Treasure MAPs? How Governmental Cooperation Shapes Income Shifting

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February 2025

ABSTRACT

Abstract: An increase in globalization in recent decades has placed growing importance on intergovernmental cooperation. Firms increasingly must adjust their operations across multiple jurisdictions, with each jurisdiction having their own set of rules. I examine firms' cross-border tax behavior in the presence of a dispute resolution mechanism. This process for dispute resolution relates to a specific tax treaty provision, Mutual Agreement Procedures, which allow governments to resolve tax disputes outside of the normal legal process. I find that income shifting is stronger for subsidiaries with more access to Mutual Agreement Procedures. This association is stronger for smaller firms that may be less able to take advantage of traditional unilateral resolution mechanisms. My results are important to regulators and policymakers, such as the OECD, which continues to push for countries to implement more effective MAPs.

I thank my committee: Cristi Gleason (Co-chair), Jaron Wilde (Co-chair), Ryan Wilson, Paul Hribar, Martin Jacob, and Bradford Hepfer. I also thank Jillian Adams, Harald Amberger, and the participants at the 2023 Deloitte Doctoral Consortium, Workshop participants at the University of Georgia, Texas A&M University, University of Illinois Urbana-Champaign, Binghamton University, Texas Christian University, and the Office of Financial Research for helpful comments.

1. INTRODUCTION

Tax cooperation is increasingly politically relevant and important. As over 140 jurisdictions work to agree on a set of international tax rules known as Pillar 1 and Pillar 2, headwinds have arisen. Specifically, the election of Donald Trump as president in 2024 has shifted the discussion about international taxes in several ways. First, the Trump administration has imposed tariffs on close trading partners and allies (Canada and Mexico). This marks one of the largest increases in trade taxes in U.S. history (Irwin 2025). Second, the administration position as it relates to the Pillar 1 and Pillar 2 proposals by the Organization for Economic Development has cast doubt over the future of the agreement and the related rollback of Digital Service Taxes (Soong and Velarde 2024). Under this backdrop, the effects of international cooperation in tax are now more important than ever.

Although there are several types of international tax cooperation (e.g. Tax Treaties, Advanced Pricing Agreements, Information Sharing Agreements), I study a provision of tax treaties known as Mutual Agreement Procedures (MAPs) which allow countries to resolve issues of double taxation. MAPs provide countries with flexibility in resolving taxation disputes and offer companies an attractive means of avoiding double taxation by facilitating the resolution of cross-border transfer pricing disputes. Firm's income shifting in response to MAPs is important to document because MAPs are a key policy tool to facilitate globalization. I provide evidence consistent with higher levels of income shifting when firms have greater access to MAPs. This finding highlights a potential unintended consequence of MAPs, as tax treaties specifically aim to "prevent fiscal evasion with respect to taxes" (Tax Convention with Chile).

As globalization has increased, countries have increasingly turned to supragovernmental organizations to facilitate cooperation.[1] One area in which intergovernmental cooperation is often initiated is reducing tax evasion.[2] According to a survey conducted in 2015, 75 percent of multinational corporations believed that making unilateral tax law changes in anticipation of supragovernmental recommendations would lead to double taxation (Deloitte 2015). In 2021, 54 percent of firms reported experiencing double taxation resulting from these changes (Deloitte 2021). By 2024, 84 percent of executives surveyed expressed a moderate or significant risk of facing double taxation (EY 2024). As the likelihood of double taxation increases, the anticipated benefits of MAPs also increase, as they provide firms with another option to reduce or eliminate double taxation that may occur during audits of cross-border transactions. In fact, 46 percent of executives surveyed stated that MAPs would be "very useful," an increase of 13 percentage points from the previous year (EY 2024). MAPs provide firms with additional means to address double taxation arising from audits of cross-border tax transactions. If firms anticipate that MAPs offer more favorable outcomes, they will take riskier tax positions, holding all else constant. My objective is to determine whether firms' access to MAPs is associated with increased tax avoidance behavior, using income shifting as a proxy.

Despite the clear benefits to firms under MAPs, it is uncertain whether access to MAPs would lead to increased levels of income shifting by firms. First, engaging with the MAP process can be costly. According to OECD reporting, it takes an average of over two years to reach a final resolution after applying for relief under a MAP, and there is no guarantee of a resolution. When considering that a firm must first be audited and double taxation imposed before applying

[1] See, for example, the Organization for Economic Development's Base Erosion and Profit Shifting Project (Tax Enforcement), The Kyoto Protocol and Paris Climate Agreement (Climate Change Policy), and World Health Organization's COVAX initiative.
[2] See, for example, https://www.oecd.org/tax/beps/about/. visited 9/7/2023.

for a resolution under a MAP, the time to resolution becomes even longer, this creates a significant period of uncertainty for firms. Second, to receive benefits under a MAP, firms must undergo a tax audit. Since audits are relatively rare, firms may not attach much importance to resolution mechanisms, even if the benefits would be substantial. Last, there may be other resolution mechanisms that are more significant to firms, such as, Bilateral Advanced Pricing Agreements that provide firms with ex-ante certainty in transfer pricing decisions. Traditional unilateral legal remedies may also be more appealing. The public nature of court decisions can provide firms with greater certainty about the expected outcome if there are previous cases. In contrast, MAP outcomes are private and not subject to public disclosure.

One of the most common purposes for MAPs is to eliminate double taxation resulting from transfer pricing. If firms believe that they will achieve more favorable outcomes from an audit under a MAP, it can be expected that they will engage in more income shifting. This connection between the existence of a MAP and a firm's transfer pricing outcomes provides a strong setting to study how alternate dispute resolution mechanism alter firms' behavior. In this study, I examine the relation between access to MAP agreements and subsidiary behavior using a sample of 108,634 European subsidiaries across 34 countries between 2013 and 2021. To investigate the association between MAPs and income shifting, I employ a modified version of the standard income shifting model (Hines and Rice 1994; Huizinga and Laeven 2008). I find that subsidiaries with greater access to MAPs tend to engage in more income shifting. For a subsidiary with an incentive to shift income, a one standard deviation increase in access to MAPs results in an increase in *Pre-Tax Income* of between 0.4 and 1.7 percent.[3] Although the magnitude is small in absolute terms, it is comparable in magnitude to the main effect of income

[3] See sections 5.1 and 5.2 for details.

shifting. A firm with no access to MAPs whose incentive to shift increases by one standard deviation reports a 0.5 to 3 percent increase in *Pre-Tax Income.*

My findings are important to policy makers and regulators such as the OECD and European Union as they attempt to implement changes to MAPs that make them more effective while at the same time implementing rules aimed at reducing the amount of tax-motivated income shifting. I also contribute to the growing literature on the determinants of income shifting and international tax avoidance (e.g., Beer, De Mooji, and Liu 2020) by examining an intergovernmental determinant. Previous research as focused on examining firm characteristics (Amberger and Osswald 2020; De Simone, Klassen, and Seidman 2016; Hopland, Lisowsky, Mardan, and Schindler 2014) or country-level characteristics (Markle 2016), Managerial Characteristics (De Vito, Hillman, Jacob, and Vosseburger 2023), or disclosure requirements (Edwards, Hutchens, and Persson 2021; Joshi 2020; Nessa, Persson, Song, Towery, and Vernon 2022). An intergovernmental setting is important as income shifting is inherently a country-pair level phenomenon. I also contribute to the literature on tax treaties. Tax treaty studies often examine foreign direct investment (FDI), as pointed out by West and Wilkinson (2023). I study a separate outcome of treaties, income shifting, which has received less attention than FDI but should be considered as countries continue to enter into tax treaties.

2. INSTITUTIONAL BACKGROUND AND RELATED LITERATURE

2.1 Tax Treaties

Tax treaties serve as a bridge for individuals or companies operating between two countries to reconcile differences in tax law and definitions. The use of tax treaties is widespread. Currently, there are over 3,000 tax treaties in force between countries, making them a key feature of the

international tax system (OECD 2020). Among members of the G20, Argentina (26) has the fewest treaties, while the United Kingdom (135) has the most (West and Wilkinson 2023).

Treaties serve various purposes, including reducing double taxation, facilitating information sharing between countries, establishing sourcing rules and tax rates, withholding for international income, and creating dispute resolution mechanisms. In a recent press conference in Liechtenstein, Government Councilor Hasler advocated for a double tax treaty to her counterpart from Croatia. She specifically noted that such a treaty "would add value to the bilateral relations between Liechtenstein and Croatia and promote economic exchange" (Liechtenstein 2024). Similarly, the U.S. State Department highlighted that the recent U.S./Chile tax treaty would create stronger business ties between the two countries (U.S. State Department 2023). On the other hand, the absence of a tax treaty between Taiwan and the United States has hindered investment in semiconductors (Hayashi 2023).

Two features of tax treaties are particularly important for my study: Mutual Agreement Procedures (MAPs) and Bilateral Advanced Pricing Agreements (Bilateral APAs). Both are facilitated by tax treaties and serve as ways to eliminate transfer pricing disputes and double taxation. Although both Bilateral APAs and MAPs share a similar goal, and are often invoked under the same treaty articles, I choose to focus on MAPs. As an ex-post remedy to double taxation, a MAP provision should affect all firms' expectations of the costs and benefits of income shifting. On the other hand, Bilateral APAs act as an ex-ante firm-level solution to transfer pricing disputes and only offer relief to the small number of firms who take preemptive action. Under Bilateral APAs, firms engage with both countries before undertaking a transaction to determine the appropriate transfer price, thereby eliminating uncertainty around the issue. I discuss both of these features in the following sections.

2.2 Mutual Agreement Procedures

In general, a MAP is a mechanism used to resolve cases of double taxation that occur in transactions between countries that have a tax treaty.[4] Instead of providing specific definitions or agreements between countries, a MAP simply states that the countries will work together to resolve any issues related to double taxation. For instance, the OECD's model tax convention includes a Mutual Agreement Procedure, which states:

> *The competent authorities of the Contracting States shall endeavour to resolve by mutual agreement any difficulties or doubts arising as to the interpretation or application of the Convention. They may also consult together for the elimination of double taxation in cases not provided for in the Convention. (OECD 2017)*

When an individual or a company that operates in both treaty countries is subject to tax on the same income in both countries (double taxation), that taxpayer can apply for a resolution of this issue through a MAP. Double taxation often results from transfer pricing audits. When a company is involved in transactions between two territorial countries, an audit in one country only adjusts one side of the transaction. As a result, there can be an increase in revenue (or a decrease in expenses) in the audited country without an offsetting increase in expenses (or decrease in revenue) in the non-audited country. This practice leads to the creation of income that is subject to taxation in both countries.

Firms have raised concerns about the possibility of double taxation in recent years. According to a 2015 survey of multinational firms, 75 percent of firms either agreed or strongly agreed that double taxation would occur due to unilateral tax changes in response to OECD recommendations (Deloitte 2015). Additionally, 79 percent of the firms believed that double

[4] See Appendix B for a detailed example of the interaction between MAPs and transfer pricing

taxation would arise specifically from the OECD changes (Deloitte 2015). One company stated that the most significant areas of change for their business would include an "increased compliance burden, more audits, more double taxation, more competent authority/arbitration activity" (Deloitte 2015). In 2021, the same survey found that 54 percent of firms agreed that their group had experienced double taxation as a result of unilateral tax law changes (Deloitte 2021).

