully shift risk away from routine functions such as *Manufacturing* or *Sales* which are more often located in jurisdictions with higher average ETRs. The risk is shifted towards entities more often located in lower tax jurisdictions, in line with the results from Becker, Johannesen and Riedel (2020[35]).

6.3. Base-protection measures

Many jurisdictions have adopted measures aiming to protect tax bases from base erosion and profit shifting practises. Two prominent examples are thin-capitalisation rules designed to reduce profit shifting via interest deductions and transfer pricing regulations ensuring that related party transactions are priced at arms-length. Both measures are also closely related to different actions of the OECD/G20 BEPS Project. To assess the relationship between these policies and business functions, a series of dummies is used, which take the value of 1 if the respective rule exists in a jurisdiction in a given year.[19] Adding these dummy variables and interacting them with the average ETR can provide some evidence on how such base-protection measure impact the importance of ETRs in the allocation MNE functions.

The results suggest that base-protection measures can reduce the responsiveness of MNE business functions to average ETRs. The existence of thin-capitalisation rules itself has little effect on the composition of functions within a jurisdiction as most coefficients on the dummy are not statistically significant (see Table A.7). In contrast, the interaction term between the dummy and the average ETR yields highly significant coefficients for most functions. For all functions except *Internal group finance*, the coefficient on the interaction term has the inverse sign of the coefficient on the average ETR – mostly it is also of comparable magnitude. For most functions, the combined coefficient is not statistically significantly different from zero (including for *Holding*), implying that the tax responsiveness of business functions is lower in jurisdictions with thin-capitalisation rules. In contrast, the tax responsiveness of *Internal group finance*, i.e. the entities where internal debt is issued from and which are thus typically thickly capitalised, is larger in jurisdictions with thin-capitalisation rules. For *IP* and *R&D*, however, the combined coefficient is also highly significant and negative. Potentially, this could mean that MNEs respond to the introduction of thin-capitalisation rules by reinforcing profit shifting via the strategic allocation intellectual property. Including the dummy capturing the existence of transfer pricing regulation and a corresponding interaction term with average ETRs yields similar, but slightly weaker result (see Table A.8). Again, most coefficients on the interaction term are of the opposite sign as the coefficients on the average ETR. This suggests that transfer pricing regulations may reduce the tax responsiveness of many MNE business functions, but it seems to also reinforce the responsiveness of *IP* and *R&D*.

[19] The Research School of International Taxation's (RSIT) International Tax Institutions (ITI) database provides dummy variables capturing the existence of thin-capitalisation rules and transfer pricing regulation in an affiliate jurisdiction. See Wamser et al. (2024[38]) for additional details on the ITI database.

7 Conclusions and policy implications

This paper draws on new data from aggregated CbCR statistics to investigate the relationship between the effective taxation of MNEs and the location of individual business functions. The analysis suggests that corporate taxation plays an important role in the allocation of some business functions of MNEs in our sample period. The initial descriptive analysis of aggregated CbCR data for the years 2017-2021 shows that MNEs tend to co-locate some functions such as *Sales* and *Services*, while other functions are rarely conducted in the same jurisdiction. Functions such as *Holding or Internal group finance*, also tend to be located in entities that pay lower effective rates. For functions such as *Manufacturing*, *Sales* or *Services*, tax seems to be less of a driver for location decisions since they are more frequently conducted in higher taxed entities.

A structured regression-based analysis confirms the relationship of effective taxation and the composition of business functions in affiliate jurisdictions. The regression analysis studies the relationship between average effective tax rates in affiliate jurisdictions and the shares of affiliates performing different business functions. The regression analysis points to negative relationship between ETRs and the share of affiliates performing finance-related functions such as *Holding* or *Internal group finance*. More routine functions such as *Manufacturing* or *Sales* are more likely to be located in jurisdictions with higher average ETRs. The broad patterns are robust throughout a large number of alternative specifications. There is evidence for heterogeneity across income groups, which suggests that tax competition has distinct patterns in jurisdictions of different levels of development. For instance, *Manufacturing* shows a higher tax sensitivity in lower middle- and low-income jurisdictions than in other income groups. At the same time, finance-related functions such as *Holding* or *Intro group finance* seem to respond to effective tax levels mainly within the group of high income jurisdictions. In upper middle income jurisdictions, higher taxes are associated with lower shares of *IP* and *R&D* functions more strongly than in high income jurisdictions, while most other functions seem less tax sensitive.

Additional analysis demonstrates that average ETRs capture only part of the effect of tax on the location of business functions. For instance, we find evidence that low ETRs, as proxies for generous tax incentives, matter more for activities related to *Manufacturing*, *Sales,* and *Services* than average ETRs. Other provisions of the tax code can also impact the allocation decisions of MNEs. More generous loss carry-forward regulation, for instance, increases the share of affiliates in a jurisdiction performing finance-oriented functions which may carry more risk. Base protection measures such as thin-capitalisation rules or transfer pricing regulation seem to reduce the tax responsiveness of many MNE business functions in affiliate jurisdictions but may reinforce the responsiveness of *IP* and *R&D* which are less impacted by these rules.

The findings in this paper may offer insights on the potential effects of the Global Minimum Tax (GMT). Since January 2024, a large number of jurisdictions implemented a minimum tax of 15% on the profit of large MNEs or are taking steps towards its implementation. The scope of the GMT is defined using a revenue threshold very similar to the threshold for CbCR such that the sample used for this paper is largely in scope of the GMT. The introduction of the GMT is a far-reaching reform of the international corporate tax system and may affect the role of taxation in the location decisions of MNEs. Based on data for a pre-GMT sample period, the results presented in this paper suggest that some business functions may be responsive to the effective taxation in affiliate jurisdictions. The GMT will reduce differences in

average tax rates between jurisdictions (Hugger et al., 2024[36]). In the dataset used in this paper, the standard deviation of the backward looking average ETR would be almost halved if the minimum tax rate of 15% were universally applied.

At given tax sensitivities, the reduced tax rate differentials under the GMT would reduce the incentive to allocate functions in certain jurisdictions for tax-related motives. This, in turn, could raise the relevance of non-tax factors in the allocation of MNE business functions. The allocation of functions that are found to be particularly sensitive to average ETRs, such as *Holding* or the provision of *Internal group finance*, may be impacted most by the introduction of the GMT. Jurisdictions with comparably low average ETRs before the introduction of the GMT might see the share of affiliates engaged in such functions decline over time as the relative tax advantage is reduced.

The allocation of other functions such as *Manufacturing, Sales* or *Services* might be less impacted by the introduction of the GMT as their allocation seems to be less driven by tax-related considerations. This could be reinforced by the carve-out based on economic substance in the GMT, implying that the effective taxation of more substance-heavy functions might be less impacted by the reform. Finally, some jurisdictions might use the impetus of the GMT for a broader reform of their CIT systems, including by reforming base-protection measures or their tax incentive structure. The results suggest that reforms of such individual provisions can interact with average ETRs in shaping MNE location decisions, as e.g. the strengthening of base-protection measures could reduce the tax responsiveness of some business functions.

Future research could expand the analysis in several directions. One option is to investigate tax responsiveness at the extensive margin, i.e., how taxation affects the decision of MNEs whether to locate an affiliate with a certain function in a jurisdiction rather than the composition of affiliate functions within jurisdictions. In addition, follow-up work could further consider the relationship between business functions and economic outcomes in jurisdictions.

References

Alstadsæter, A. et al. (2023), "The Real Effects of Tax Havens", *UCD Centre for Economic Research Working Paper Series*, Vol. WP23/21. [4]

Antràs, P. and A. Gortari (2020), "On the Geography of Global Value Chains", *Econometrica*, Vol. 88/4, pp. 1553-1598, https://doi.org/10.3982/ecta15362. [13]

Arkolakis, C. et al. (2018), *Innovation and production in the global economy*, American Economic Association, https://doi.org/10.1257/aer.20141743. [11]

Becker, J., N. Johannesen and N. Riedel (2020), "Taxation and the allocation of risk inside the multinational firm", *Journal of Public Economics*, Vol. 183, pp. 104-138, https://doi.org/10.1016/J.JPUBECO.2020.104138. [35]

Becker, J. and N. Riedel (2012), "Cross-border tax effects on affiliate investment-Evidence from European multinationals", *European Economic Review*, Vol. 56/3, pp. 436-450, https://doi.org/10.1016/J.EUROECOREV.2011.11.004. [19]

Beer, S., R. de Mooij and L. Liu (2020), "International Corporate Tax Avoidance: A Review of the Channels, Magnitudes, and Blind Spots", *Journal of Economic Surveys*, Vol. 34/3, pp. 660-688, https://doi.org/10.1111/JOES.12305. [3]

Belderbos, R. et al. (2016), "Where to Locate Innovative Activities in Global Value Chains: Does Co-location Matter?", *OECD Science, Technology and Industry Policy Papers*, No. 30, OECD Publishing, Paris, https://doi.org/10.1787/5jlv8zmp86jg-en. [10]

