Negotiated Tax Havens

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Abstract

Tax subsidies alter the distribution of tax burdens in ways that blur the ability of researchers and policymakers to measure tax incentives at the country level, to clearly define a tax haven, and to understand firm-level tax avoidance. In the European Union (EU), control of "state aid" restricts tax subsidy competition while permitting tax rate competition; there is no U.S. corollary. The EU's unique regulatory environment creates novel data for examining the determinants and effects of tax subsidies granted on a discriminatory basis. We find that better-governed countries are more likely to grant subsidies and to direct larger amounts of this "tax aid" toward mobile firms (i.e., firms that are part of a multinational corporation). Despite the EU regulations, we find that mobile firms enjoy significantly larger ETR reductions from tax aid than do immobile firms, even in countries already offering low tax rates. Our findings are important in light of ongoing debates about the appropriate role of preferential tax regimes in global tax competition.

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Subject: RE: tax planning and int'l expansion
I agree with you on Europe and a similar approach probably works for business in Asia. One aspect of those structures is finding a low taxed jurisdiction to park profits. If we are going to hire a large group in a single location, we should look into whether we can negotiate tax breaks with that country and effectively create a low taxed jurisdiction that way. That can often be cleaner than using offshore entities. --- internal email, Facebook, April 10, 2008

1. Introduction

International competition for corporate taxes has intensified over the last two decades. Driven by a mismatch between the rate of globalization and the pace at which countries' tax laws are adapted, opportunities for multinational corporations (MNCs) to legally reduce their tax burdens have increased. To identify firms' incentives to shift their profits to other jurisdictions and reduce their tax burden, the extant research generally uses either countries' statutory tax rates or their identification as a "tax haven".[1] However, countries have other tools to use in attracting and retaining a corporate tax base. They can negotiate deals and provide subsidies that increase firms' returns and encourage them to have their profits taxed in the country, all while leaving their statutory tax rate unchanged and avoiding the label of "tax haven." It is this aspect of tax competition – largely overlooked in the extant literature – which we study in this paper.

We examine European Union (EU) countries that offer relatively greater tax subsidies and chart how discriminatory subsidies alter the distribution of the corporate tax burdens of EU firms. The particular aspect of discrimination we focus on is whether, and to what extent, the national tax system targets mobile capital. Such so-called "preferential tax regimes," which allow national tax codes to effectively impose lower rates on corporate tax bases with a higher degree of international mobility, are controversial in practice. According to theoretical studies (e.g., Janeba and Peters [1999]; Keen [2001]; Janeba and Smart [2003]), these regimes should reduce

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[1] Dharmapala and Hines [2009] define a tax haven as a country "with very low tax rates and other tax attributes designed to appeal to foreign investors". The intersection of their list with our sample of EU countries classifies Cyprus, Ireland, Malta, The Netherlands, and Luxembourg as tax havens. However, these countries are not those with the lowest tax rates. The average statutory tax rate for haven (non-haven) EU countries is 24.2% (24.9%).

international tax rate competition. Our results do not support that theory. We find evidence that well-governed countries grant more subsidies and direct larger amounts of aid to mobile firms (i.e., firms that are part of an MNC). These subsidies lower each firm's effective tax rate (ETR) by approximately 2.7 percentage points, on average. Even more important is our finding that this ETR reduction is *greater for mobile firms*, relative to immobile (i.e., domestic) firms, in low tax rate countries and countries labelled as tax havens. Our findings suggest that allowing countries to use preferential tax regimes to target mobile capital will not necessarily reduce tax rate competition, as theory predicts.

All government subsidies have the general aim of promoting an economic or social policy. Subsidies delivered through the tax code come in many forms – e.g., credits (reductions in tax due), exemptions (income not subject to tax), deductions (reductions to the tax base), deferrals (delay in the payment of tax), or preferential tax rates (certain types of income taxed at lower rates). All tax subsidies are, at some level, "discriminatory," in that they favor the business activities of recipient firms over those of non-recipients. However, to understand the data we use in this study, it is important to understand how the term is used in the EU. There, a discriminatory tax subsidy is one that "confers an advantage on a selective basis to undertakings." While a tax credit for research and development (R&D) unambiguously favors firms investing in R&D, it is not considered discriminatory in the EU unless the credit is, for example, available only to small firms or to those performing R&D of a specific nature, such as developing a vaccine for COVID-19. Note that "discriminatory" need not mean that the incentive targets a single firm.