MAPs are a unique form of intergovernmental cooperation. Instead of the firm negotiating individually with each country, the competent authorities (who are generally distinct from tax auditors or revenue agents) from the two countries negotiate with each other to determine an outcome for the firm. Countries ostensibly agree to cooperate and resolve double taxation disputes under a MAP; however, in practice, the negotiation between the two countries to resolve a MAP is a zero-sum game. If double taxation is eliminated, an increase in one country's taxable base results in a decrease in the other negotiating country. Since typical tax-motivated income shifting often leads to recognizing more income in lower-tax countries, this means that the low-tax country will negotiate for a taxpayer-favorable resolution. To the extent that the low-tax country has more bargaining power than the taxpayer, the taxpayer will be better off engaging with the MAP process than through the traditional legal process, where the taxpayer negotiates, adversarily and individually, with both countries. Thus, the firm becomes something of a bystander in the negotiations. Once the negotiations are completed, the firm has the option to accept or reject the proposed resolution.

There are reasons to believe that the traditional legal remedies may be less appealing than MAP resolutions. First, under the traditional legal system, the firm must negotiate with tax auditors or revenue agencies, whose goals are opposite of the firm. Under a MAP, the

negotiations are done by competent authorities. While competent authorities may still fall under the jurisdiction of the taxing agency, they are not the same individuals who assessed the additional tax. Second, competent authorities are not bound by domestic law and can negotiate settlements that may not be possible under through domestic remedies. Finally, resolution under a MAP does not always exclude other resolution mechanisms under domestic law. If a taxpayer is dissatisfied with the result of the MAP negotiations, they can reject the MAP resolution and, in some cases, use unilateral domestic remedies.

As an ex-post resolution, MAPs also offer advantages within the current tax enforcement system. The audit rates for corporate tax returns are generally low. For instance, the Internal Revenue Service (IRS) reports that it audited less than 1 percent of corporate tax returns and only 15.8 percent of the largest corporate tax returns (with over $20 billion in assets) (IRS 2024). When firms face a low risk of audit, ex-post resolution mechanisms become more beneficial as they allow firms to engage in aggressive tax behavior and maintain a high probability of retaining the benefits of avoidance if they are not audited. In the event of an audit, firms can then take advantage of the ex-post resolution system to avoid double taxation.

Despite these benefits, there are reasons to believe that engaging with MAPs is not beneficial for firms. The MAP process does not guarantee a better resolution than unilateral domestic remedies. According to OECD statistics, between 14.8 and 17.0 percent of closed MAP cases result in no relief.[5] Assuming that engaging with the MAP process is costly, firms may be worse off than if they don't engage at all, with the largest costs being time and uncertainty. The average time to resolve MAP cases can exceed two years. This timeframe suggests that there

[5] See Appendix B, Table B1, Panel A (2.53 cases, on average, result in No relief per year out of an average of 14.91 closed cases per year) and Table B1, Panel B (0.44 cases on average result in No relief per year, with an average of 2.98 closed cases per year).

could be a significant gap between when a taxpayer takes a tax position, that position is audited, and the taxpayer receives relief under a MAP agreement. For example, the IRS' audit of Microsoft transfer pricing activity in Puerto Rico is already 10 years old, with the assessment of additional tax being entered in 2023 (Kiel 2023). There is also indirect evidence that the MAP process may be costly. First, there are relatively few MAP cases per year, with the average country having just 25 new cases per year according to OECD statistics. Additionally, both the OECD and the EU have tried to streamline and reduce the burden on taxpayers engaging in the MAP process.

2.3 Bilateral Advanced Pricing Agreements

Bilateral APAs serve as an alternative to MAPs. Under a Bilateral APA, the firm negotiates with the countries before the transaction is finalized. This provides the taxpayer with certainty that both countries agree on the final price and generally protects the issue from future audits (related to the covered transaction) while the Bilateral APA is in effect.

At first glance, it may seem that a Bilateral APA would always be preferable to relying on a MAP. However, there are reasons why a firm may choose not to engage in the Bilateral APA process. Taxpayers have cited the cost of a Bilateral APA as one of the disadvantages (Longley and Serrano 2023). These costs may be monetary but can also be the cost of forgone tax benefits. As an ex-ante resolution, Bilateral APAs may not allow the taxpayer to take the most aggressive position. If the taxpayer is too aggressive in its application for a Bilateral APA, the countries may refuse to agree to a Bilateral APA. Second, and related, if a firm proposes a transaction and the request is not granted, it may provide the revenue agency with a roadmap for future audits or trigger an examination. For this reason, some countries allow applications for Bilateral APAs to be submitted anonymously (Wrappe, Hartman, Taheri, and Reboulet 2024). In

a comment letter by former IRS directors, they note that anonymous filings encourage firms to bring new or emerging transfer pricing issues to the IRS, and that eliminating or restricting anonymous initial filings may cause taxpayers to avoid the process altogether (Ackerman et al. 2014). This suggests that the costs of a Bilateral APA are greater than the benefits unless there is anonymity. Similar to MAPs, the use of Bilateral APAs appears to be limited to a select group of firms. According to an EU report on the use of APAs, most countries that allow Bilateral APAs had fewer than ten active at the end of 2021. Even significant economies such as France (40) and Germany (51) had relatively low numbers of Bilateral APAs in force. Importantly, unlike MAPs, only firms that engage with the Bilateral APA process up front can benefit, thus the number of Bilateral APAs currently in force for a country represents the maximum number of firms which may currently be benefiting from a Bilateral APA.

2.4 Income Shifting

Income shifting is a strategic choice by firms to use intercompany pricing decisions to recognize more income in low-taxed jurisdictions and more expenses in higher-taxed jurisdictions with the intent of reducing their overall tax burden. Klassen and Laplante (2012) show that US firms have become more aggressive income shifters over time. A growing body of prior research has examined various determinants of income shifting such as territorial taxation (Markle, 2016), loss firms (De Simone, Klassen, and Seidman 2016; Hopland, Lisowsky, Mardan, and Schindler 2014), personal income tax rates (De Vito, Hillman, Jacob, and Vosseburger 2023), third-party reporting (Edwards, Hutchens, and Persson 2021), and intellectual property (Amberger and Osswald 2020).[6]

[6] This list is not intended to be exhaustive; see Beer, De Mooij and Liu (2020) for a review of the international tax avoidance literature.

As concerns about income shifting have risen, so to have governmental and supra-governmental responses. The OECD Base Erosion and Profit Shifting (BEPS) Project is a multilateral attempt to reduce income shifting while still allowing countries to compete for investment that involves over 130 countries. Although certain aspects of the BEPS Project have been implemented, major changes to international taxation are still being planned. When examining the OECD's proposals, prior research has largely focused on the effects of private country-by-country reporting (Joshi 2020; Nessa, Persson, Song, Towery, and Vernon 2022) and public country-by-country reporting (Eberhartinger, Speitmann, Sureth-Sloane 2020; Brown 2020; Brown, Jorgensen, and Pope 2019; Joshi, Outslay, Persson, Shevlin, and Venkat 2020; Overesch and Wolff 2021).

3. HYPOTHESIS DEVELOPMENT

The impact of MAPs on income shifting is uncertain, tax treaties can either disadvantage firms if they specify suboptimal transfer pricing rules or benefit firms by enhancing tax certainty through dispute resolution mechanisms like MAPs (Davies 2004). Previous research has primarily focused on tax treaties and MAPs in the context of foreign direct investment (FDI) (West and Wilkinson 2023; Davies 2004). Bond and Gresik (1996) model increased government cooperation and find that cooperation increases welfare for both governments and firms. Blonigen, Oldenski, and Sly (2014) find that bilateral tax treaties lead to higher FDI and intercompany sales for firms with challenging arm's length valuations for inputs. However, Louie and Rousslang (2002) argue that the impact of treaties on FDI is the result of correlated omitted variables. They find that controlling for a country's governance characteristics eliminates the effect of treaties on FDI.

According to OECD reports on MAPs, more than half of all MAP cases are related to transfer pricing. This suggests that transfer pricing carries the risk of double taxation and that

domestic remedies may not always be sufficient to eliminate double taxation. The high percentage of MAPs related to transfer pricing also demonstrates that firms believe that resolving issues through MAPs will provide a better solution than relying solely on domestic remedies. However, despite the increasing number of MAP cases reported by the OECD, only a fraction of firms actually participate in the MAP process. This low usage rate may be due to the fact that a firm must be audited and have an audit assessment before it would benefit from engaging with the MAP process.

I expect that MAPs primarily influence firm behavior because firms anticipate better resolutions under a MAP, rather than directly affecting transfer pricing. If firms believe that audits with a MAP available will lead to more favorable outcomes for taxpayers, they should engage in more income shifting. This expectation is consistent with (1) 46 percent of executives surveyed believing MAPs are highly useful (EY 2024) and (2) at most 4.1 percent of subsidiaries in my sample engaging with the MAP process in 2021.[7]

In their theoretical framework, Form, Oestreicher, and Schwager (2023) model the interaction between MAPs and income shifting. They predict that when there is a large tax rate differential between two countries, the presence of a MAP will result in firms engaging in more income shifting. While there are reasons why MAPs may not always be effective, as discussed in Section 2.3, there are very few circumstances where a MAP would lead to a worse outcome. Therefore, I state my hypothesis in the alternative form as follows:

Subsidiaries with more access to MAPs will engage in greater levels of income shifting.

[7] See Table 8 for more details. For 2021, there are 3,382 open MAP cases and my sample contains 82,274 Unique subsidiaries (4.1 percent). This percentage ranges from a high of 34.8 percent for Denmark to a low of 0 percent for Estonia on a per country basis.

4. METHODOLOGY AND DATA

4.1 Mutual Agreement Procedures

I collect information on MAPs from the OECD reports for 2017–2021. Countries report various statistics regarding their MAPs to the OECD every year.[8] I collect data on the number of MAP cases, the number of new cases between countries, the number of resolved cases, and the type of resolution.[9] Since my primary focus is on how MAPs affect firms' income shifting incentives, I focus on MAP cases related to transfer pricing disputes. I define a country as having MAPs if they report at least one transfer price-related MAP case with any country between 2017 and 2021 and define a country-pair as having a MAP if they report at least one transfer price-related case between 2017 and 2021. I report additional information and statistics on the data collection process and MAPs in Appendix C.

4.2 Empirical Specification

To empirically test the relation between MAPs and a firm's incentive to shift income from countries with high statutory tax rates to countries with low statutory tax rates, I use the following specification (Hines and Rice 1994; Huizinga and Laeven 2008; Markle 2016; De Simone 2016; De Simone et al. 2017; Joshi et al. 2020):

$$ln(Pre-Tax\ Income_{i,s,p,z,t}) = \beta_0 + \beta_1 C_{i,t} + \beta_2 Weighted\ Average\ MAP_{i,t} + \beta_3 C_{i,t} \times Weighted\ Average\ MAP_{i,t} + Subsidiary\ Controls_{i,t} + Country\ Controls_{s,t} + Parent\ Fixed\ Effects_i + Year\ Fixed\ Effects_p + Industry\ Fixed\ Effects_z + \varepsilon \quad (1)$$

[8] See https://www.oecd.org/tax/dispute/2021-map-statistics-germany.pdf for an example of an OECD report

[9] The OECD MAP reports give statistics on MAP cases on a lag. The first report year (2017) has detailed MAP case statistics for cases started in 2016. Although they report summary statistics for MAP cases before 2016 in aggregate, the reporting is not broken down by country-pairs which is necessary for my research design.