Bloom, N., R. Griffith and J. Van Reenen (2002), "Do R&D tax credits work? Evidence from a panel of countries 1979–1997", *Journal of Public Economics*, Vol. 85/1, pp. 1-31, https://doi.org/10.1016/S0047-2727(01)00086-X. [23]

Bratta, B., V. Santomartino and P. Acciari (2021), *Assessing profit shifting using Country-by-Country Reports: a non-linear response to tax rate differentials*, http://www.finanze.it/opencms/it/il-dipartimento/documentazione/Collana-di-lavori-e-. [42]

Celani, A., L. Dressler and M. Wermelinger (2022), "Building an Investment Tax Incentives database: Methodology and initial findings for 36 developing countries", *OECD Working Papers on International Investment*, No. 2022/01, OECD Publishing, Paris, https://doi.org/10.1787/62e075a9-en. [5]

Conte, M., P. Cotterlaz and T. Mayer (2022), *The CEPII Gravity Database Working Paper*, http://www.cepii.fr. [37]

Davies, R. and J. Markusen (2021), "What do multinationals do? The structure of multinational [12]

firms' international activities", *The World Economy*, Vol. 44/12, pp. 3444-3481, https://doi.org/10.1111/TWEC.13199.

de Mooij, R. and S. Ederveen (2008), "Corporate tax elasticities: a reader's guide to empirical findings", *Oxford Review of Economic Policy*, Vol. 24/4, pp. 680-697, https://doi.org/10.1093/oxrep/grn033. [16]

de Mooij, R. and L. Liu (2020), "At a Cost: The Real Effects of Transfer Pricing Regulations", *IMF Economic Review 2020 68:1*, Vol. 68/1, pp. 268-306, https://doi.org/10.1057/S41308-019-00105-0. [21]

Devereux, M. and R. Griffith (2003), "The Impact of Corporate Taxation on the Location of Capital: A Review", *Economic Analysis and Policy*, Vol. 33/2, pp. 275-292, https://doi.org/10.1016/s0313-5926(03)50021-2. [1]

Dowd, T., P. Landefeld and A. Moore (2017), "Profit shifting of U.S. multinationals", *Journal of Public Economics*, Vol. 148, pp. 1-13, https://doi.org/10.1016/J.JPUBECO.2017.02.005. [32]

Dyreng, S. et al. (2015), "The effect of tax and nontax country characteristics on the global equity supply chains of U.S. multinationals", *Journal of Accounting and Economics*, Vol. 59/2-3, pp. 182-202, https://doi.org/10.1016/j.jacceco.2015.01.003. [29]

Ellison, G., E. Glaeser and W. Kerr (2010), "What Causes Industry Agglomeration? Evidence from Coagglomeration Patterns", *American Economic Review*, Vol. 100/3, pp. 1195-1213, https://doi.org/10.1257/aer.100.3.1195. [15]

Feld, L. and J. Heckemeyer (2011), "FDI and taxation: A meta-study", *Journal of Economic Surveys*, Vol. 25/2, pp. 233-272, https://doi.org/10.1111/j.1467-6419.2010.00674.x. [2]

Fuest, C. et al. (2022), "Global Profit Shifting of Multi-national Companies: Evidence from CbCR Micro Data", *CESifo Working Paper*, Vol. No. 9757. [43]

Fuest, C., F. Hugger and F. Neumeier (2022), "Corporate profit shifting and the role of tax havens: Evidence from German country-by-country reporting data", *Journal of Economic Behavior & Organization*, Vol. 194, pp. 454-477, https://doi.org/10.1016/J.JEBO.2021.11.016. [41]

Gaessler, F., B. Hall and D. Harhoff (2021), "Should there be lower taxes on patent income?", *Research Policy*, Vol. 50/1, pp. 104-129, https://doi.org/10.1016/J.RESPOL.2020.104129. [25]

González Cabral, A. et al. (2023), "A time series perspective on income-based tax support for R&D and innovation", *OECD Taxation Working Papers*, No. 62, OECD. [34]

Griffith, R., H. Miller and M. O'Connell (2014), "Ownership of intellectual property and corporate taxation", *Journal of Public Economics*, Vol. 112, pp. 12-23, https://doi.org/10.1016/j.jpubeco.2014.01.009. [27]

Guceri, I. and L. Liu (2019), "Effectiveness of Fiscal Incentives for R&D: Quasi-experimental Evidence", *American Economic Journal: Economic Policy*, Vol. 11/1, pp. 266-91, https://doi.org/10.1257/POL.20170403. [24]

Hanappi, T. and D. Whyman (2023), "Tax and Investment by Multinational Enterprises", *OECD Taxation Working Papers*, No. 64, OECD Publishing, Paris, https://doi.org/10.1787/e817ce39-en. [22]

Helpman, E., M. Melitz and S. Yeaple (2004), "Export Versus FDI with Heterogeneous Firms", *American Economic Review*, Vol. 94/1, pp. 300-316, https://doi.org/10.1257/000282804322970814. [9]

Hugger, F. et al. (2024), "The Global Minimum Tax and the taxation of MNE profit", *OECD Taxation Working Papers*, No. 68, OECD Publishing, Paris, https://doi.org/10.1787/9a815d6b-en. [36]

Hugger, F., A. González Cabral and P. O'Reilly (2023), "Effective tax rates of MNEs: New evidence on global low-taxed profit", *OECD Taxation Working Papers*, No. 67, OECD Publishing, Paris, https://doi.org/10.1787/4a494083-en. [31]

IMF (2019), "The Rise of Corporate Market Power and its Macroeconomic Effects", *World Economic Outlook, April 2019 Growth Slowdown, Precarious Recovery*. [20]

Kano, L., E. Tsang and H. Yeung (2020), "Global value chains: A review of the multi-disciplinary literature", *Journal of International Business Studies*, Vol. 51/4, pp. 577-622, https://doi.org/10.1057/s41267-020-00304-2. [14]

Karkinsky, T. and N. Riedel (2012), "Corporate taxation and the choice of patent location within multinational firms", *Journal of International Economics*, Vol. 88/1, pp. 176-185, https://doi.org/10.1016/j.jinteco.2012.04.002. [26]

Laffitte, S. and F. Toubal (2022), "Multinationals' Sales and Profit Shifting in Tax Havens", *American Economic Journal: Economic Policy*, Vol. 14/4, pp. 371-396, https://doi.org/10.1257/pol.20200203. [28]

Millot, V. et al. (2020), "Corporate taxation and investment of multinational firms: Evidence from firm-level data", *OECD Taxation Working Papers*, No. 51, OECD Publishing, Paris, https://doi.org/10.1787/9c6f9f2e-en. [18]

OECD (2024), *Corporate Tax Statistics 2024*, OECD Publishing, Paris, https://doi.org/10.1787/9c27d6e8-en. [30]

OECD (2024), *Guidance on the Implementation of Country-by-Country Reporting: BEPS Action 13*, OECD, Paris, https://www.oecd.org/ctp/guidance-on-the-implementation-of-country-by-country-reporting-beps-action-13.pdf. [44]

OECD (2024), "OECD INNOTAX Portal on Tax Incentives for R&D and Innovation", https://stip-pp.oecd.org/innotax/. [6]

OECD (2023), "Income-based tax relief for R&D and innovation: An integrated view", *OECD Science, Technology and Industry Policy Papers*, No. 161, OECD Publishing, Paris, https://doi.org/10.1787/2db44e8b-en. [7]

OECD (2021), *Statement on a Two-Pillar Solution to Address the Tax Challenges Arising from the Digitalisation of the Economy*, OECD, Paris, https://www.oecd.org/tax/beps/statement-on-a-two-pillar-solution-to-address-the-tax-challenges-arising-from-the-digitalisation-of-the-economy-october-2021.pdf. [8]

OECD (2017), *Model Tax Convention on Income and on Capital: Condensed Version 2017*, OECD Publishing, Paris, https://doi.org/10.1787/mtc_cond-2017-en. [39]

Papke, L. and J. Wooldridge (1996), "Econometric Methods for Fractional Response Variables [33]

with an Application to 401 (K) Plan Participation Rates", *Journal of Applied Econometrics*, Vol. 11/6, pp. 619-632, https://doi.org/10.1002/(SICI)1099-1255(199611)11:6<619::AID-JAE418>3.0.CO;2-1.