When an EU country grants such a subsidy, the expenditures are captured in a database maintained by the European Commission (EC). Referred to as "state aid" under EC competition

law, the expenditures are categorized into different types; we refer to expenditures made through the tax system as "tax aid."[2] The EC database covers all EU countries for the period 2000-2018. It exists to provide a transparent and publicly accessible source of information about the use of public resources in the EU and to evaluate the EC's control of state aid. The EC is said to "control" state aid because the only type of discrimination allowed by law, when granting subsidies, is that which the EC deems to be compatible with the EU idea of the single market.[3] If the discrimination distorts or threatens to distort competition and to affect trade between EU countries in a way that is incompatible with EU objectives, then the aid cannot be granted and will not be included in the database.

The ideal dataset to understand how governments choose their subsidy offers, as well as the effects of those offers, would consist of the detailed contracts between each government and each subsidized firm. Observing these contracts would reveal governments' preferences regarding the distribution of the tax burden across firms. Of course, these contracts are confidential; only recently have disclosures been required in the US.[4] Discriminatory subsidies in the EU differ, in that they are generally not granted via a "contract" with a specific firm.[5] Our review of EC data for the period 2000-2018 reveals that the majority of EU tax subsidies are

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[2] The data do not reveal which firms benefit from the subsidies, but they do indicate whether the subsidy was granted via the tax system, the general objective of the aid (e.g., environmental, cultural, regional development, etc.), and the total Euro amount of the expenditure, for example.

[3] The single market idea sees the EU as one territory without any internal borders or other regulatory obstacles to the free movement of goods and services.

[4] In the US, since 2016 state and local governments are required to report tax abatement spending in the notes of their comprehensive annual financial reports (CAFRs). A tax abatement is an agreement between one or more governments and an individual or entity in which the government(s) forego tax revenue in exchange for a promise by the individual or entity to contribute in some way to economic development. Good Jobs First has extracted information from CAFRs on over 20,000 agreements and has made the data available through a product called Tax Break Tracker on its website: https://www.goodjobsfirst.org/taxbreaktracker

[5] Tax rulings are agreements between governments and firms intended to provide certainty on how a transaction will be treated for tax purposes. They may constitute state aid when the discretion of the tax authorities exceeds the management of tax revenue by reference to objective criteria. Note that a firm could lobby for or negotiate the terms of a national tax scheme, but that scheme (if enacted) would also benefit other firms performing similar activities.

provided through national tax laws that favor certain activities, rather than a specific firm.[6] For example, in 2013 the United Kingdom (UK) notified the EC that it intended to introduce a high-end animation tax relief scheme, providing a tax rate reduction until 2018 to firms producing qualifying cultural programs. The UK expected 11 to 50 firms would benefit from this scheme.[7]

We conduct three analyses on a sample of 28 EU countries and the firms located in those countries. First, in a sample of 503 country-years from 2000-2018, we explore whether country governance explains countries' use of tax aid. In this we expand upon Dharmapala and Hines [2009] (herein, DH [2009]), which found country governance to be associated with tax haven status, defined to include five EU countries – Cyprus, Ireland, Malta, the Netherlands, and Luxembourg . Second, in a limited sample of beneficiaries of tax aid from 2016-2018, we examine whether mobile firms (i.e., firms that are part of an MNC) receive larger aid awards than immobile firms. We also examine whether this relation varies with the statutory tax rate and the tax haven status of the granting country. Third, we search for systematic differences in the firm-level ETRs of mobile and immobile firms in a sample of approximately 12 million firms from 2000-2018. Our data for this third analysis includes the total amount of aid enjoyed each year by qualifying firms in each country, but (unlike the limited sample used in our second analysis) does not name the individual firms that benefited.[8] By design, these expenditures influence the country's tax code and, by extension, the ETRs of other firms in the same country.[9]