I measure the dependent variable, ln(*Pre-Tax Income*), as the natural log of *Pre-Tax Income* for subsidiary *i,* in country *s*, in industry *z*, with parent *p*, in year *t*. Following Huizinga and Laeven (2008), I proxy for a subsidiary's incentive to engage in tax motivated income shifting by constructing their composite tax rate (C_{it}). C_{it} measures a firm's incentive to shift income out of the subsidiary country *s*. C_{it} is a weighted average tax rate differential and is defined as:

$$C_{it} = \frac{1}{1-\tau} \frac{\sum_{k \neq i}^{n} (\frac{B_k}{1-\tau_k})(\tau_i - \tau_k)}{\sum_{k}^{n} (\frac{B_k}{1-\tau_k})} \quad (2)$$

Where τ_{it} is the statutory tax rate of subsidiary *i* in year *t,* and τ_{kt} is the statutory tax rate for subsidiary *k* in year *t*, and *n* is the number of subsidiaries controlled by the parent *p*.[10] The differences between subsidiary tax rates are weighted by B_k, which is either subsidiary total revenue or subsidiary capital. The weighting variable proxies for the magnitude of income that could be shifted into or out of subsidiary *k*. A negative C_{it} indicates that subsidiary *i* has a lower statutory tax rate than other subsidiaries of the parent firm, and the parent firm has an incentive to shift income into subsidiary *i.* In other words, a negative value of *C* represents an incentive to shift income into the subsidiary, while a positive value of *C* represents an incentive to shift income out of the subsidiary. A negative coefficient on β_1 implies subsidiaries generally engage in tax motivated income shifting.

To match the construction of *C,* I create a MAP variable defined at the subsidiary-year level. I define *Weighted Average MAP* as the weighted average number of MAPs that Subsidiary *i* has with all other subsidiaries of parent *p*, weighted by either subsidiary revenue or subsidiary

[10] I collect corporate statutory tax rates from the KPMG corporate tax rates table (https://kpmg.com/it/it/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html; accessed 6/21/2023) for the years 2013–2020. I supplement these data with corporate tax rates from De Simone (2016) for the year 2012, who also used KPMG corporate tax rate statistics, but these are no longer available online through KPMG. I collect corporate statutory rates from the OECD for the 2021 tax year.

capital. I define a subsidiary pair as having a MAP if at least one open transfer pricing case is reported to the OECD between 2017 and 2021 for the country pair. To aid in interpreting the coefficients, I standardize *Weighted Average MAP* in my regressions to have a mean of 0 and a standard deviation of 1. I use 2017 to 2021 to define my MAP variable, as those are the years with detailed OECD reports available to identify open cases between countries. Although MAP agreements are defined at the country-pair level, my regressions and outcome variable are defined only at the subsidiary-year level, which prohibits me from using a simple indicator for the presence of a MAP agreement. A subsidiary *i* can have a MAP with subsidiary *k*, but not with subsidiary *j*. It is possible that two countries could have a MAP in place but no cases for any of these years. Petutschnig and Zhang (2023) highlight the importance of the effectiveness of MAPs. To the extent that countries where a MAP exists but there are no cases, it could signal that the MAP between the two countries may be ineffective or unnecessary. If MAPs are ineffective, they should not affect income shifting. If firms change behavior based on MAPs but do not seek to/need to use the process, my results may understate the effect that MAPs have on income shifting.

One concern with using Weighted Average MAP as a variable of interest is its correlation with tax treaties. The OECD model tax treaty contains a MAP provision, so it is possible that all countries that engage in double tax treaties also have MAPs by default. To examine whether all treaties have MAPs, I hand-collect treaty information for two countries: Germany, a large G7 country, and Romania, a smaller eastern European country. Figure 1 presents both MAPs between countries and tax treaties for these two countries. In Figure 1, Panel A, the European countries with tax treaties with Germany are shown in orange, while countries with both tax treaties and MAPs are shown in green. Germany has many MAPs, although they are primarily

concentrated in Western Europe and with larger countries. Each of the G7 members in Europe (Germany, Italy, France, and the United Kingdom) have MAPs with each other. Figure 1, Panel B shows the MAP agreements for Romania. Although Romania has a MAP with Germany and Italy, it does not have one with France or the United Kingdom, also members of the G7. These figures provide anecdotal evidence that both countries with many MAPs and countries with few MAPs have tax treaties without MAPs.

The variable of interest in my test is the interaction between C_{it} and *Weighted Average* $MAP_{it,}$ coefficient β_3, which estimates the effect on subsidiary pre-tax profit for subsidiaries that have an incentive to engage in tax motivated income shifting and have a larger proportion of MAP agreements within the parent group. If MAPs give subsidiaries more certainty in tax cases or provide better resolutions when tax authorities challenge positions, I expect there to be a negative and significant coefficient on the interaction term.

Following prior literature, I construct my control variables assuming that firms follow a Cobb-Douglas production function in which labor and capital are the determinants of subsidiary income (Hines and Rice 1994; Huizinga and Leaven 2008). I control for subsidiary wages (*Wages*) and subsidiary tangible property (*Tangible Assets*). Additionally, intangible assets are an important part of firms' profitability, and so I also control for subsidiary intangible assets *(Intangible Assets*). Because not all intangible assets are reported on the balance sheet, my measure of intangible assets may understate intangible assets if a firm has significant self-created intangibles. I control for subsidiary leverage (*Leverage*) which both indicates the investment opportunities of the subsidiary and relates to interest expense which reduces income. I control for country-level variables to control for country effects on subsidiary productivity by including *GDP Growth*, GDP per Capita (*GDP per capita*), and inbound *Foreign Direct Investment*. As

resolutions under MAP agreements are by their nature outside of the traditional court system, I control for the World Bank Control of Corruption Score (*Control of Corruption Score*). Finally, in my main specification, I include several fixed effects. I include Parent fixed effects to control for the time-invariant parent characteristics, Industry fixed effects to control for time-invariant industry characteristics of subsidiaries, and finally, Year fixed effects to control for changes over time. As prior research has noted potential bias in highly saturated fixed effects models, I examine the robustness of my results to alternative fixed effect specifications. (Jennings, Kim, Lee, and Taylor 2023; Breuer and deHaan 2023). I define all variables in Appendix A.

4.3 Sample Selection and Descriptive Statistics

I begin my sample with 455,507 unconsolidated subsidiary-years in the Orbis Europe database with total assets greater than $100,000, sales greater than $1,000, non-missing values for my relevant control variables, and positive pre-tax income between 2012 and 2021. Since my primary focus is shifting between subsidiaries of the same parent, I exclude firms for which parent information is missing. My sample period matches the years for which I have statutory country tax rate data and for which Orbis is well populated.[11] I further remove subsidiary-years where either the parent or subsidiary is located outside Europe (15,050 subsidiary-years) to ensure proper coverage of firms by Orbis and subsidiaries in regulated industries (34,448 subsidiary-years) as they have unique tax and regulatory aspects which may change income shifting incentives.[12] My final sample contains 406,009 subsidiary-year observations for 94,818

[11] Due to the construction of the Orbis Database, Orbis generally drops firm-years older than 10 years from the database. I end in 2021 as Orbis has a two-year delay in adding new firm years.
[12] Although my final sample includes only European subsidiaries, I keep all subsidiaries when calculating my income shifting variable, *C*.

subsidiaries that are controlled by 22,680 parent firms. I report these sample cuts in Table 1, Panel A along with the number of subsidiaries and parents for each cut.

Table 1, Panel B describes the number of subsidiaries and parent firms by country. The number of subsidiaries and parents varies by country, depending on both the firms within a country and the regulatory reporting requirements within each country. Consistent with prior literature, I find that the countries with the most subsidiaries [parents] are France (17,236 [2,083]), Italy (14,976 [3,761]), Spain (10,023 [1,988]), and Germany (7,488 [2,836]). Table 2, Panel A provides descriptive statistics for my sample. On an unweighted basis, subsidiaries have MAPs with an average (median) of 38.2 (33.3) percent of subsidiaries in the same parent group (untabulated). When weighted (by either sales or capital), the average decreases slightly, indicating that subsidiaries with smaller weights are more likely to have MAPs. *C* is slightly positive for both weighting variables at both the average and median. My sample's average (median) subsidiary is small, with only $11.4 million ($915,000) in pre-tax income. Subsidiaries have more tangible property than intangible property, with an average of $13.3 million of tangible fixed assets and only $3.0 million of intangible fixed assets.[13] Table 2, Panel B presents correlations between variables with Pearson on top and Spearman on the bottom. These correlations are calculated on the demeaned variables to show the within fixed effect correlation between variables. The correlation between *C* and *Pre-tax Income* is positive, highlighting the importance of controlling for the production function. *Wages, Tangible Assets,* and *Intangible Assets* are all positively correlated with income as expected.

[13] In Appendix D, I report selected descriptive statistics of my regression variables demeaned by my fixed effects, as suggested by Breuer and deHaan (2023).

5. RESULTS

5.1 Main Results

I test the relation between MAPs and income shifting behavior by estimating model (1). I report the results of the regression in Table 3. In column (1), I report the results of model (1) with *C* and *Weighted Average MAP* variables weighted by sales while column (2) reports the results using sales weighted *C* variable and an un-*Weighted Average MAP*. In both columns, I find that the coefficient on *C* × *Weighted Average MAP* is negative ($p < 0.01$), indicating that when subsidiaries have more access to MAPs and have an incentive to shift income to the subsidiary, they will report greater income. The coefficient on *C* is negative in both columns ($p > 0.10$, $p < 0.01$, respectively), indicating that when firms have lower tax rates than other subsidiaries in their parent group, they tend to have higher incomes. The coefficient on *Weighted Average MAP* is negative and significant in both columns ($p < 0.01$). Firms with more access to MAPs generally report lower levels of income when there is no incentive to shift. The coefficients on *Wages*, *Tangible assets*, and *Intangible Assets* are positive and significant ($p < 0.01$), indicating a positive return on capital and wages. The coefficient on *Leverage* is negative and significant ($p < 0.01$) indicating that the income decreasing interest expense dominates higher expected returns from leverage. The coefficient on *GDP Growth* is negative and significant ($p < 0.01$). Overall, my results are consistent with Hypothesis 1, when firms have greater access to MAP resolution mechanisms, they engage in more income shifting behavior, in equilibrium.

In terms of magnitude, for a firm with an incentive to shift income (i.e. at the 25th percentile of *C),* a one standard deviation increase in *Weighted Average MAP* will increase *Pre-*

Tax Income between 0.7 (Column 1) and 0.4 (Column 2) percent.[14] Although this amount is small in absolute terms, it is large in terms of overall income shifting. In Column (1), I find that a one standard deviation decrease in *C* (a decrease in *C* increases the incentive to shift) increases *Pre-Tax Income* by 0.7 percent (-0.052 × -0.138) when a firm has no access to MAPs. In column (2) the estimate is greater, with a one standard deviation decrease equating to a 3.1 percent increase in income.

5.2 Robustness Tests

In Table 4, I report several alternative specifications. In column (1), I replace ln(*Pre-Tax Income)* with ln(*EBIT).* Although one form of income shifting relates to debt shifting between subsidiaries, MAPs appear most relevant to transfer pricing based on OECD reports (Huizinga, Laeven, and Nicodeme 2008). To remove the income shifting effects of debt, I use ln(*EBIT).* I find that access to MAPs continues to be related to income shifting, even before the effects of interest. The coefficient on *C* × *Weighted Average MAP* is negative and significant at the one percent level. In column (2), I change both *C* and *Weighted Average MAP* to be weighted by Capital instead of Sales. The coefficient *C* × *Weighted Average MAP* continues to be negative and significant *($p < 0.01$).*

Prior literature notes that incorrectly specified fixed effects models introduce bias in coefficients of interest (Jennings et al. 2023; Breuer and deHaan 2023). To examine whether the results of my model are due to the specific set of fixed effects in my model, I test two alternative fixed effects models that have been used in prior income shifting studies. Column (3) of Table 4, I examine a more saturated Parent×Year and Industry×Year model. In column (4), I examine a

[14] I use the 25th percentile for calculations of magnitude for ease of interpretation. The value of *C* at the 25th percentile for my sample is 0.011.

model that uses only Parent and Year fixed effects. In both columns (3) and (4) the coefficient on *C* × *Weighted Average MAP* is negative and significant ($p < 0.01$). Finally, in column (5), I use the subsidiary country's statutory tax rate (*Statutory Tax Rate*) instead of *C*. In this specification, I find that the interaction between *Statutory Tax Rate* × *Weighted Average MAP* is negative and significant ($p < 0.01$).