Sztajerowska, M. (2021), *International Investment Agreements, Double-Taxation Treaties and Multinational Activity: The (Heterogeneous) Effects of Binding*, https://shs.hal.science/halshs-03265057. [17]

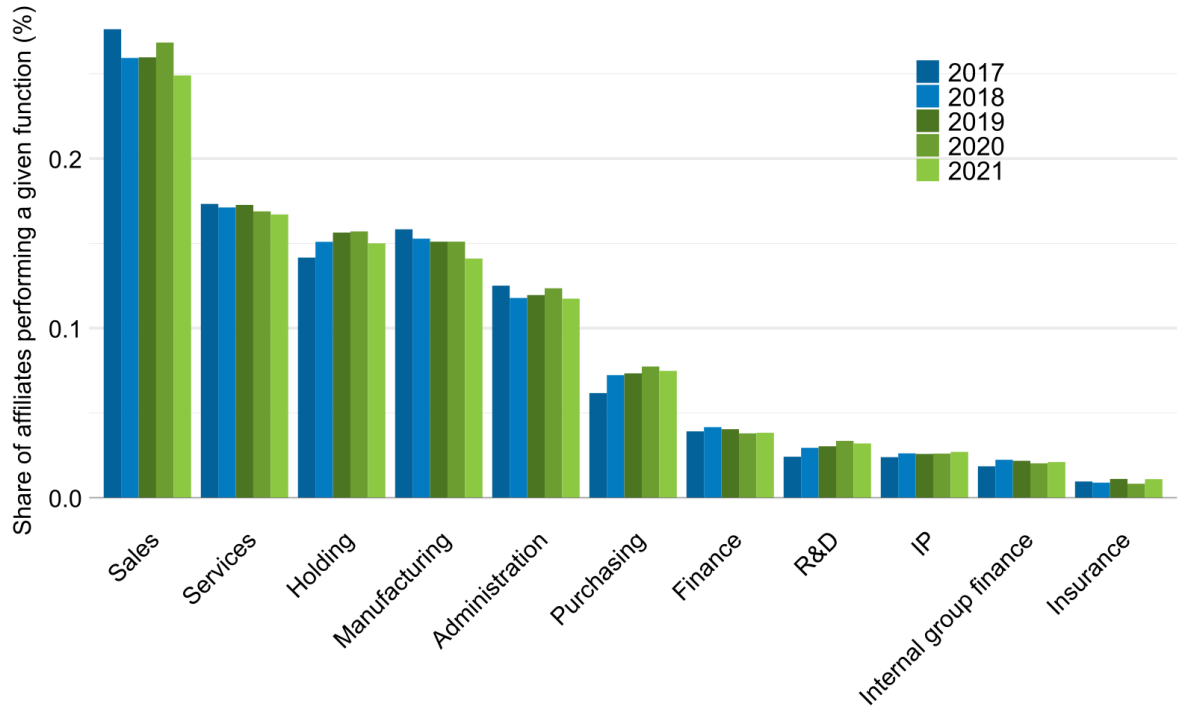
Tørsløv, T., L. Wier and G. Zucman (2023), "The Missing Profits of Nations", *The Review of Economic Studies*, Vol. 90/3, pp. 1499-1534, https://doi.org/10.1093/restud/rdac049. [40]

Wamser, G. et al. (2024), "The ITI database: New data on international tax institutions", RSIT-WP-05-24. [38]

Annexe A. Additional figures and tables

Annex Figures

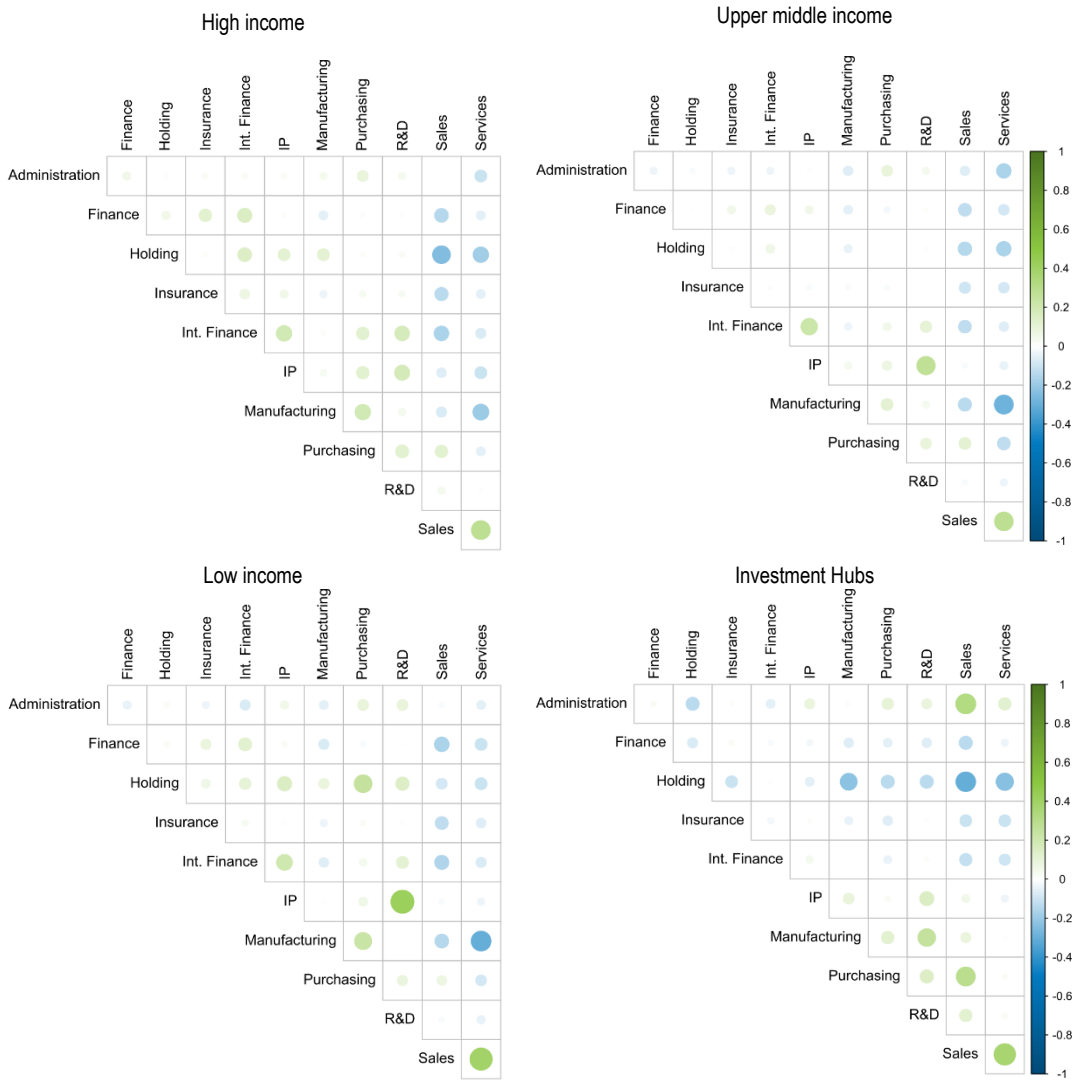
Figure A.1. Evolution of business function shares over time



Note: Global shares of affiliates engaged in each business function for each sample year (2017-2021). The underlying data comes from the anonymised and aggregated CbCR statistics (OECD, 2024[30]). Some UPE jurisdictions do not report all business functions.

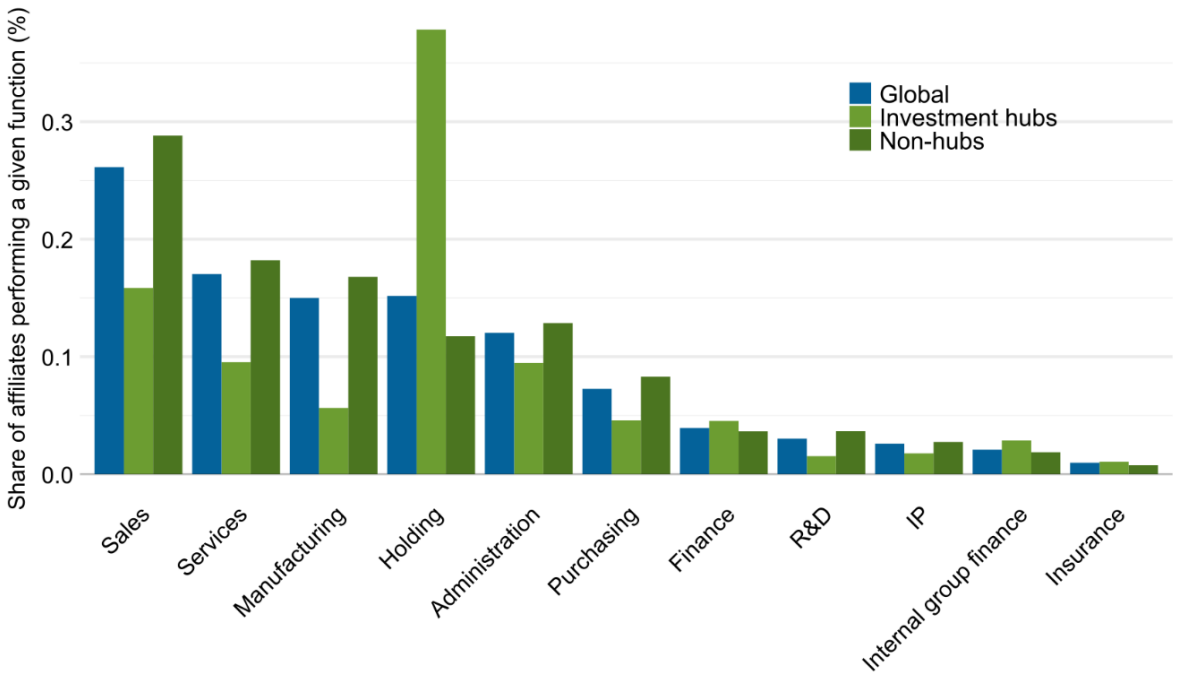
Figure A.2. Correlations between business function shares by income group