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[6] Each subsidy is considered a "case" and is entered into the EU's state aid database. Each case is associated with an unobservable (to the researcher) level of government expenditure. Cases that relate to tax subsidies granted via the tax system comprise 91 percent of all cases, with the balance related to subsidies granted to specific firms. Note that we cannot determine these percentages based on expenditures.
[7] https://ec.europa.eu/competition/state_aid/cases/247345/247345_1416718_88_1.pdf
[8] There has been a push for transparency in the EU regarding beneficiaries. See Section 2 for a discussion.
[9] As is widely shown in the literature, statutory tax rates do not capture the complex details that together define a firm's actual or expected tax burden in a county. For this reason, most studies rely on ETRs calculated as income tax expense divided by pre-tax income. An ETR is a rough proxy variable that summarizes the interaction of various tax provisions that apply to a firm and its activities.

Thus, our approach interprets within-country-year differences in ETRs across mobile and immobile firms, explained by variation in tax aid granted at the country-year level, as revealing the average effect of countries' targeted subsidies.

Our first set of results show that a country's use of tax aid increases along with the quality of its governance. Extending DH [2009], which examines governance and tax haven status, we show that tax aid use must also be combined with good governance to have its intended effect. Our coefficient estimates suggest that well-governed countries forego 3.2 percent of corporate tax revenue to subsidies. It is also noteworthy that a country's tax haven status is not significantly associated with tax aid; by contrast, having a low tax rate is negatively associated with tax aid. These results are consistent with the theoretical literature on tax competition (e.g., Keen [2001]) which predicts that low tax rates and targeted tax subsidies will act as substitute policies to some extent when preferential regimes are permitted.

Our second analysis shows that mobile firms receive larger aid awards, relative to immobile firms, controlling for firm size and industry. This suggests that countries use tax aid to compete for mobile capital even within the EU, where the use of preferential tax regimes is restricted. Using the same beneficiary level data, we also examine whether granting larger aid awards to mobile firms varies by statutory tax rate as well as by tax haven status. Here, we find that while mobile firms receive larger aid awards, on average, this effect is magnified (muted) in tax haven (low tax) countries. These results suggest countries with low tax rates do not target tax aid toward mobile capital; the low rate already provides incentive for firms to earn income in the country. However, tax haven countries do target tax aid toward mobile capital. This latter result is consistent with DH [2009] that include in their tax haven definition jurisdictions having "other

tax attributes designed to appeal to foreign investors". These "other tax attributes" include government policies surrounding the use of targeted tax subsidies.

Our third analysis examines the impact of a country's tax aid on the effective tax rates (ETRs) of its resident firms. It is widely known that statutory tax rates do not always represent the tax costs of reporting income in a jurisdiction. The reason may be that countries lower tax rates on certain types of income, or facilitate the negotiation of a lower tax rate for certain taxpayers (Dowd, Landefeld, and Moore [2017]). After considering country specific tax incentives or administrative practices that lower firms' tax obligations – notably the use of tax aid – the tax cost of reporting income will be reflected in the ETRs firms. We find that firms located in high tax aid countries enjoy a 2.7 percentage point ETR reduction and that this effect is smaller in tax haven and low tax rate countries, suggesting that subsidies and other tax incentives are substitutes. When we look across mobile and immobile firms, this substitution effect of tax incentives is stronger in the sample of immobile firms. These results imply that tax aid and other tax incentives are used as complementary (substitute) policy tools to target mobile (immobile) firms.

Our study makes two important contributions to the literatures on tax competition and the tax avoidance behavior of firms. A controversial issue in the study of tax competition is whether it is desirable to restrict countries from using targeted subsidies to attract mobile capital (e.g., Janeba and Peters [1999]; Keen [2001]) . One view is that allowing countries to use targeted tax subsidies will prevent them from having to reduce their statutory tax rate, which applies to both mobile and immobile capital, in order to remain globally competitive. Our findings call this view into question: We show that high tax aid use in low tax rate countries leads to a *greater* reduction in the ETRs of mobile firms. The literature on tax avoidance contains the apparent anomaly that

tax avoidance has increased in purely domestic firms as much as in multinationals over the past 30 years. Documenting this anomaly, Dyreng et al. [2017] conjecture that purely domestic firms have tax subsidies available that permit them to lower their tax burdens.[10] Our study makes sense of the apparent anomaly by showing that all firms enjoy ETR reductions from tax subsidies, but mobile firms enjoy greater reductions than do purely domestic firms. We also find that the ETR reductions enjoyed by mobile firms are greater in low tax countries and in tax havens.