I next examine the relation between the level of MAPs and income shifting. Hainmueller, Mummolo, and Xu (2018) note that the interpretation of interactions between two continuous variables can be misleading when only looking at the average effect. Following their suggestion, I create indicators for the quintile rank of *Weighted Average MAP* and interact these indicators with *C.* I report the results of this analysis in Table 5 and Figure 2. In the case of *Weighted Average MAP,* the baseline lowest quintile represents approximately 20 percent of subsidiaries with no MAP connections. The trend as *MAP Quintile* increases is that income shifting also increases. I find that the coefficient on the interaction terms is negative and significant for all but the lowest quintiles where it positive. In terms of magnitude, a firm in the top three quintiles of *Weighted Average MAP* reports between 1.2 and 1.7 percent more income when *C* is at the 25th percentile (and there is an incentive to shift income into the subsidiary).

6. ADDITIONAL ANALYSES

6.1 Intangible Intensive Firms

I next turn my attention to the cross-sectional variation in the association between MAPs and types of income shifting. First, I examine whether there are differential effects of MAPs based on the amount of intangible assets a firm reports. Different types of income shifting may benefit more from the nature of the MAP process than others. Income shifting using intangible assets is one of the primary ways that firms shift income, traditionally by locating valuable

patents in low-tax jurisdictions and recognizing large amounts of royalty income paid by related parties. This type of income is hard to audit, as determining an arm's length price for unique one-of-a-kind intellectual property is harder than for a commoditized physical asset, which may have many arm's length comparable transactions (Grubert 2003). If tax authorities have difficulty in assigning arm's length values to transfer pricing of intangible assets, they may be less likely to audit those transactions or less likely to succeed in assessing additional tax. The difficulty in these types of audits is highlighted by the IRS' legal battle with Microsoft over its decision to locate intellectual property in Puerto Rico. This battle has lasted over 10 years and only recently resulted in a proposed adjustment (Finley 2023; Kiel 2020; Kiel 2023). If taxing authorities have a more challenging time assessing deficiencies in the transfer pricing of intangibles, MAP resolutions may be unnecessary. An additional factor is the portability of intangible assets. Income shifting via intangibles is often called paper shifting, as it typically does not require investment in tangible assets. This practice has led firms to shift income to dot tax havens, small countries with zero or near-zero rates. When examining this form of shifting, MAPs may be less beneficial. One factor that makes MAPs attractive is that it is an adversarial negotiation between two countries over the firm's tax base. However, when one country in the negotiations has a zero or close-to-zero corporate tax rate, they may not have significant incentives to negotiate to retain their tax base, as any tax base they retain does not increase tax collections.

To examine this question, I split my sample into High Intangibles and Low Intangibles Firms based on reported intangible assets by subsidiaries. Intangible assets are generally not recorded at fair market value on the balance sheet of firms; rather, they may be fully expensed (and not recorded at all) or be recorded at a capitalized cost value. Because the value of intangibles on a subsidiary's balance sheet is measured with error, I assign subsidiaries in the top

tercile of Intangible Assets as High Intangibles, and subsidiaries in the bottom tercile of Intangible Assets as Low Intangibles. Although this approach likely still misclassifies some firms, if firms develop intangible assets in one country and then move those intangible assets to another lower-taxed country, they will be reported at a stepped-up value at the subsidiary level. If a subsidiary purchases an intangible, it will also be included on the balance sheet at fair market value. With these limitations in mind, I report my results in Table 6.

In column (1), I report the results of model (1) for the High Intangibles sample. In column (2), I report the results for the Low Intangibles sample. When I examine firms' general incentive to shift income (*C*) by itself, I document that *C* is negative but not significant at conventional levels for both High Intangible and Low Intangible Firms. When examining the association MAPs have with income shifting, I find the coefficient on $C \times$ *Weighted Average MAP* is negative and significant for both the High Intangible subsidiaries (-0.452, $p < 0.01$) and the Low Intangible firms (-0.777, $p < 0.01$). The two groups are also marginally significantly different from one another ($p < 0.10$). This provides weak evidence that the type of income shifting which benefits from MAPs is related to tangible assets, rather than intangible assets.

6.2 Firm Size

Next, I examine the role of the parent firm's resources in income shifting incentives around MAPs. Firms with larger parent companies may have more resources to engage with the traditional unilateral resolution mechanisms. In practical terms, this may involve engaging experts to write transfer pricing studies, hiring legal counsel and experts to help defend the firm's positions when audited, and engaging legal counsel to fight any audit assessments through the court system. These costs can be significant for transfer pricing cases as the process may need to be done in two or more countries, not just one. As these costs are likely more fixed, it may make

sense for larger firms, whose tax savings are greater, to utilize these expert services. Smaller firms may not have the tax savings to justify fighting an audit through the legal system. MAPs help alleviate some of these costs as they offer an alternative to costly legal battles by requiring the two countries to negotiate with each other.

To examine the relation parent firm resources have on income shifting, I require data on parent total assets and split the sample between Small Parent and Large Parent at the median of parent total assets. When examining traditional income shifting incentives (*C*), I find that firms with small parents do not engage in income shifting, with the coefficient on *C* being positive and marginally significant ($p < 0.10$). I find that firms with larger parents continue to shift income, with the coefficient on *C* being negative and significant ($p < 0.05$). However, when Small Parent subsidiaries have more access to MAPs, they shift more income. The coefficient on *C* × *Weighted Average MAP* is -1.29 ($p < 0.01$), which is significantly more negative than the coefficient for Large Parent subsidiaries (-0.476, $p < 0.01$). This finding suggests that subsidiaries of Small Parent firms will shift more income in equilibrium compared to those subsidiaries whose parent firms may have more resources. This is consistent with MAPs being a cost-effective response to transfer pricing audit assessments.

6.3 Effectiveness of MAPs

Finally, there is uncertainty regarding the impact of the increasing significance and utility of MAPs on income shifting following recent changes by the OECD and EU. Both the OECD and EU have undertaken initiatives to enhance the efficacy of MAPs. In 2015, as part of the BEPS project, the OECD proposed a series of reforms that countries should adopt with respect to MAP agreements. These recommendations were outlined in the OECD's action item 14, which aimed to enhance the resolution of tax-related disputes. Although the OECD does not explicitly mention

income shifting, Action Item 14 forms part of the organization's broader strategy to address and minimize income shifting. The European Union has also taken steps to enhance the effectiveness of MAPs. In 2017, it issued Directive 2017/1852, which introduced a two-year time limit for countries to resolve disputes under MAP agreements. If an agreement cannot be reached within this timeframe, the MAP case would automatically proceed to mandatory arbitration, and the arbitration results would bind the countries involved.

The impact of increased effectiveness on firms' incentives to shift income under a MAP is unclear. On the one hand, a more effective MAP is likely to give more certainty to firms, resulting in a further increase in income shifting when the MAP process becomes easier. On the other hand, this increased efficiency may also reduce income shifting if countries can reach mutually agreeable solutions more easily. For instance, in the EU directive, countries are only allowed to negotiate for a maximum of two years before the MAP case goes to arbitration. This forced arbitration limits the negotiating power of countries that attempt to obstruct or coerce the other party. Nonetheless, the extent to which these effects benefit the firm depends on the specific situation and the countries involved.

A MAP process that is easier for firms to engage with is also likely to increase the burden on competent authorities, changing the way they can negotiate if countries do not commit more resources. Nessa, Schwab, Stomberg, and Towery (2020) show that IRS resources are positively associated with more enforcement actions. This evidence suggests that as the use of MAPs increases, negotiation strategies may change if countries do not increase the budgets of their competent authority. However, it is unclear whether the finding in Nessa et al. (2023) would apply where two governments with increasing burdens are negotiating instead of a firm and government negotiating. Additionally, if countries are increasingly focused on MAPs, the

negotiation dynamics between countries are likely to change. The OECD BEPS plan also emphasizes international cooperation. Further complicating this process is the fact that there were other significant concurrent changes related to the OECD BEPS project, such as the introduction of private Country-by-Country (CbCr) reporting. In additional specifications, I attempt to control for concurrent changes related to implementing CbCr on income shifting by including a *Post CbCr* variable, which equals 1 after 2017. However, I cannot account for every nuance of the OECD BEPS project.

I examine two changes to MAP effectiveness in Table 7. In columns (1) and (2), I examine countries in the European Union and the effects of Directive 2017/1852. I continue to find that the interaction on $C \times$ *Weighted Average MAP* is negative and significant ($p < 0.01$). However, I find no change in the relation between MAPs and income shifting after the directive is put in force either before or after controlling for the simultaneous implementation of private country-by-country reporting in 2017.

The second change I examine is the OECD's Action Item 14 plan. Under Action Item 14, OECD countries made changes to their administration of MAP cases. These changes included making MAPs more widely available to firms and reducing the time it takes to reach a resolution. However, because the changes required countries to amend their income tax treaties, the OECD created a Multilateral Instrument. This instrument allowed countries to modify all of their income tax treaties based on the OECD's recommendations all at once. I use the staggered adoption of Multilateral Instruments between 2017 and 2023 as treatment dates. In my sample, Bulgaria, Romania, Spain, Turkey, and Italy either implemented the instrument after my sample period ended or have not yet implemented it. I present the results of this regression in columns (3) and (4) of Table 7. Similar to the EU directive, I continue to find that the interaction between

C × *Weighted Average MAP* is negative and significant ($p < 0.01$). I fail to find evidence that the adoption of the Multilateral Instrument changed the association between MAPs and income shifting. Ultimately, I fail to find evidence of changes in firm behavior around the implementation of changes to MAPs.

6.4 Bilateral APAs

A significant concern in my main specifications is that the effects of MAP agreements may be confounded with the impact of Bilateral Advanced Pricing Agreements. Both procedures can be implemented through provisions in bilateral trade agreements, and both procedures should affect the transfer pricing decisions of firms. I retrieve statistics reported by the European Union on the number of Bilateral APAs in force at the end of 2021. This data is reported by countries to the EU and represents all Bilateral APAs that are in force.[15]

Table 8 reports the number of Bilateral APAs in force for EU countries at the end of 2021, as reported by the European Union (EU 2023). For each country, I list the number of unique subsidiaries in my sample, the number of open MAP cases at the end of 2021, and the number of Bilateral APAs in force at the end of 2021. The number of Bilateral APAs listed in Table 8 is the maximum number of firms in my sample that could have Bilateral APAs, placing an upper bound on the effect of Bilateral APAs in my results. The number of Bilateral APAs includes Bilateral APAs with both European and non-European countries. The number of Bilateral APAs also consists of all firms in the country, whereas my sample is a subset of the population of firms. In Table 8, most countries have less than 10 Bilateral APAs in force, and the maximum percentage of my sample firms that could have Bilateral APAs is under one percent

[15] Greece and Lithuania also have Bilateral APAs (1 each), but I do not have any subsidiaries in my sample headquartered in these countries. I also exclude the Netherlands as they do not report statistics to the EU.

for all countries except Denmark (5.9 percent). This provides descriptive evidence that Bilateral APAs' effect on observed income shifting levels is limited to a small number of firms. Similarly, the number of Bilateral APAs is also small compared to the number of open MAP cases. For countries which have at least one open MAP case and at least one Bilateral APA in force at the end of 2021, the average number of MAP cases is 15 times as large as the number of Bilateral APAs in force (untabulated). The ratio of open MAP cases to Bilateral APAs ranges from 2.4 (Hungary) to 32.2 (Sweden).