Colours indicate the sign of the correlation (blue=negative; green=positive); size indicates significance



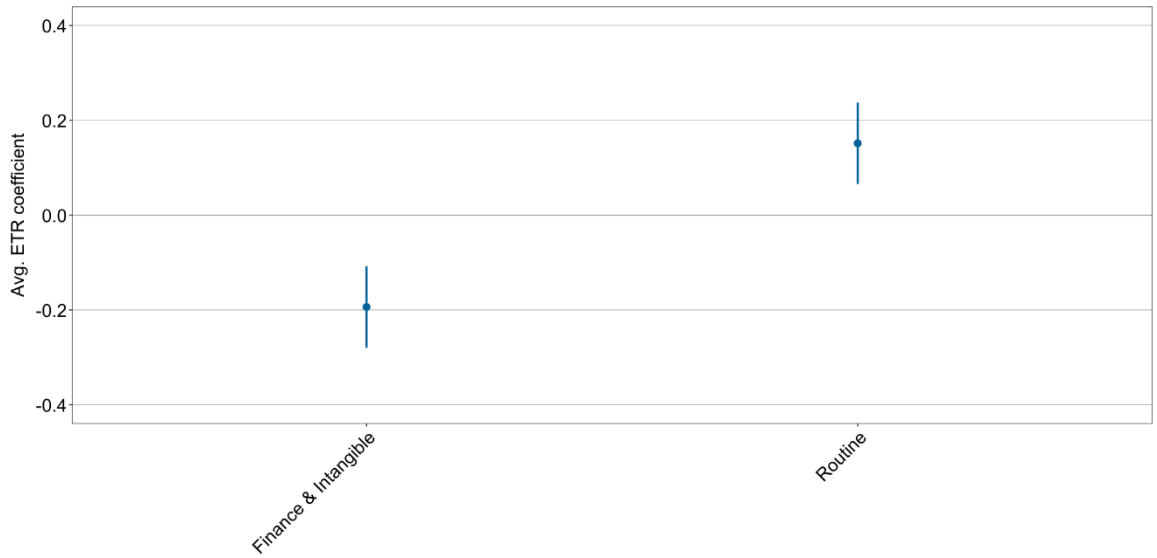
Note: Correlations between the shares of affiliates engaging in different business functions at the UPE-affiliate jurisdiction level, indicating the extent to which business functions are co-located, by income group of the affiliate jurisdiction. The colour of the dots indicates the direction of the correlations between the shares, where green (blue) indicates positive (negative) correlations. The size of the dots indicates the statistical significance of the relationship. The underlying data comes from the anonymised and aggregated CbCR statistics (OECD, 2024[30]) and is pooled across 2017-2021. Some UPE jurisdictions do not report all business functions.

Figure A.3. Share of affiliates performing different business functions



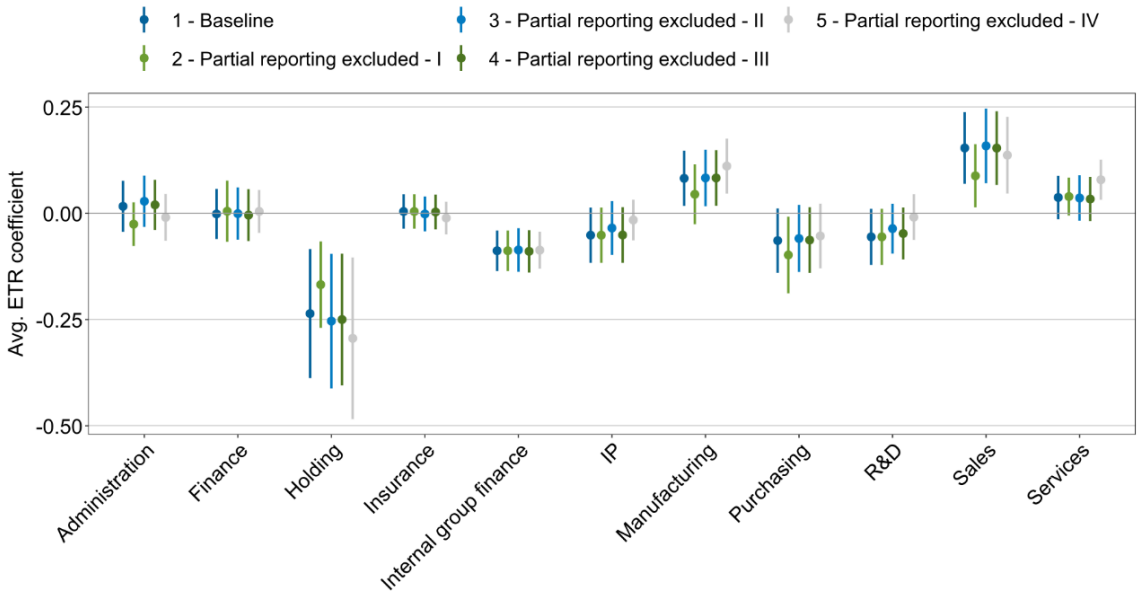
Note: Global shares of affiliates engaged in each business function for the sample years (2017-2021) for all affiliates (blue), affiliates located in investment hubs (light green), and affiliates located in non-hub jurisdictions (dark green). Investment hubs are defined based on an FDI to GDP ratio following Hugger, Gonzalez Cabral & O'Reilly (2023[31]). The underlying data comes from the anonymised and aggregated CbCR statistics (OECD, 2024[30]). Some UPE jurisdictions do not report all business functions.

Figure A.4. Effective tax rates and business functions – finance and intangible vs. routine functions



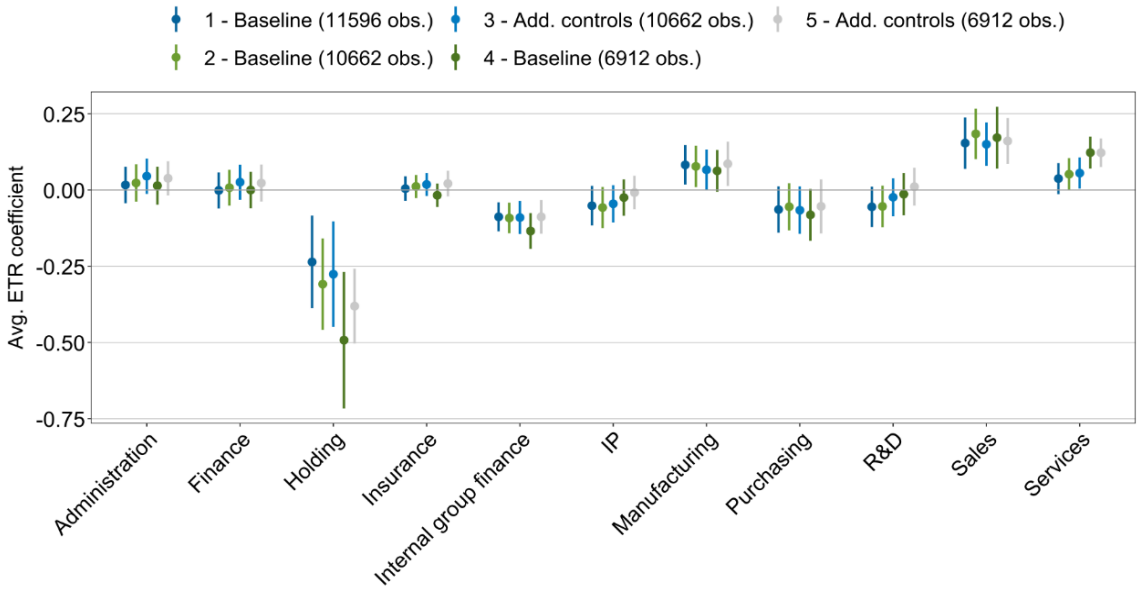
Note: Point estimates of the regression coefficients for the average effective tax rate with respect to each group of business functions, as well as the respective 95% confidence intervals. Each coefficient is estimated in a separate regression. Finance and intangible functions include *Finance*, *Holding*, *Int. finance*, *Insurance*, *IP*, *Other*, and *R&D*. Routine functions include *Admin*, *Services*, *Sales*, *Manufacturing*, and *Purchasing*. See Table B.1 for the coefficient estimates.