Overall, our study demonstrates how targeted subsidies blur the ability of researchers and policymakers to measure a country's tax incentive policies, to define a tax haven, and to capture a firm's tax avoidance incentives at the country level. Our novel data, which to our knowledge have not featured before in an academic study, will be useful for future studies that examine these issues. From a policy perspective, our paper highlights the need for the tax authorities of major economies to remember to look inward as well as outward when they consider ways to combat corporate profit shifting. In terms of actual effects, their willingness to negotiate and to cut deals with MNCs is really not so different from countries with low or zero statutory tax rates, such as the Caymans or Bermuda.

Section 2 provides background on state aid in the EU and on related studies. Section 3 develops our testable hypotheses. Section 4 describes our data and research design. Section 5 discusses our empirical results. Section 6 concludes.

2. Institutional background and related literature

In the global economy, it is increasingly possible for MNCs to shift income from one country to another. This can result in tax competition: Countries compete for mobile tax bases by reducing the rates at which these bases are taxed. So-called "preferential tax regimes" allow

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[10] Relatedly, Chow, Hoopes, and Maydew [2020] document tax rate reductions of between 1.9 and 3.3 percentage points resulting from tax holidays granted to US firms by foreign governments.

national tax codes to impose different tax rates on tax bases having different degrees of international mobility. Whether it is desirable for countries (or regions) to agree not to provide such preferential treatment to different forms of capital is controversial (Janeba and Peters [1999]; Keen [2001]; Janeba and Smart [2003]; Haupt and Peters [2005]; Bucovetsky and Haufler [2008]; Mongrain and Wilson [2018]).

One view argues that preferential tax regimes should be abolished; otherwise, countries will aggressively compete for mobile capital, resulting in taxes that are far below their efficient level (even down to zero), while more immobile bases are taxed more heavily. The alternate view favors allowing preferential regimes for the same reason: to reduce tax competition. Keen [2001] argues that if all tax bases must be taxed at the same rate then, to attract mobile capital, governments would reduce the tax rate on all capital. If this uniform tax rate lies below the rate levied on less-mobile bases in a preferential tax regime, it is not clear that restricting countries from offering such regimes would raise more revenue (Wilson [2018]).

Discriminatory tax measures generally come in one of two forms (Bucovetsky and Haufler [2007]). One form discriminates between domestically-owned and foreign-owned firms, the other discriminates by industry or class of asset. In the second case, activities involving mobile assets benefit from lower tax rates, regardless of whether a domestic- or foreign-owned firm owns those assets.[11] In both cases, preferential tax regimes grant tax concessions to activities that are more internationally mobile. The practical details of preferential tax regimes are typically negotiated between national governments and individual firms (or groups of firms) expecting to benefit from the tax preferences.

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[11] A recent example of this type of preferential tax regime is intellectual property (IP) box regimes that allow income from the exploitation of IP to be taxed at a lower rate than the standard statutory tax rate. The potential for IP boxes to attract mobile income was reviewed as a potentially harmful preferential tax practice (depending on how it is designed) as part of the OECD Base Erosion and Profit Shifting project.

The significance of these tax regimes has been difficult to quantify. However, the EU provides a unique setting to explore their use, as well as how they result in differential tax burdens across different forms of capital. While regulating business subsidies, an EU central authority has collected two decades worth of data about discriminatory tax measures in EU countries.[12] The European Commission (EC) enforces an agreement among EU countries (Article 107(1) of the Treaty for Functioning of the EU) to prevent member states from engaging in wasteful subsidy races and to ensure that firms compete on a level playing field. Under EU competition law, "state aid" refers to any subsidy (not solely tax subsidies) that "provides a selective advantage to one or more undertakings, with the potential to distort competition and affect trade between member states." These types of coordinated tax policy initiatives taken by the EU (and the Organization for Economic Cooperation and Development), aimed at abolishing preferential tax regimes, motivate much of the theoretical work on the merits of allowing versus abolishing these regimes (e.g., Bucovetsky and Haufler [2007]; Keen [2001]; Janeba and Smart [2003]). To our knowledge, empirical work has done little to inform these debates.