Although the magnitude of MAP cases is significantly greater than Bilateral APAs ($p < 0.01$), the two are highly correlated (0.84, $p < 0.01$). I interpret these statistics with caution. Since MAPs can be used ex-post, an open MAP case could be for transactions entered into in prior years, while Bilateral APAs cannot be entered into after the transaction has already taken place. However, this is also a reason why MAPs should have a larger effect on income shifting behavior. If a firm does not have a Bilateral APA in place in 2021, it cannot implement one later; however, a firm which does not have a MAP case in 2021 can start a MAP case in a later year if the firm is audited. My examination of Bilateral APAs is limited, as I only identify Bilateral APAs at the country level, not the country pair level (as I am able to do with MAPs). I leave it to future research to examine the relative importance of MAPs and Bilateral APAs in firm income shifting decisions.

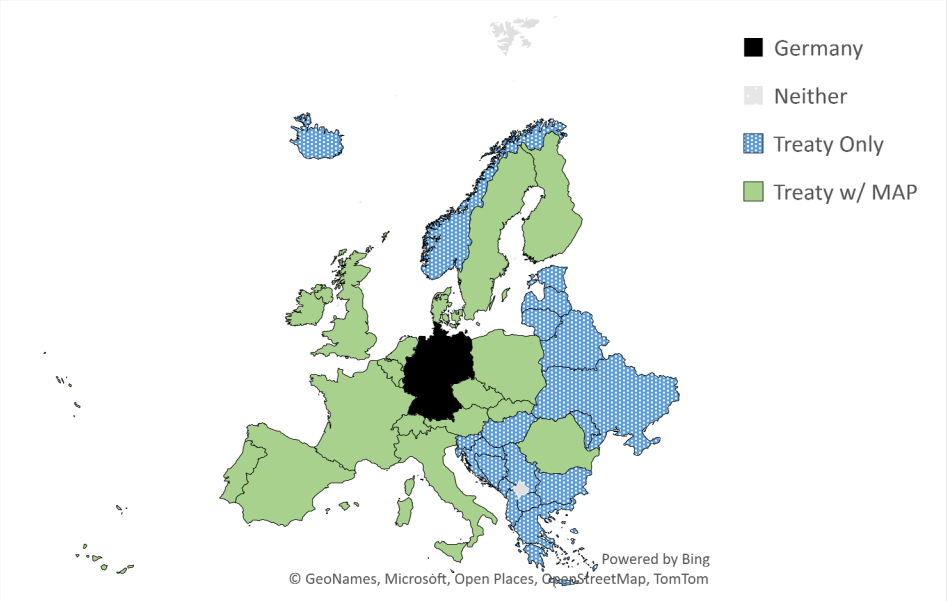
7. CONCLUSION

I examine the relation between income shifting and Mutual Agreement Procedures (MAPs). While there has been an increasing emphasis on international cooperation and income shifting in recent years, the question of this specific type of cooperation between countries in dispute resolution has not been thoroughly explored. I find that greater access to MAPs is

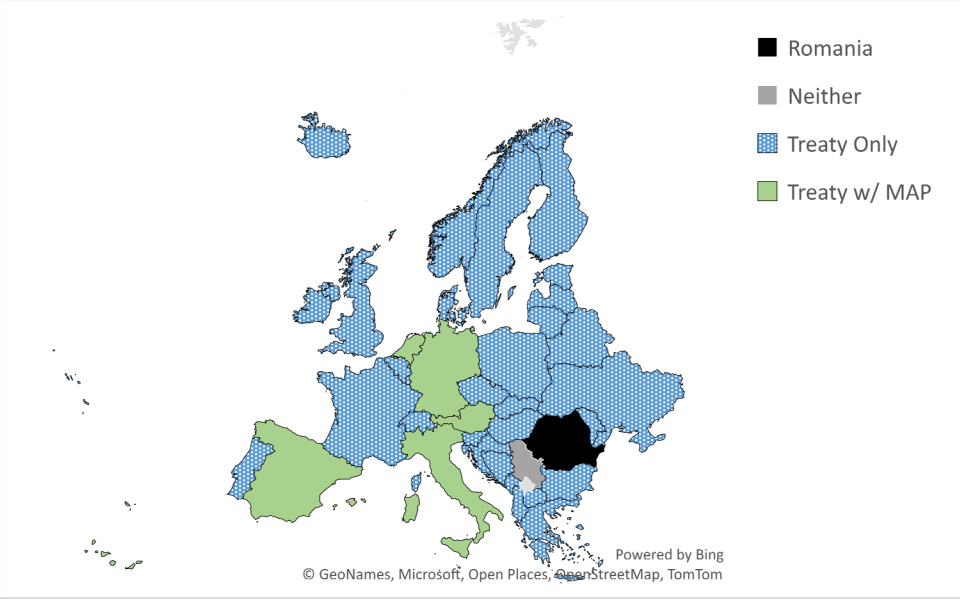
associated with increased levels of income shifting by firms. This effect is particularly pronounced in firms with lower levels of intangible assets, suggesting a connection to the transfer pricing of tangible property. There is also limited evidence suggesting that MAPs may be more closely associated with income shifting in cases where the parent firm has fewer resources. Additionally, I analyze recent supragovernmental actions concerning MAPs and fail to find that improvements in their effectiveness have a significant effect on income shifting. These findings should be of interest to policymakers and regulators as they seek to gather more information on the effectiveness of MAPs and further examine the issue of income shifting in general.

Figure 1. Example of Tax Treaty Coverage

Panel A: Treaty and MAP Treaties for Germany

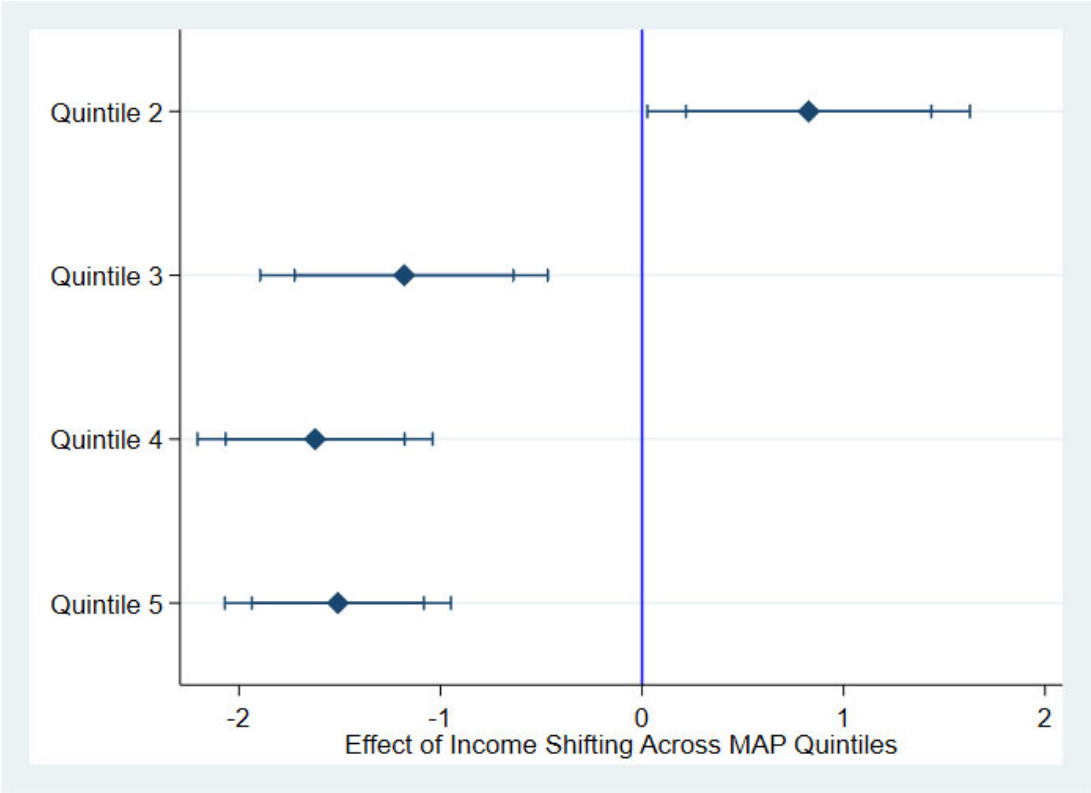


Panel B: Treaty and MAP Treaty Countries for Romania



Note: Figure 1, Panel A shows the countries for which Germany has some form of bilateral tax treaty (Orange), and countries for which there is a tax treaty, and that tax treaty has a MAP (Green). Figure 1, Panel B shows the countries for which has some form of bilateral tax treaty (Orange), the countries for which there is a tax treaty, and that tax treaty has a MAP (Green).

Figure 2. Income Shifting Effects by Quintile of Weighted Average MAP



Note: Figure 2 shows the regression coefficients from Model (1) where *Weighted Average MAP* is replaced by quintile indicators of *Weighted Average MAP.* The dependent variable in the regressions is the ln(*Pre-tax Income*). *C* is defined as the weighted average difference in statutory tax rates between all of the subsidiaries for a parent as given by: $C_{it} = \frac{1}{1-\tau} \frac{\sum_{k \neq i}^{n} (\frac{B_k}{1-\tau_k})(\tau_i - \tau_k)}{\sum_{k}^{n} (\frac{B_k}{1-\tau_k})}$, and developed by Huizinga and Laeven (2008). A negative value of C proxies for a parent's incentive to engage in tax motivated income shifting to subsidiary$_{it}$. Diamonds represent the coefficient estimate on the interaction term between *Weighted Average MAP Decile* and *C*. Confidence intervals are shown for the 95th and 99th percentile.

Table 1. Sample Selection

Panel A: Sample Selection

	Observations	Subsidiaries	Parents
Orbis Firms with Total Assets above $100,000 and Revenue above $1,000, between 2012 and 2021, with non-missing regression variables	455,507	107,643	23,650
Less: Parent Firms or subsidiaries not in Europe	-15,050	-3,918	-164
Less: Firms in Extractive, Utility, Financial, or Insurance Industry	-34,448	-8,907	-806
Total Final Sample	406,009	94,818	22,680

Note: Table 1, Panel A reports sample size for Subsidiary-year, Subsidiary, and Parent Observations. Sample selection is described in Section 3.3

Panel B: Sample by Country

Country		Subsidiaries	Parents	Country		Subsidiaries	Parents
Albania	AL	30	2	Malta	MT	38	78
Austria	AT	2,200	766	Montenegro	ME	91	14
Belgium	BE	2,822	757	Netherlands	NL	292	700
Bosnia Herzegovina	BA	381	70	Norway	NO	4,335	783
Bulgaria	BG	1,269	251	Poland	PL	4,099	316
Croatia	HR	1,081	214	Portugal	PT	2,631	399
Czech Republic	CZ	4,186	1,265	Romania	RO	2,420	154
Denmark	DK	557	388	Russia	RU	63	81
Estonia	EE	585	133	Serbia	RS	1,021	146
Finland	FI	2,696	680	Slovakia	SK	1,951	399
France	FR	17,236	2,083	Slovenia	SI	939	233
Germany	DE	7,488	2,836	Spain	ES	10,023	1,988
Hungary	HU	1,349	311	Sweden	SE	3,257	1,241
Iceland	IS	49	27	Switzerland	CH	24	618
Ireland	IE	408	142	Turkey	TR	1	82
Italy	IT	14,976	3,761	Ukraine	UA	1,345	43
Latvia	LV	63	41	United Kingdom	GB	4,912	1,449

Note: Table 1, Panel B presents the sample size by number of unique subsidiaries and number of unique parents by country.