Figure A.5. Coefficient estimates for alternative samples



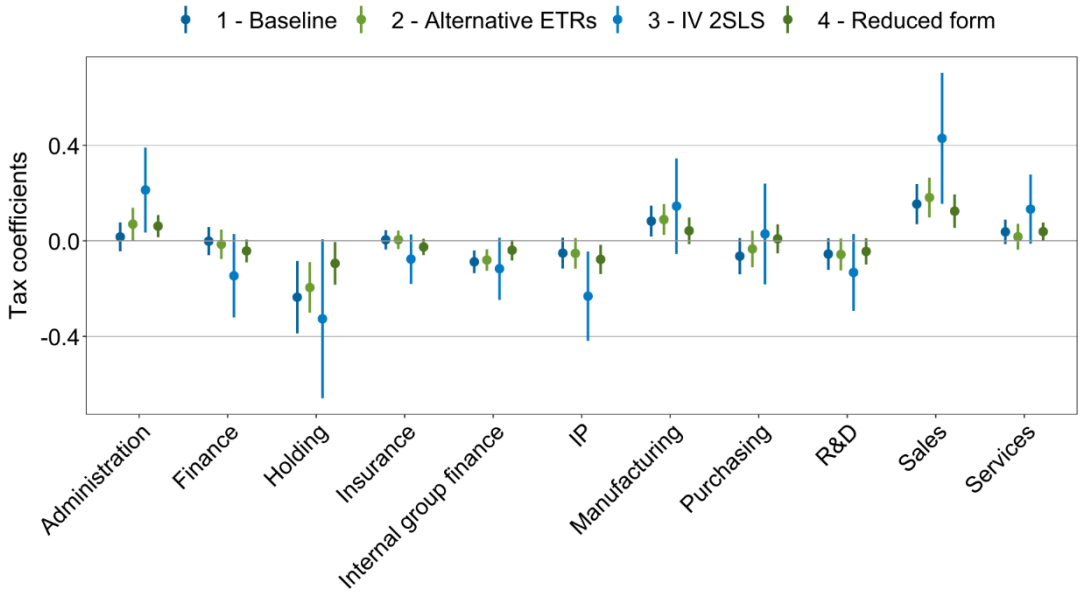
Note: Point estimates of the regression coefficients for the average effective tax rate with respect to each business function, as well as the respective 95% confidence intervals. Each coefficient is estimated in a separate regression. All models follow Equation (1) for different sample specifications. Model 1 (Baseline) reproduces the coefficients in Figure 5; Model 2 excludes observations where the number of affiliate functions is lower than the total number of affiliates; Model 3 excludes observations of MNEs with UPE in the US; Model 4 excludes observations of MNEs with UPE in Switzerland. Model 5 excludes domestic affiliates. See Table B.2-Table B.5 for the coefficient estimates.

Figure A.6. Coefficient estimates with additional control variables



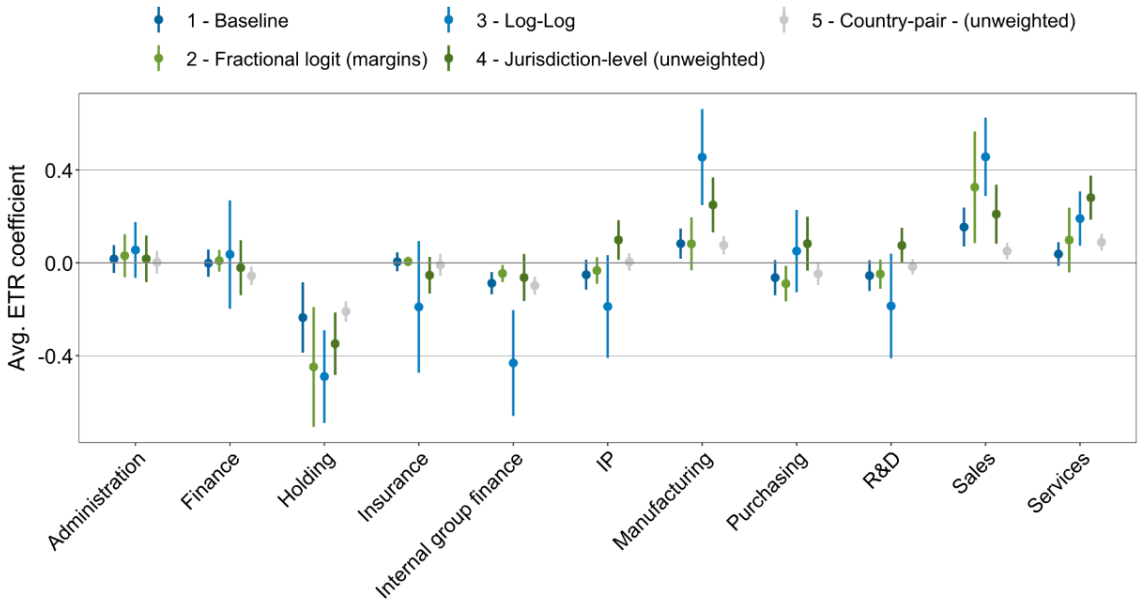
Note: Point estimates of the regression coefficients for the average effective tax rate with respect to each business function, as well as the respective 95% confidence intervals. Each coefficient is estimated in a separate regression. All models follow Equation (1) for different set of regressors. Model 1 (Baseline) reproduces the coefficients in Figure 5; Model 2 reproduces the same equation with the same set of regressors, but only for observations covered by the second set of regressors; Model 3 includes the second set of regressors (i.e., secondary school enrolment rate, the MNE wage level, the number of days required to start a business and the number of business procedure to do so, the unemployment rate and the Gini coefficient); Model 4 reproduces the baseline equation but on only for observation covered by the third set of regressors; Model 5 includes the third set of regressors (i.e., 10-year lags of jurisdiction-level sectoral shares of gross output among domestic firms). See Table A.1 for summary statistics and Table A.2 for an overview on the additional controls. See Table B.6 and Table B.7 for the coefficient estimates.

Figure A.7. Coefficient estimates for approaches addressing endogeneity concerns



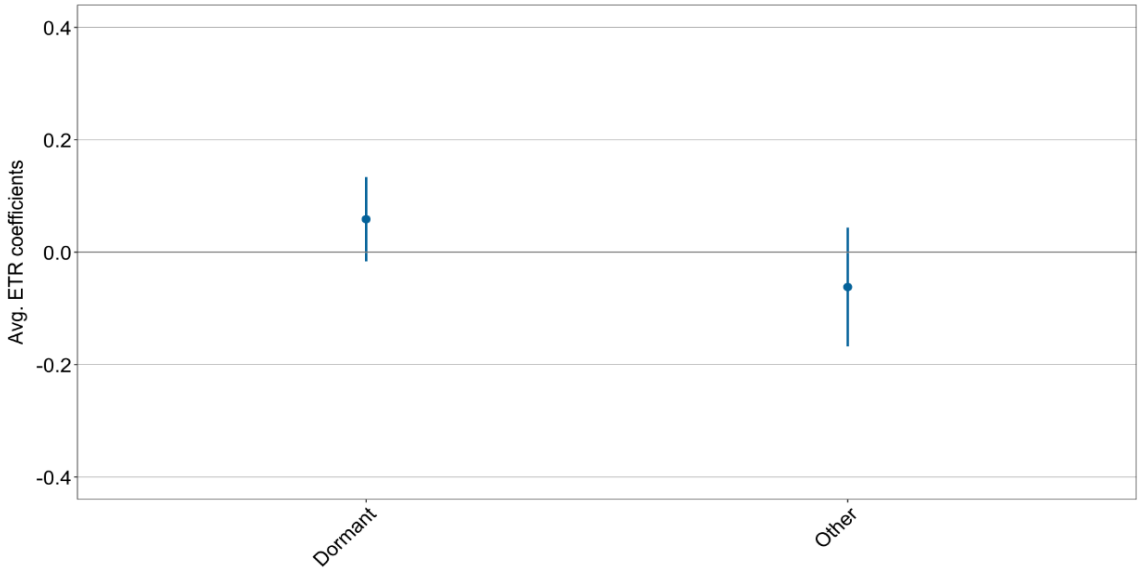
Note: Point estimates of the regression coefficients for effective tax rates with respect to each business function, as well as the respective 95% confidence intervals. Each coefficient is estimated in a separate regression. Model 1 (Baseline) follows Equation (1) and reproduces the coefficients in Figure 5; Model 2 uses an alternative backward-looking ETR measures where the ETR of the affiliates from the country-pair of interest are removed from the computation of the ETR of the destination-country. Model 3 instruments the backward-looking ETR by the forward-looking EATR; Model 4 presents the reduced form, where the forward-looking EATR is directly used as main tax regressors. See Table B.8 for the first stage of the IV and Table B.9-Table B.11 for the coefficient estimates presented in the figure.

Figure A.8. Coefficient estimates for alternative estimation approaches



Note: Point estimates of the regression coefficients for the average effective tax rate with respect to each business function, as well as the respective 95% confidence intervals. Each coefficient is estimated in a separate regression. Model 1 (Baseline) follows Equation (1) and reproduces the coefficients in Figure 5; Model 2 splits the shares with the log number of affiliate performing a given function as outcome variable and the log of the total number of affiliates as control. Model 3 uses a fractional logit model and shows the marginal effects estimated at the sample mean. See Table B.12-Table B.15 for the coefficient estimates.

Figure A.9. Tax sensitivity of Other and Dormant functions



Note: Point estimates of the regression coefficients for the average effective tax rate with respect to each business function, as well as the respective 95% confidence intervals. Each coefficient is estimated in a separate regression. The model used follows Equation (1) for the Dormant and Other functions.