Table 2. Descriptive Statistics

Panel A: Descriptive Statistics

Variables					
	Mean	**Std. Dev.**	**p25**	**Median**	**p75**
Pre-tax Income	11,415	137,655	235	915	3,487
EBIT	7,356	88,440	226	867	3,147
Tangible Assets	13,264	44,822	165	1,075	6,370
Intangible Assets	2,956	13,156	12	86	605
Wages	12,185	30,165	1,019	3,011	9,297
Foreign Direct Investment	3,542,988	2,340,892	1,712,175	3,156,535	4,737,324
Regression Variables					
C (Capital)	.0017	.0546	-0.0093	.0004	.022
C (Sales)	.0004	.052	-0.0106	.0012	.0226
Weighted Average MAP (Capital)	.3022	.3442	0.0013	.1249	.5858
Weighted Average MAP (Sales)	.3092	.3272	0.0088	.1743	.5917
ln(Pre-tax Income)	6.7887	2.0669	5.4596	6.8189	8.1568
ln(EBIT)	6.8447	1.9034	5.5872	6.8491	8.1073
ln(Tangible Assets)	6.9001	2.5611	5.1059	6.9801	8.7594
ln(Intangible Assets)	4.5739	2.6961	2.4849	4.4543	6.4052
ln(Wages)	8.0382	1.6711	6.9266	8.01	9.1374
Leverage	.5854	.2476	0.3992	.5986	.7781
GDP Growth	-.0072	.0782	-0.0618	-.0187	.0375
GDP per Capita	33.2569	11.3866	26.3780	34.622	41.593
ln(Foreign Direct Investment)	14.8065	.8958	14.3533	14.965	15.371
Control of Corruption Score	.9031	.6487	0.2603	.7416	1.3104

Notes: Table 2, Panel A provides descriptive statistics for the full sample of subsidiary years for 2012-2021. *Weighted Average MAP (Sales) and Weighted Average MAP (Capital)* in the regression variables section are shown before standardization. Variable definitions are found in Appendix A. I report descriptive statistics showing the within fixed effect variation in Appendix D as recommended by Breuer and deHaan (2023).

Panel B: Correlations for Within FE Variables (Spearman Above, Pearson Below)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1)	*ln(Pre-tax Income)*	1.00	0.95*	0.06*	0.05*	-0.09*	-0.10*	0.51*	0.40*	0.64*	-0.18*	-0.02*	0.12*	0.03*	0.13*
(2)	*ln(EBIT)*	0.94*	1.00	0.04*	0.04*	-0.09*	-0.10*	0.56*	0.41*	0.67*	-0.13*	-0.02*	0.10*	0.02*	0.12*
(3)	*C (Capital)*	0.06*	0.05*	1.00	0.95*	0.12*	0.12*	0.02*	0.12*	0.13*	0.09*	0.20*	0.44*	0.14*	0.26*
(4)	*C (Sales)*	0.06*	0.04*	0.97*	1.00	0.11*	0.13*	0.01*	0.13*	0.13*	0.10*	0.20*	0.46*	0.15*	0.28*
(5)	*Weighted Average MAP (Capital)*	-0.09*	-0.09*	0.15*	0.15*	1.00	0.86*	-0.14*	-0.09*	-0.08*	0.05*	0.07*	0.08*	-0.01*	0.04*
(6)	*Weighted Average MAP (Sales)*	-0.11*	-0.11*	0.16*	0.17*	0.88*	1.00	-0.12*	-0.07*	-0.09*	0.04*	0.08*	0.07*	-0.01*	0.02*
(7)	*ln(Tangible Assets)*	0.52*	0.58*	0.02*	0.01*	-0.13*	-0.11*	1.00	0.36*	0.62*	-0.08*	-0.02*	-0.02*	0.01*	0.01*
(8)	*ln(Intangible Assets)*	0.42*	0.44*	0.14*	0.14*	-0.10*	-0.07*	0.38*	1.00	0.50*	0.02*	0.04*	0.19*	0.03*	0.17*
(9)	*ln(Wages)*	0.64*	0.68*	0.15*	0.15*	-0.09*	-0.10*	0.63*	0.51*	1.00	0.02*	0.01*	0.23*	0.06*	0.23*
(10)	*Leverage*	-0.19*	-0.13*	0.09*	0.10*	0.05*	0.04*	-0.08*	0.02*	0.03*	1.00	0.05*	0.12*	0.00	0.06*
(11)	*GDP Growth*	-0.02*	-0.02*	0.16*	0.16*	0.05*	0.06*	-0.02*	0.02*	0.01	0.03*	1.00	0.03*	-0.01*	-0.01*
(12)	*GDP per Capita*	0.12*	0.10*	0.44*	0.45*	0.06*	0.06*	-0.01*	0.20*	0.21*	0.12*	0.01*	1.00	0.11*	0.75*
(13)	*ln(Foreign Direct Investment)*	0.04*	0.03*	0.10*	0.10*	-0.01*	-0.01*	0.02*	0.03*	0.06*	-0.00	-0.04*	0.09*	1.00	0.19*
(14)	*Control of Corruption Score*	0.15*	0.13*	0.29*	0.30*	0.04*	0.02*	0.04*	0.18*	0.24*	0.06*	0.01*	0.75*	0.19*	1.00

Notes: Table 2, Panel B. provides correlations for the variables included in Model (1). All variables are demeaned by the fixed effects included in Model (1): Parent, Year, and Industry. These correlations are presented to show the within FE correlations as recommended by Breuer and deHaan (2023). Spearman correlations are provided above the diagonal, Pearson correlations are provided below the diagonal. Significance denoted by (* $p < 0.01$). Variable definitions are included in Appendix A.

Table 3. Main Results

Dependent Variable	Prediction	(1) *ln(Pre-Tax Income)*	(2) *ln(Pre-Tax Income)*
C	-	-0.138	-0.572***
		(-1.44)	(-6.44)
Weighted Average MAP	?	-0.087***	-0.034***
		(-16.08)	(-5.28)
C* × *Weighted Average MAP	**-**	-0.716***	-0.448***
		(-10.18)	(-5.98)
ln(Wages)	+	0.650***	0.655***
		(117.21)	(118.12)
ln(Intangible Assets)	+	0.067***	0.068***
		(33.99)	(34.43)
ln(Tangible Assets)	+	0.124***	0.125***
		(37.58)	(37.88)
Leverage		-1.517***	-1.523***
		(-82.98)	(-83.17)
GDP Growth		-0.186***	-0.205***
		(-2.84)	(-3.13)
GDP per Capita		0.004***	0.005***
		(8.42)	(8.83)
ln(Foreign Direct Investment)		0.004	0.004
		(1.54)	(1.34)
Control of Corruption Score		-0.017	-0.007
		(-1.52)	(-0.61)
Constant		1.110***	1.052***
		(21.44)	(20.44)
Observations		402,323	402,323
C Measure		Sales	Sales
MAP Weighting		Sales	None
Fixed Effects		Parent, Year, Industry	Parent, Year, Industry
Adj. R^2		0.6650	0.6643

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table 3 reports the regression results from Model (1). The dependent variable in the regressions is the ln(*Pre-tax Income*). *C* is defined as the weighted average difference in statutory tax rates between all of the subsidiaries for a parent as given by: $C_{it} = \frac{1}{1-\tau}\frac{\sum_{k\neq i}^{n}(\frac{B_k}{1-\tau_k})(\tau_i-\tau_k)}{\sum_{k}^{n}(\frac{B_k}{1-\tau_k})}$, and developed by Huizinga and Laeven (2008). A negative value of *C* proxies for a parent's incentive to engage in tax motivated income shifting to subsidiary$_{it}$. *Weighted Average MAP* is the weighted average number of MAP agreements between Subsidiary$_{it}$ and all other subsidiaries in the parent group. All variables are defined in Appendix A. Standard errors are clustered by subsidiary.

Table 4. Robustness Tests

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	*ln(EBIT)*		*ln(Pre-tax Income)*		
C	-0.633***	-0.350***	-0.086	-0.197**	
	(-7.22)	(-3.89)	(-0.77)	(-2.02)	
Statutory Tax Rate					-0.006***
					(-5.69)
Weighted Average MAP	-0.071***	-0.050***	-0.086***	-0.076***	0.117***
	(-14.44)	(-9.95)	(-13.50)	(-13.80)	(5.95)
C* × *Weighted Average MAP	**-0.653*** **	**-0.438*** **	**-0.784*** **	**-0.632*** **	
	(-10.17)	**(-6.85)**	**(-9.23)**	**(-8.84)**	
Statutory Tax Rate × Weighted Average MAP					**-0.007*** **
					(-9.78)
Observations	388,039	400,444	345,035	402,906	402,323
C Measure	Sales	Capital	Sales	Sales	n/a
MAP Weighting	Sales	Capital	Sales	Sales	Sales
Controls	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Parent, Year, Industry		Parent×Year, Industry×Year	Parent, Year	Parent, Year, Industry
Adj. R^2	0.6982	0.6636	0.6352	0.6550	0.6649

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table 4 reports the regression results from Model (1) with alternate fixed effect and weighting variables. The dependent variable in the regressions is the ln(*Pre-tax Income*). *C* is defined as the weighted average difference in statutory tax rates between all of the subsidiaries for a parent as given by: $C_{it} = \frac{1}{1-\tau}\frac{\sum_{k\neq i}^{n}(\frac{B_k}{1-\tau_k})(\tau_i-\tau_k)}{\sum_{k}^{n}(\frac{B_k}{1-\tau_k})}$, and developed by Huizinga and Laeven (2008). A negative value of C proxies for a parent's incentive to engage in tax motivated income shifting to subsidiary$_{it}$. *Weighted Average MAP* is the weighted average number of MAP agreements between subsidiary$_{it}$ and all other subsidiaries in the parent group. All variables are defined in Appendix A. Standard errors are clustered by subsidiary.

Table 5. Quintile Ranking of *Average Weighted MAP*

	(1)
	ln(Pre-Tax Income)
MAP Quintile 2 × C	0.827***
	(2.66)
MAP Quintile 3 × C	-1.180***
	(-4.26)
MAP Quintile 4 × C	-1.622***
	(-7.16)
MAP Quintile 5 × C	-1.509***
	(-6.93)
Observations	543,207
C Measure	Sales
MAP Weighting	Sales
Controls	Yes
Fixed Effects	Parent, Year, Industry
Adj. R^2	0.2747

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table 5 reports the regression results from Model (1) except *Weighted Average MAP* is replaced with quintile Indicators of *Weighted Average MAP*. The dependent variable in the regressions is the ln(Pre-tax Income).. C is defined as the weighted average difference in statutory tax rates between all of the subsidiaries for a parent as given by: $C_{it} = \frac{1}{1-\tau}\frac{\sum_{k\neq i}^{n}(\frac{B_k}{1-\tau_k})(\tau_i-\tau_k)}{\sum_{k}^{n}(\frac{B_k}{1-\tau_k})}$, and developed by Huizinga and Laeven (2008). A negative value of C proxies for a parent's incentive to engage in tax motivated income shifting to subsidiary$_{it}$. *Weighted Average MAP* is the weighted average number of MAP agreements between subsidiary$_{it}$ and all other subsidiaries in the parent group. All columns include control variables as detailed in Model (1). All variables are defined in Appendix A. Standard errors are clustered by subsidiary.