Annex Tables

Table A.1. Summary statistics

	Mean	Median	SD	Min	Max	N
Panel A: Business function shares						
Share Manufacturing (in %)	13.31	9.36	16.60	0	100	11 597
Share Services (in %)	23.35	17.27	25.17	0	100	11 597
Share Sales (in %)	31.32	27.50	26.79	0	100	11 597
Share R&D (in %)	2.30	0.00	5.78	0	100	11 295
Share IP (in %)	1.97	0.00	5.72	0	100	11 295
Share Holding (in %)	8.62	2.07	15.69	0	100	11 597
Share Finance (in %)	2.83	0.00	7.82	0	100	11 597
Share Int. Finance (in %)	1.80	0.00	6.11	0	100	11 295
Share Insurance (in %)	1.50	0.00	5.37	0	100	11 295
Share Admin (in %)	10.55	7.97	14.25	0	100	11 597
Share Purchasing (in %)	5.44	2.21	8.81	0	100	11 597
Share Dormant (in %)	9.82	5.41	14.73	0	100	11 597
Share Other (in %)	13.20	6.90	18.80	0	100	11 597
Panel B: Main explanatory variables						
Bilateral distance (log)	8.42	8.76	1.08	2	10	11 597
Contiguity (dummy)	0.05	0.00	0.22	0	1	11 597
Common lang (dummy)	0.17	0.00	0.38	0	1	11 597
Colonial past (dummy)	0.06	0.00	0.24	0	1	11 597
GDP (log)	4.92	5.14	2.09	-2	10	11 597
Population (log)	9.33	9.35	2.13	2	14	11 597
Population squared (in bn)	47	0.13	280	136	2000	11 597
Internet users (in %)	71.98	79.72	23.15	2	100	11 597
Electricity access (in %)	93.11	100.00	17.51	4	100	11 597
GDP per capita (log)	9.39	9.46	1.36	6	12	11 597
GDP growth	0.05	0.05	0.12	-1	1	11 597
Rule of law (index)	0.32	0.29	0.97	-2	2	11 597
Corruption (index)	0.28	0.09	1.01	-2	2	11 597
Inflation (in %)	4.16	2.30	6.82	-1	40	11 597
Heritage foundation (index)	67.11	77.00	27.92	-1	100	11 597
FWL-EATR (in %)	21.37	22.95	8.89	0	48	11 597
Average BWL-ETR (in %)	17.29	18.35	8.78	0	46	11 597
p5 of BWL-ETR (in %)	4.89	2.32	5.76	0	28	11 597
Loss Carry-Forward (dummy)	0.51	1.00	0.50	0	1	11 597
Thin-Capitalization (dummy)	0.50	1.00	0.50	0	1	11 563
Transfer Pricing (dummy)	0.88	1.00	0.33	0	1	11,581

Note: For all variables, the table presents the mean, the median, the standard deviation (SD), the minimum and the maximum value and the number of observations. The underlying data on business function shares presented in Panel A comes from the anonymised and aggregated CbCR statistics (OECD, 2024[30]). The backward-looking average ETR follows the definition outlined in Section 3. The loss carry-forward, thin-capitalization and transfer pricing dummies follow the definitions outlined in Section 6.

Table A.2. Sets of regressors

	Set I	Set II	Set III	Source
Bilateral distance	✓	✓	✓	Gravity Database – CEPII
Contiguity	✓	✓	✓	Gravity Database – CEPII
Common lang	✓	✓	✓	Gravity Database – CEPII
Colonial past	✓	✓	✓	Gravity Database – CEPII
GDP (log)	✓	✓	✓	IMF and OECD databases
Population (log)	✓	✓	✓	IMF and OECD databases
Population squared	✓	✓	✓	IMF and OECD databases
Internet users	✓	✓	✓	World Bank – World Development Indicators
Electricity access	✓	✓	✓	World Bank – World Development Indicators
GDP per capita (log)	✓	✓	✓	IMF and OECD databases
GDP growth	✓	✓	✓	IMF and OECD databases
Rule of law (index)	✓	✓	✓	Heritage Foundation
Corruption (index)	✓	✓	✓	Heritage Foundation
Inflation	✓	✓	✓	IMF and OECD databases
Freedom House (index)	✓	✓	✓	Freedom House
Credit Rating	✓	✓	✓	S&P Global Ratings updates
Secondary School Enrolment Rate		✓	✓	World Bank – World Development Indicators
Gini		✓	✓	World Inequality Lab
Business Start Days		✓	✓	World Bank – B-READY database
Business Procedures		✓	✓	World Bank – B-READY database
AMNE			✓	OECD – AMNE database
Observations	11 597	10 662	6 912	

Note: The table presents all control variables used in Figure A.6, presents their sources and the corresponding number of observations covered in the regressions where the controls are included. The control variables at the bilateral level (bilateral distance, contiguity, common coloniser, and common language) are taken from the CEPII gravity dataset (Conte, Cotterlaz and Mayer, 2022[37]) The control variables at the affiliate jurisdiction level (GDP, GDP per capita, the trade share in GDP, and inflation) are taken from IMF and OECD databases. Government bond credit ratings are gathered from the 2017-2021 S&P Global Ratings updates and classified in four categories: AAA, Investment grade (AA to BBB), Speculative grade (BB to CC) and no notation.

Table A.3. Regression results – baseline specification

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	0.016	-0.001	-0.236***	0.004	-0.088***	-0.051	0.082**	-0.064*	-0.055*	0.154***	0.037
	(0.031)	(0.030)	(0.077)	(0.021)	(0.024)	(0.033)	(0.033)	(0.039)	(0.034)	(0.043)	(0.026)
log(GDP)	-0.697	1.391	-2.949**	-0.205	2.177	0.590	1.373*	0.245	0.298	0.717	-0.483
	(0.802)	(1.420)	(1.488)	(0.481)	(1.445)	(1.200)	(0.795)	(0.792)	(0.856)	(1.049)	(0.575)
log(Distance)	0.003	0.005	-0.007	-0.017*	-0.017	-0.005	-0.073***	-0.067***	-0.003	-0.013	0.010
	(0.016)	(0.014)	(0.030)	(0.010)	(0.010)	(0.023)	(0.018)	(0.021)	(0.016)	(0.023)	(0.009)
Contiguity	-0.004	0.099	-0.154	-0.034	-0.038	-0.072	-0.110	-0.137*	-0.033	-0.043	0.039
	(0.072)	(0.102)	(0.111)	(0.037)	(0.042)	(0.070)	(0.071)	(0.081)	(0.076)	(0.097)	(0.069)
Common language	0.022	0.196***	-0.006	0.085**	0.086**	0.005	-0.090*	0.043	-0.024	-0.184**	0.016
	(0.055)	(0.053)	(0.103)	(0.036)	(0.036)	(0.040)	(0.048)	(0.046)	(0.053)	(0.074)	(0.044)
Common coloniser	-0.181**	-0.331***	1.186***	-0.142*	-0.094*	0.152**	0.447***	0.291***	0.251***	-0.083	-0.095
	(0.073)	(0.101)	(0.245)	(0.074)	(0.053)	(0.065)	(0.090)	(0.096)	(0.071)	(0.089)	(0.059)
Log (Population)	0.316	-0.617	1.147*	0.049	-0.895	-0.154	-0.475	-0.034	0.017	-0.332	0.238
	(0.334)	(0.590)	(0.615)	(0.202)	(0.597)	(0.501)	(0.330)	(0.326)	(0.356)	(0.438)	(0.239)
Population squared	-0.000***	-0.000	-0.000	0.000	0.000***	0.000***	0.000	0.000	0.000**	0.000**	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Internet users	-0.004*	-0.007***	-0.010***	-0.002	-0.000	0.005**	-0.001	-0.000	-0.001	0.005*	0.001
	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.001)
Electricity access	0.008***	0.001	0.005	-0.004**	-0.005***	-0.007***	0.007***	0.006**	-0.003	0.006**	-0.009***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
log(GDPpc)	0.309	-0.566	2.185**	0.352	-1.134	-0.107	-0.790	-0.219	0.131	-0.695	0.250
	(0.489)	(0.871)	(0.908)	(0.289)	(0.890)	(0.740)	(0.495)	(0.497)	(0.522)	(0.641)	(0.354)
GDP growth	-0.112	-0.385**	0.237	-0.242***	-0.197	-0.133	0.044	0.208*	-0.047	-0.062	-0.065
	(0.110)	(0.179)	(0.217)	(0.091)	(0.238)	(0.178)	(0.128)	(0.125)	(0.098)	(0.120)	(0.081)
Rule of law (index)	-0.167	0.109	-0.048	-0.069	-0.261***	-0.305***	0.017	0.063	-0.035	0.089	0.121*
	(0.107)	(0.086)	(0.131)	(0.059)	(0.062)	(0.083)	(0.087)	(0.101)	(0.096)	(0.113)	(0.064)
Corruption (index)	0.321***	-0.149**	0.124	-0.023	0.191***	0.194***	-0.082	0.029	0.020	0.023	-0.042
	(0.101)	(0.058)	(0.108)	(0.041)	(0.041)	(0.065)	(0.064)	(0.073)	(0.064)	(0.088)	(0.055)
Inflation	-0.050**	-0.000	0.102**	-0.032	-0.005	-0.045**	-0.077***	-0.063**	-0.058**	-0.093***	-0.042**
	(0.023)	(0.026)	(0.040)	(0.027)	(0.022)	(0.023)	(0.026)	(0.031)	(0.023)	(0.034)	(0.017)
Freedom House index	-0.001	-0.001	0.003	0.000	0.003***	0.006***	-0.000	-0.003*	0.005***	-0.004***	-0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Domestic dummy	0.051	0.138*	0.155	-0.061	0.127**	0.047	-0.336***	-0.200**	-0.021	-0.419***	0.013
	(0.091)	(0.075)	(0.108)	(0.044)	(0.049)	(0.131)	(0.084)	(0.086)	(0.097)	(0.112)	(0.054)
Constant	-3.046	5.570	-8.886*	-0.057	7.616	0.966	3.012	-0.330	-0.675	2.050	-1.535
	(2.779)	(4.853)	(5.117)	(1.706)	(4.937)	(4.158)	(2.714)	(2.650)	(2.954)	(3.637)	(1.974)
Gov't credit risk dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	8 797	8 797	8 797	8 567	8 567	8 567	8 797	8 797	8 567	8 797	8 797
R^2	0.452	0.580	0.673	0.168	0.437	0.428	0.724	0.764	0.593	0.620	0.458