Table 6. Additional Analyses

	(1)	(2)	(3)	(4)
Dependent Variable		*ln(Pre-Tax Income)*		
C	-0.233	-0.107	0.361*	-0.424**
	(-1.25)	(-0.74)	(1.71)	(-2.35)
Weighted Average MAP	-0.136***	-0.054***	-0.140***	-0.023**
	(-12.78)	(-6.40)	(-13.05)	(-2.01)
C* × *Weighted Average MAP	**-0.452*****	**-0.777*****	**-1.291*****	**-0.476*****
	(-2.97)	**(-7.73)**	**(-8.80)**	**(-3.21)**
Chi Squared Test *p*-value	Column (1) vs. Column (2) (0.075)		Column (3) vs. Column (4) (0.000)	
Observations	133,010	131,346	80,640	81,215
Sample Split	High Intangibles	Low Intangibles	Small Parent	Large Parent
C Measure	Sales	Sales	Sales	Sales
MAP Weighting	Sales	Sales	Sales	Sales
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Parent, Year, Industry	Parent, Year, Industry	Parent, Year, Industry	Parent, Year, Industry
Adj. R^2	0.6588	0.5900	0.6362	0.6268

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table 6 reports the regression results from Model (1). Columns (1) and (2) split the sample based on whether the subsidiary is in the top or bottom tercile of intangible assets. Columns (3) and (4) split the sample based on whether the subsidiaries parent is above or below the sample median in total assets. The dependent variable in the regressions is the ln(*Pre-tax Income*). *C* is defined as the weighted average difference in statutory tax rates between all of the subsidiaries for a parent as given by: $C_{it} = \frac{1}{1-\tau}\frac{\sum_{k\neq i}^{n}(\frac{B_k}{1-\tau_k})(\tau_i-\tau_k)}{\sum_{k}^{n}(\frac{B_k}{1-\tau_k})}$, and developed by Huizinga and Laeven (2008). A negative value of C proxies for a parent's incentive to engage in tax motivated income shifting to subsidiary$_{it}$. *Weighted Average MAP* is the weighted average number of MAP agreements between subsidiary$_{it}$ and all other subsidiaries in the parent group. All variables are defined in Appendix A. All columns include control variables as detailed in Model (1). Variables are described in Appendix A. Standard Errors are clustered by subsidiary.

Table 7. EU and OECD Changes to MAPs

	(1)	(2)	(3)	(4)
	ln(Pre-tax Income)			
C	-0.151	-0.260**	-0.135	-0.301***
	(-1.29)	(-2.13)	(-1.39)	(-2.88)
Weighted Average MAP	-0.087***	-0.086***	-0.088***	-0.087***
	(-14.38)	(-13.59)	(-15.77)	(-14.62)
C* × *Weighted Average MAP	-0.774***	-0.744***	-0.715***	-0.757***
	(-9.76)	(-8.63)	(-9.99)	(-9.42)
Post MAP Effectiveness ×C	0.519***	0.216*	0.001	-0.312**
	(4.59)	(1.74)	(0.01)	(-2.20)
Post MAP Effectiveness × C × Weighted Average MAP	**0.067**	**0.177**	**-0.016**	**-0.057**
	(0.68)	**(1.62)**	**(-0.14)**	**(-0.46)**
Post CbCr × C		0.438***		0.485***
		(3.79)		(4.87)
Post CbCr × C × Weighted Average MAP		-0.146		0.073
		(-1.50)		(0.84)
Observations	360,168	360,168	402,323	402,323
Controls	Yes	Yes	Yes	Yes
Sample	EU Firms	EU Firms	All Firms	All Firms
Post MAP Effectiveness	EU Directive	EU Directive	Action Item 14	Action Item 14
C Measure	Sales	Sales	Sales	Sales
MAP Weighting	Sales	Sales	Sales	Sales
Fixed Effects	Parent, Year, Industry	Parent, Year, Industry	Parent, Year, Industry	Parent, Year, Industry
Adj. R-Sq^2	0.6621	0.6621	0.6650	0.6650

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table 6 reports the regression results from Model (1) adding interaction terms for events which may have changed subsidiary income shifting behavior. The dependent variable in the regressions is the ln(*Pre-tax Income*). *C* is defined as the weighted average difference in statutory tax rates between all of the subsidiaries for a parent as given by: $C_{it} = \frac{1}{1-\tau}\frac{\sum_{k\neq i}^{n}(\frac{B_k}{1-\tau_k})(\tau_i-\tau_k)}{\sum_{k}^{n}(\frac{B_k}{1-\tau_k})}$, and developed by Huizinga and Laeven (2008). A negative value of C proxies for a parent's incentive to engage in tax motivated income shifting to subsidiary$_{it}$. *Weighted Average MAP* is the weighted average number of MAP agreements between subsidiary$_{it}$ and all other subsidiaries in the parent group. *Post MAP Effectiveness* is equal to 1 after the implementation of the EU directive 2017/1852 on MAPs (After 2019). In columns (3) and (4) *Post MAP Effectiveness* is equal to one after the subsidiary country adopted the OECD Multilateral Instrument which included changes to MAPs. *Post CbCr* is equal to one after 2017 when private country by country reporting was implemented. All variables are defined in Appendix A. All columns include control variables as detailed in Model (1). Variables are described in Appendix A. Standard Errors are clustered by subsidiary.

Table 8. Bilateral APA Statistics

Country		(1) Subsidiaries	(2) 2021 Ending Open MAP Cases	(3) Bilateral APAs in force at the end of 2021
Austria	AT	2,200	100	6
Belgium	BE	2,822	130	19
Bulgaria	BG	1,269	3	0
Croatia	HR	1,081	6	0
Czech Republic	CZ	4,186	29	1
Denmark	DK	557	194	33
Estonia	EE	585	0	0
Finland	FI	2,696	45	18
France	FR	17,236	566	40
Germany	DE	7,488	622	51
Hungary	HU	1,349	12	5
Ireland	IE	408	86	3
Italy	IT	14,976	670	24
Latvia	LV	63	7	0
Malta	MT	38	14	0
Poland	PL	4,099	81	20
Portugal	PT	2,631	65	4
Romania	RO	2,420	73	0
Slovakia	SK	1,951	34	2
Slovenia	SI	939	11	0
Spain	ES	10,023	441	20
Sweden	SE	3,257	193	6

Note: Table 8 reports various statistics relating to MAPs and Bilateral APAs. Column (1) reports the number of unique subsidiaries present in my sample of firms. Column (2) reports the number of ending open MAP cases as of the end of 2021 reported by the OECD. Column (3) reports the number of Bilateral APAs in force at the end of 2021 as reported by the European Union. The average number of MAP cases by country is 154. The average number of Bilateral APAs by country is 11 (untabulated).

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Appendix A: Variable Definitions

Regression Variables

MAP	1 if Country *i* and Country *k* report at least one MAP case between 2017 and 2021.	OECD
Weighted Average MAP†	$\frac{\sum_{k\neq i}^{n}(B_k)(MAP)}{\sum_{k}^{n}(B_k)}$, standardized to mean 0 and a standard deviation of 1 for the regression analyses.	OECD, Orbis
Weighted Average MAP Decile [X]	The decile rank of *Weighted Average MAP*	OECD
$C^{\dagger}$	$\frac{1}{1-\tau}\frac{\sum_{k\neq i}^{n}(\frac{B_k}{1-\tau_k})(\tau_i-\tau_k)}{\sum_{k}^{n}(\frac{B_k}{1-\tau_k})}$ Composite tax Incentive (Huizinga and Laeven, 2008)	Orbis, KPMG, OECD

τ	Corporate Statutory Tax Rate	KPMG, De Simone (2016), OECD
Sales	TURN, OPRE if missing(TURN)	Orbis
Capital	TFAS + IFAS	Orbis
Pre-Tax Income‡	PLBT	Orbis
Tangible Assets‡	TFAS	Orbis
Intangible Assets‡	IFAS	Orbis
Wages‡	STAF	Orbis
Leverage	(TOAS – SHFD) / TOAS	Orbis
ln(Pre-Tax Income)‡	Ln(abs(PLBT)) * -1 if PLBT < 0	Orbis
ln(Tangible Assets)‡	Ln(TFAS)	Orbis
ln(Intangible Assets)‡	Ln(IFAS)	Orbis
ln(Wages)‡	Ln(STAF)	Orbis
GDP Per Capita	GDPCAP	CEPII
GDP Growth	$(GDP_{t-1} – GDP_t)) / GDP_{t-1}$	CEPII
Foreign Direct Investment	Foreign Direct Investment (In thousands)	World Bank
ln(Foreign Direct Investment)	ln(*Foreign Direct Investment)*	World Bank
Control of Corruption Score	Control of Corruption Score (CC_EST)	World Bank
Note: †Variable B_k is either defined as SALES or CAPITAL. ‡Orbis variables divided by 1,000 and rounded to standardize to thousands from dollars		

Appendix B: Transfer Pricing Example

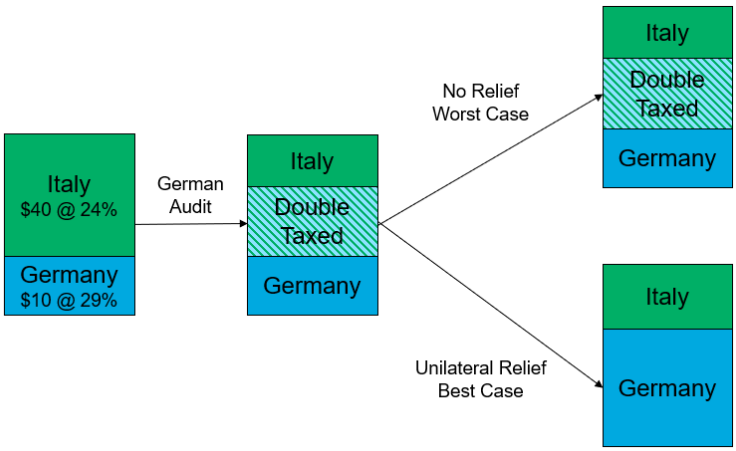
To understand the importance of MAPs, I detail an imaginary firm that engages in intercompany sales between its Italian Subsidiary U and its German Subsidiary G in Appendix B: Figure 1. Subsidiary U sells products with a cost of $50 to Subsidiary G for $90. Subsidiary G sells the products to the final consumer for $100. This creates $40 of tax at the Italian rate of 24 percent and $10 of tax at the German rate of 29 percent. Germany audits Subsidiary G and finds that the appropriate intercompany price should have been $70, creating an additional $20 of income taxed at 29 percent in Germany. This adjustment, however, does not change the amount of tax in Italy. If no MAP exists or the company does not want to take advantage of a MAP that does exist, it can seek a domestic remedy in Italy. In Italy, Subsidiary U can file an amended return to report the transfer price as adjusted by Germany. There is no guarantee, however, that Italy would accept the same transfer price as determined by Germany. This could lead to either remaining double taxation or costly litigation. Without a MAP, the best-case scenario for the firm would be to recognize $30 of income in Germany and $20 in Italy. The worst-case scenario for the firm would be to be subject to double taxation on $20, as shown in Appendix B: Figure 1, Panel A. Another potential downside of domestic remedies is that litigation can foreclose certain remedies under the MAP agreement if they do exist (Ault, 2013).

Under a MAP, the worst-case scenario for the firm would be that Italy and Germany cannot agree on the appropriate transfer price, and the firm must resort to the same domestic remedies that would have been available if there were no MAP. Therefore, the company can never be worse off from a tax perspective under a MAP than without a MAP. [16] If the firm takes advantage of the MAP procedure, the competent tax authorities from Italy and Germany negotiate the appropriate intercompany transfer price. Importantly, this negotiation between Italy and Germany is adversarial, with each country interested in achieving a transfer price that maximizes their tax revenue. If the two countries agree on a transfer price of $80, then the firm will pay an additional tax on $10 of income to Germany but will receive a refund for the tax it paid on that $10 of income from Italy. This eliminates double taxation and is a better outcome than if the firm accepted the German transfer price. I detail the best and worst-case outcomes with a MAP in Appendix B: Figure 1, Panel B. Importantly, MAPs can also resolve issues that do not have resolutions under domestic law. For example, there can be secondary effects even if the firm uses domestic remedies to eliminate double taxation. The domestic remedy may not eliminate the interest or penalties charged on the underpayment of tax. For countries that impose tax on distributions or cash flows between international subsidiaries, domestic remedies may eliminate the double taxation of the income but not the taxation incurred to repatriate the cash back to the proper entity. A resolution under a MAP agreement can eliminate these secondary effects that can otherwise be imposed under a domestic remedy (Ault, 2013).