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4. Regression results – Income group heterogeneity

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	-0.017	-0.030	-0.418***	-0.011	-0.130***	-0.050	0.137***	-0.031	-0.015	0.215***	0.063**
	(0.032)	(0.039)	(0.087)	(0.025)	(0.029)	(0.040)	(0.040)	(0.042)	(0.044)	(0.048)	(0.029)
Avg. ETR x UMIC	0.182***	0.104*	0.507***	0.020	0.080***	-0.051	-0.082	-0.024	-0.139***	-0.110*	-0.095**
	(0.059)	(0.059)	(0.075)	(0.029)	(0.031)	(0.039)	(0.054)	(0.058)	(0.049)	(0.056)	(0.038)
Avg. ETR x L(M)IC	0.073	0.046	0.487***	0.037	0.091**	-0.034	-0.350***	-0.199***	-0.116	-0.223***	0.013
	(0.077)	(0.070)	(0.099)	(0.049)	(0.036)	(0.054)	(0.071)	(0.075)	(0.077)	(0.068)	(0.050)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11596	11596	11596	11294	11294	11294	11596	11596	11294	11596	11596
R^2	0.479	0.596	0.703	0.209	0.439	0.450	0.723	0.771	0.605	0.657	0.471

Note: *UMIC* and *L(M)IC* represent dummies for upper middle income jurisdictions and a combined group of lower middle and low income jurisdictions following the World Bank classification based on GNI per capita. Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A.5. Regression results – Tax incentives

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
p5 of ETR distr.	-0.076***	0.053*	0.078*	0.031***	0.010	-0.009	-0.103***	-0.101***	-0.064***	-0.128***	-0.024
	(0.026)	(0.030)	(0.041)	(0.011)	(0.014)	(0.021)	(0.023)	(0.027)	(0.024)	(0.029)	(0.018)
Avg. ETR	0.078**	-0.044	-0.299***	-0.023	-0.096***	-0.044	0.166***	0.017	-0.000	0.257***	0.057*
	(0.038)	(0.038)	(0.069)	(0.023)	(0.027)	(0.041)	(0.041)	(0.044)	(0.041)	(0.048)	(0.029)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11596	11596	11596	11294	11294	11294	11596	11596	11294	11596	11596
R^2	0.478	0.593	0.673	0.201	0.429	0.445	0.720	0.772	0.604	0.646	0.462

Note: *p5 of ETR distribution* represents the fifth percentile of the ETR distribution across MNE profit within an affiliate jurisdiction as estimated in (Hugger, González Cabral and O'Reilly, 2023[31]). Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6. Regression results – Loss carry forward rules

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Generous LCF	0.065	0.142***	0.280***	0.044	0.088***	-0.027	-0.189***	-0.152***	-0.025	-0.116**	-0.034
	(0.049)	(0.052)	(0.078)	(0.031)	(0.027)	(0.035)	(0.051)	(0.055)	(0.051)	(0.054)	(0.032)
Avg. ETR	0.008	-0.020	-0.272***	-0.001	-0.099***	-0.048	0.106***	-0.045	-0.052	0.169***	0.042
	(0.029)	(0.032)	(0.079)	(0.021)	(0.025)	(0.035)	(0.033)	(0.038)	(0.034)	(0.044)	(0.026)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11580	11580	11580	11278	11278	11278	11580	11580	11278	11580	11580
R^2	0.473	0.592	0.679	0.203	0.429	0.445	0.715	0.770	0.602	0.641	0.465

Note: *Generous LCF* represents a dummy for above-median length of loss carry-forwards allowed for in an affiliate jurisdiction. Standard errors in parentheses. Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.7. Regression results – Thin-capitalisation rules

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
TC rule	-0.188***	0.016	-0.040	-0.015	0.038	0.042	0.032	0.010	-0.008	0.016	0.011
	(0.042)	(0.053)	(0.085)	(0.027)	(0.036)	(0.040)	(0.036)	(0.039)	(0.049)	(0.058)	(0.030)
Avg. ETR	0.070*	-0.107**	-0.431***	0.008	-0.046	0.063*	0.197***	0.039	0.092**	0.297***	0.092***
	(0.042)	(0.050)	(0.091)	(0.030)	(0.031)	(0.036)	(0.041)	(0.047)	(0.039)	(0.055)	(0.032)
Avg. ETR x TC rule	-0.046	0.156**	0.301***	-0.003	-0.075**	-0.189***	-0.179***	-0.158***	-0.231***	-0.219***	-0.084**
	(0.050)	(0.064)	(0.099)	(0.035)	(0.036)	(0.041)	(0.041)	(0.045)	(0.055)	(0.063)	(0.035)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11596	11596	11596	11294	11294	11294	11596	11596	11294	11596	11596
R^2	0.478	0.593	0.673	0.201	0.429	0.445	0.720	0.772	0.604	0.646	0.462

Note: *TC rule* represents a dummy for the existence of thin-capitalisation rules in the affiliate jurisdiction taken from the ITI database (also see Wamser et al. (2024[38])). Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8. Regression results – Transfer pricing regulations

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
TP regulation	-0.105	-0.081	0.579***	-0.350**	0.035	-0.006	-0.007	0.145	-0.059	0.190*	-0.237***
	(0.096)	(0.115)	(0.194)	(0.147)	(0.088)	(0.078)	(0.108)	(0.097)	(0.079)	(0.103)	(0.071)
Avg. ETR	0.166**	-0.006	-0.979***	0.119	-0.052	-0.026	0.192**	0.076	0.068	0.333***	0.269***
	(0.082)	(0.097)	(0.197)	(0.104)	(0.067)	(0.056)	(0.081)	(0.081)	(0.059)	(0.103)	(0.063)
Avg. ETR x TP regulation	-0.153*	0.007	0.760***	-0.110	-0.039	-0.027	-0.114	-0.149*	-0.128**	-0.192*	-0.236***
	(0.080)	(0.099)	(0.197)	(0.102)	(0.064)	(0.058)	(0.076)	(0.077)	(0.064)	(0.100)	(0.060)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11580	11580	11580	11278	11278	11278	11580	11580	11278	11580	11580
R^2	0.473	0.592	0.679	0.203	0.429	0.445	0.715	0.770	0.602	0.641	0.465

Note: *TP regulation* represents a dummy for the existence of transfer pricing regulation in the affiliate jurisdiction taken from the ITI database (also see Wamser et al. (2024[38])). Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Annexe B. Tables for alternative specifications and robustness

Table B.1. Finance and intangible vs. routine functions

	(1) Routine	(2) Finance & Intangible
Avg. ETR	0.151*** (0.044)	-0.194*** (0.044)
Controls	Yes	Yes
UPE FE	Yes	Yes
Year FE	Yes	Yes
N	11596	11596
R^2	0.732	0.713

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Finance and intangible functions include *Finance*, *Holding*, *Int. finance*, *Insurance*, *IP*, *Other*, and *R&D*. Routine functions include *Admin*, *Services*, *Sales*, *Manufacturing*, and *Purchasing*. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.2. Partial reporting excluded I

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	-0.026 (0.026)	0.005 (0.037)	-0.168*** (0.052)	0.004 (0.021)	-0.088*** (0.024)	-0.051 (0.033)	0.045 (0.036)	-0.098** (0.046)	-0.055* (0.034)	0.088** (0.038)	0.039* (0.023)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11294	11294	11294	11294	11294	11294	11294	11294	11294	11294	11294
R^2	0.504	0.602	0.708	0.200	0.429	0.445	0.714	0.738	0.602	0.661	0.488

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. Observations relating to UPE-affiliate pairs where the total count of business functions is lower than the total number of affiliates are excluded. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.3. Partial reporting excluded II