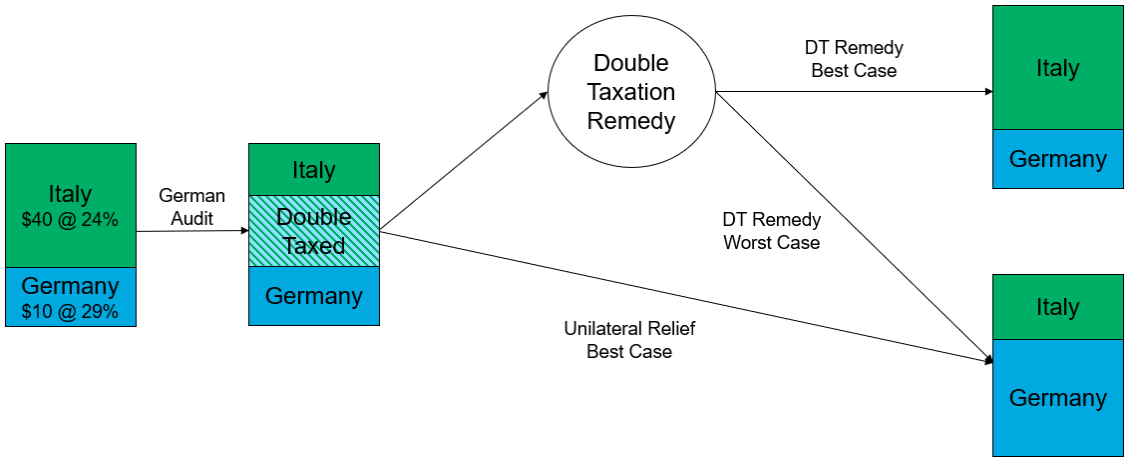
[16] MAP resolutions are not costless to firms, and thus if the cost of engaging in the MAP process is high, firms may be worse off even if they end up paying less tax.

Appendix B. Figure B1. Transfer Pricing Example

Panel A: Example of Double taxation without a MAP



Panel B: Example of Double taxation with a MAP



Note: Figure 1 examines the potential outcomes where a firm engages in income shifting between a high tax country (Germany) and a lower taxed country (Italy). The firm incentive is to shift income from Germany and report it in Italy, as evidenced by the larger proportion of income taxed in Italy (Green vs. Blue). German revenue authorities have an incentive to audit this arrangement to reclassify income from Italy to Germany. If reclassification happens, a certain amount of income will be taxed in both countries—i.e., double taxed income. Figure 1, Panel A shows the potential outcomes if there is no MAP agreement. Under the best-case scenario, Italy gives the firm unilateral relief from double taxation. In the worst case, the double taxation is left in place. Panel B shows the same example if there is a MAP. The firm can apply to use the MAP. Under a MAP, countries are not bound by legal precedents, and thus the best outcome for the firm is actually the initial allocation of income. The worst-case outcome under a double taxation remedy is still equal to the best-case scenario under the unilateral relief scenario where there is no MAP. According to OECD statistics, in 2021, 53 percent of MAP cases resulted in full elimination of double taxation, while another 22 percent were granted unilateral relief or resolved via domestic remedy.

Appendix C: OECD MAP Statistics

I collect data on MAP cases from the OECD for each year available.[17] For each country that reports to the OECD, the country reports various items. Each country reports the open number of cases at the beginning of the year, new cases that year, cases closed that year, and cases still open at the end of the year. Reports break cases down on two broad dimensions. First, because enhanced reporting started in 2017 (for the year 2016), countries break down cases between pre-2016 cases and post-2016 cases. Detailed information about cases and resolutions are only available for post-2016 cases. Countries also report case counts between transfer pricing cases and all other cases. As my research question specifically regards income shifting, I examine only the transfer pricing cases. Other information included in each report relates to how long cases take to resolve. The timing information is for all cases closed since January 2016. Some countries/territories, such as Gibraltar, file reports with the OECD, although they report no MAP cases. The OECD reporting consists of 142 countries (untabulated) that report MAP statistics to the OECD, of which 72 report active cases between 2017 and 2021.

I use data from Table 1 in each report to construct a dataset of MAP variables. I collect information from OECD Table 1 on a country-pair basis. I report descriptive statistics on both a country-year (unilateral) and country-pair-year (bilateral) basis in Table C1. I report unilateral statistics at the country level in Table C1, Panel B. I find that on average the number of MAP cases is increasing over time, with countries reporting an average of 25.8 new MAP cases per year while only reporting an average of 14.9 closed cases per year. When countries close cases, the most common outcome for firms is that double taxation is fully eliminated, with an average of 9.3 cases closed with full relief from double taxation per year. These averages are highly skewed, with the median country reporting only 3.6 new cases and 1.7 closed cases per year. On average, countries report MAP cases with four other countries, but some countries report MAP cases with as many as 26 different countries (untabulated). I report statistics on a country-pair basis, averaged over the sample period in Table C1, Panel C. Overall, I identify 162 country-pairs that report MAP cases between 2017 and 2021. On average (median) there are 8.2 (3.3) new cases per year between them and three closed cases per year.

[17]Data for the year 2021: https://www.oecd.org/tax/dispute/mutual-agreement-procedure-statistics-2021-per-jurisdiction-all.htm. An example report for Germany can be found at: https://www.oecd.org/tax/dispute/2021-map-statistics-germany.pdf

Appendix C. Table C1. MAP Descriptive Statistics

Panel A: Variable Descriptions

MAP Variables

Number of MAPs	The average number of countries for which Country k reports any open cases in a given year	OECD
Beginning Cases *	Average number of MAP transfer pricing cases in year t	OECD
New Cases *	Average of cases started in year t	OECD
Closed Cases *	Average of cases closed in year t	OECD
No Relief *	Average of MAP cases which are denied, withdrawn, or where it is determined there is no double taxation, or where there is no agreement for MAP cases in year t	OECD
Partial Relief *	Average of MAP cases which there is an agreement which partially resolves taxation not in accordance with the tax treaty for MAP cases in year t	OECD
*Unilateral Relief**	Average of MAP cases where one country provides unilateral relief for the taxpayer for MAP cases in year t	OECD
Full Relief *	Average of MAP cases where there is an agreement that fully eliminates the double taxation for MAP cases in year t	OECD
Note: * I calculate averages by Reporting Country k for Unilateral Statistics, or by Country-Pair for Bilateral Statistics.		

Panel B & C: Mutual Agreement Procedures Descriptive Statistics

Panel B: Unilateral Statistics

	N	Mean	Median	Std. Dev.
Beginning Cases	76	41.81	6.00	85.41
Closed Cases	76	14.91	1.70	30.68
New Cases	76	25.82	3.60	51.01
Unilateral Relief	76	2.51	0.80	5.55
Full Relief	76	9.32	0.38	20.48
Partial Relief	76	0.38	0.00	0.95
No Relief	76	2.53	0.50	5.05
Number of MAPs	76	3.96	1.60	4.81

Panel C: Bilateral Statistics

Variable	N	Mean	Median	Std. Dev.
Beginning Cases	162	8.21	3.30	15.76
New Cases	162	5.03	2.20	7.95
Closed Cases	162	2.98	1.20	5.31
Unilateral Relief	162	0.40	0.00	1.12
Full Relief	162	2.03	0.80	4.05
Partial Relief	162	0.07	0.00	0.31
No Relief	162	0.44	0.00	0.78

Note: Appendix C. Table 1 reports descriptive statistics collected from OECD Country level reports on MAP agreements from 2017 through 2021. Panel A summarizes Variables by Reporting Country-Year. OECD reports are aggregated at the reporting country-year level. Panel B summarized variables by Country-Pair-Year. For example, MAPs for Germany-Austria-2020 is a separate observation than MAPs from Germany-United States-2020. Variables defined in Appendix A.

Appendix D: Within Fixed Effect Statistics

Appendix D. Table D1. Within Fixed Effect Statistics

Panel A: Summary Statistics of Fixed Effects

	Number of ...			Observations per group		
	Observations	Groups	Singletons	Min.	Avg.	Max.
Parent	405,430	22,660	3,107	1	17.89	5,082
Year	405,430	10	0	31,584	40,543.00	48,685
Industry	405,430	78	0	2	5,197.82	73,044
Joint singletons	.	.	0	.	.	.
Total singletons	.	.	3,107	.	.	.

Panel B: Variables that are constant within a fixed effect group

	Number of ...		*Parent**		*Year**		*Industry**	
	Obs	Singl	#Groups	#Obs	#Groups	#Obs	#Groups	#Obs
ln(Pre-tax Income)	405,430	3,107	19	42	0	0	0	0
C (Sales)	405,430	3,107	950	4,416	0	0	0	0
Weighted Average MAP (Sales)	405,430	3,107	6,427	55,567	0	0	0	0
C × Weighted Average MAP	405,430	3,107	950	4,416	0	0	0	0
ln(Wages)	405,430	3,107	22	47	0	0	0	0
ln(Intangible Assets)	405,430	3,107	285	740	0	0	0	0
ln(Tangible Assets)	405,430	3,107	78	171	0	0	0	0
Leverage	405,430	3,107	4	8	0	0	0	0
GDP Growth	405,430	3,107	253	735	0	0	0	0
GDP per Capita	405,430	3,107	253	735	0	0	0	0
ln(Foreign Direct Investment)	405,430	3,107	253	735	0	0	0	0
Control of Corruption Score	405,430	3,107	253	735	0	0	0	0

Note: columns with * were computed excluding singleton observations

Panel C: Residual variation after partialling-out

		Std. Dev.			R2 by fixed effect			R2
	N*	Pooled	Within*	Ratio (%)	*Parent*	*Year*	*Industry*	Overall
ln(Pre-tax Income)	402,323	2.0930	1.6172	77.27	0.369	0.005	0.066	0.408
C (Sales)	402,323	0.0528	0.0479	90.80	0.170	0.004	0.008	0.182
Weighted Average MAP (Sales)	402,323	1.0002	0.7031	70.29	0.503	0.001	0.026	0.510
C × Weighted Average MAP	402,323	0.0645	0.0552	85.56	0.270	0.002	0.006	0.274
ln(Wages)	402,323	1.6869	1.2311	72.98	0.426	0.003	0.078	0.471
ln(Intangible Assets)	402,323	2.7337	2.2691	83.00	0.292	0.002	0.048	0.316
ln(Tangible Assets)	402,323	2.5776	1.8301	71.00	0.403	0.001	0.217	0.500
Leverage	402,323	0.2497	0.2018	80.80	0.337	0.002	0.047	0.352
GDP Growth	402,323	0.0840	0.0312	37.14	0.056	0.844	0.001	0.863
GDP per Capita	402,323	15.2026	9.6555	63.51	0.570	0.051	0.037	0.600
ln(Foreign Direct Investment)	402,323	0.8790	0.7403	84.22	0.179	0.116	0.008	0.296
Control of Corruption Score	402,323	0.7287	0.4636	63.62	0.589	0.022	0.036	0.598

Note: Columns with * were computed excluding singleton observations