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	0.028 (0.031)	-0.001 (0.031)	-0.254*** (0.081)	-0.002 (0.021)	-0.086*** (0.026)	-0.035 (0.032)	0.083** (0.034)	-0.059 (0.040)	-0.036 (0.030)	0.159*** (0.045)	0.036 (0.027)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	10938	10938	10938	10636	10636	10636	10938	10938	10636	10938	10938
R^2	0.487	0.599	0.679	0.210	0.428	0.458	0.721	0.776	0.615	0.643	0.498

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. Observations relating to UPE-affiliate pairs where the UPE is located in the United States are excluded. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.4. Partial reporting excluded III

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	0.020 (0.030)	-0.004 (0.031)	-0.250*** (0.079)	0.003 (0.021)	-0.089*** (0.025)	-0.051 (0.033)	0.083** (0.033)	-0.063 (0.039)	-0.048 (0.031)	0.154*** (0.044)	0.034 (0.026)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	10979	10979	10979	10680	10680	10680	10979	10979	10680	10979	10979
R^2	0.488	0.610	0.681	0.216	0.434	0.474	0.722	0.776	0.612	0.637	0.495

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. Observations relating to UPE-affiliate pairs where the UPE is located in Switzerland are excluded. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.5. Partial reporting excluded IV

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	-0.010 (0.028)	0.004 (0.026)	-0.294*** (0.097)	-0.011 (0.020)	-0.087*** (0.022)	-0.016 (0.024)	0.111*** (0.033)	-0.053 (0.039)	-0.009 (0.027)	0.137*** (0.046)	0.079*** (0.024)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11381	11381	11381	11084	11084	11084	11381	11381	11084	11381	11381
R^2	0.302	0.347	0.660	0.180	0.280	0.284	0.608	0.570	0.384	0.519	0.434

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. Observations relating to the UPE jurisdiction are excluded. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.6. Additional controls I

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	0.045 (0.030)	0.026 (0.029)	-0.276*** (0.088)	0.018 (0.019)	-0.090*** (0.028)	-0.045 (0.031)	0.066* (0.034)	-0.066* (0.040)	-0.024 (0.032)	0.150*** (0.036)	0.055** (0.026)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Add. Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector shares	No	No	No	No	No	No	No	No	No	No	No
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	10662	10662	10662	10380	10380	10380	10662	10662	10380	10662	10662
R^2	0.516	0.639	0.651	0.236	0.448	0.465	0.719	0.782	0.614	0.709	0.451

Note: Additional controls are secondary school enrolment rate, the MNE wage level, the number of days required to start a business and the number of business procedures to do so, the unemployment rate and the Gini coefficient. Sector shares refer to a set of 10-year lags of jurisdiction-level sectoral shares of gross output among domestic firms. See Table A.1 for summary statistics and Table A.2 for an overview on the additional controls. Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.7. Additional controls II

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	0.038 (0.028)	0.023 (0.031)	-0.381*** (0.063)	0.021 (0.021)	-0.088*** (0.028)	-0.009 (0.028)	0.086** (0.037)	-0.054 (0.045)	0.011 (0.032)	0.161*** (0.038)	0.122*** (0.024)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Add. Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector shares	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	6912	6912	6912	6672	6672	6672	6912	6912	6672	6912	6912
R^2	0.412	0.510	0.749	0.312	0.372	0.345	0.675	0.643	0.466	0.703	0.499

Note: Additional controls are secondary school enrolment rate, the MNE wage level, the number of days required to start a business and the number of business procedures to do so, the unemployment rate and the Gini coefficient. Sector shares refer to a set of 10-year lags of jurisdiction-level sectoral shares of gross output among domestic firms. See Table A.1 for summary statistics and Table A.2 for an overview on the additional controls. Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.8. Instrumental variables, first stage

	(1)	(2)	(3)
	BWL-ETR	BWL-ETR	BWL-ETR
EATR	0.289***	0.335***	0.464***
	(0.039)	(0.027)	(0.116)
Model	Dyadic	Dyadic – Partial reporting excluded I	Destination-jurisdiction level
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
UPE FE	Yes	Yes	No
N	11596	11294	981
R2	0.83	0.84	0.67
F-Stat	219.0	290.1	53.9

Note: The table presents the first stage of the Instrumental Variable regressions (2SLS in Figure A.7). The dependent variable of the first stage is the backward-looking ETR and is regressed on its instrument, the EATR. Predicted values of the backward-looking ETR are used in the second stage to control for endogeneity concerns. Controls include the same covariates as for the baseline regression. Columns (1) and (2) includes the first stage for Model 1 (Baseline) in Figure A.7. Column (2) represents the first stage for the following business functions: *R&D*, *IP*, *Internal Group Finance* and *Insurance* as they exclude data from US MNEs from the estimation sample due to incomplete data for these shares. Column (3) indicates the first stage with the dataset collapsed at the destination-jurisdiction level. Standard errors in parentheses, * p < 0.10, ** p < 0.05, *** p < 0.01.

Table B.9. Alternative average ETR

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Alternative avg. ETR	0.070**	-0.015	-0.196***	0.004	-0.080***	-0.053	0.089***	-0.034	-0.057*	0.181***	0.017
	(0.035)	(0.031)	(0.054)	(0.020)	(0.023)	(0.033)	(0.033)	(0.039)	(0.034)	(0.043)	(0.028)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11596	11596	11596	11294	11294	11294	11596	11596	11294	11596	11596
R^2	0.474	0.592	0.670	0.200	0.428	0.445	0.715	0.768	0.602	0.640	0.460

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.10. IV estimation

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	0.213**	-0.147*	-0.326*	-0.077	-0.117*	-0.232**	0.145	0.029	-0.133	0.429***	0.132*
	(0.091)	(0.089)	(0.170)	(0.053)	(0.066)	(0.096)	(0.102)	(0.108)	(0.082)	(0.140)	(0.074)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11597	11597	11597	11295	11295	11295	11597	11597	11295	11597	11597
R^2	0.449	0.587	0.670	0.195	0.428	0.433	0.713	0.767	0.600	0.611	0.453

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.11. Reduced form

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
EATR	0.062***	-0.042*	-0.094**	-0.026	-0.039*	-0.078**	0.042	0.008	-0.044	0.124***	0.038**
	(0.024)	(0.024)	(0.046)	(0.018)	(0.022)	(0.031)	(0.028)	(0.031)	(0.028)	(0.036)	(0.019)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11596	11596	11596	11294	11294	11294	11596	11596	11294	11596	11596
R^2	0.475	0.592	0.666	0.201	0.426	0.448	0.714	0.767	0.602	0.637	0.462

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.12. Fractional logit

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	0.293	0.241	-3.833***	0.426	-1.690**	-0.984	0.676	-1.400**	-1.242	1.814***	0.709
	(0.451)	(0.654)	(1.102)	(0.794)	(0.685)	(0.874)	(0.483)	(0.603)	(0.821)	(0.690)	(0.512)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11597	11597	11597	11295	11295	11295	11597	11597	11295	11597	11597

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.13. Log-log specification

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Log(avg. ETR)	0.055	0.036	-0.490***	-0.190	-0.432***	-0.188*	0.455***	0.051	-0.186	0.457***	0.191***
	(0.061)	(0.119)	(0.102)	(0.145)	(0.116)	(0.113)	(0.106)	(0.091)	(0.115)	(0.086)	(0.060)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	7297	4103	5690	2939	3108	3757	7548	6119	4056	9193	8699
R^2	0.977	0.949	0.965	0.882	0.944	0.951	0.964	0.967	0.962	0.968	0.967

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.14. Jurisdiction-level regression

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	0.017	-0.021	-0.349***	-0.054	-0.063	0.098**	0.249***	0.082	0.075*	0.210***	0.281***
	(0.051)	(0.060)	(0.068)	(0.040)	(0.051)	(0.043)	(0.060)	(0.059)	(0.039)	(0.065)	(0.048)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1037	1037	1037	1037	1037	1037	1037	1037	1037	1037	1037
R^2	0.006	0.033	0.189	0.016	0.024	0.023	0.107	0.035	0.046	0.064	0.138

Note: Standard errors (in parentheses) are clustered at the affiliate jurisdiction level. Observations are weighed based on the number of affiliates they represent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.15. Unweighted jurisdiction-pair regression

	(1) Admin	(2) Finance	(3) Holding	(4) Insurance	(5) Int. Finance	(6) IP	(7) Manu-facturing	(8) Purchasing	(9) R&D	(10) Sales	(11) Services
Avg. ETR	0.032	-0.438***	-3.294***	-0.048	-0.603***	0.022	1.261***	-0.418*	-0.100	1.354***	2.235***
	(0.358)	(0.158)	(0.353)	(0.128)	(0.121)	(0.112)	(0.344)	(0.213)	(0.098)	(0.495)	(0.467)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UPE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11596	11596	11596	11294	11294	11294	11596	11596	11294	11596	11596
R^2	0.089	0.162	0.277	0.085	0.138	0.080	0.249	0.146	0.134	0.476	0.538

Note: Standard errors (in parentheses) are clustered at the UPE-affiliate jurisdiction pair level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.