In 2000, the EC began publishing the *State Aid Scoreboard*, based on reports provided by each country.[13] These data exist "to provide a transparent and publicly accessible source of information on the overall state aid situation in each EU country" [14] and to underscore the EC's control of state aid. They capture aid expenditures made at the national level that are intended to benefit either an individual firm or a particular sector or activity. The beneficiaries of state aid are not named in this dataset, although limited beneficiary-level information became available in

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[12] There is no US corollary, because there is no legislation that restricts tax competition among US states. Chirinko and Wilson [2017] conclude that policies restricting tax competition among US states are likely to be ineffective.
[13] https://ec.europa.eu/competition/state_aid/scoreboard/index_en.html
[14]
https://webgate.ec.europa.eu/comp/redisstat/databrowser/explore/all/COMP_TOP_2019?lang=en&display=card&sort=category

2016, as will be discussed below. Subsidies that do not favor certain undertakings, or do not have the potential to affect trade or distort competition, are not included in the *Scoreboard*, as they do not constitute state aid. The dollar amounts given in the dataset represent the economic advantage passed on to the actual beneficiaries of the aid.

Awarding state aid is illegal in the EU unless the targeted subsidy qualifies for an automatic exemption or is approved by the EC.[15] State aid may be legally granted when the positive effects of the subsidy (e.g., stimulating regional development) are considered to outweigh its negative impact (e.g., distorting trade or competition among EU countries). The EC makes this determination by considering the costs and benefits to the EU as a whole, consistent with the single market idea. Illegal state aid necessarily involves either deception or a serious misinterpretation of the rules by both the country and the beneficiary.[16] If illegal aid is awarded (and discovered as part of the enforcement process), countries have a legal duty to recover it. The beneficiary may be ordered to repay the full value of the benefits received, with compound interest backdated to the awarding of the grant.

Salient to our study is the extent to which a country provides discriminatory business tax subsidies. Figure 1 shows the aggregate amount of state aid ("all aid"), state aid delivered via tax subsidies ("tax aid"; e.g., excluding direct grants) and corporate tax revenues collected in the EU from 2000-2018. Expenditures for state aid remained relatively flat, with an increase beginning in 2013; tax aid increased at a slower pace than non-tax aid. As of 2018, targeted tax subsidies in the EU stood at approximately 10 percent of the corporate tax revenue collected.

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[15] As of 2018, 36 percent of state aid was granted by member states under an exemption ("exempted aid"), whereby the EC declares certain categories of state aid to be compatible with the single market. The remaining 64 percent of state aid is "notified aid," whereby the member state asked the EC to approve the aid prior to granting it.

[16] There have been approximately 120 cases since 1990 where a member state was accused by the EC of providing illegal state aid. Note that these accusations may be appealed and decided in court, as in the most recent Apple case.

While the aggregate amount of tax aid granted in the EU is relatively stable over time, it varies significantly across and within countries. To measure the percent of corporate tax revenue forgone to preferential tax treatment, for each country-year we scale tax aid by the sum of corporate tax revenue and tax aid. Figure 2 shows that, on average over the sample period, the high end (19-20 percent) includes Portugal, Hungary, and Malta, while the low end (2-3 percent) includes Estonia, the Netherlands, Bulgaria, Italy, and Croatia. Figure 3 shows that the three largest EU countries in terms of tax revenue – France, Germany, and the UK – vary in terms of their use of tax subsidies. On average, Germany foregoes about 16 percent of its corporate tax revenue to subsidies, while the UK foregoes about 4 percent. Figure 4 highlights the aggregate variation over time (top) and in the largest EU countries (bottom).

In 2016, the EC began compiling (and disclosing) aid expenditure data at the beneficiary level. This action came in response to public distrust over state aid arising from the LuxLeaks investigation, published in November 2014, which exposed more than 300 secret tax deals that Luxembourg struck with global businesses. In several cases, the deals – known as "tax rulings" – allowed firms to pay tax in Luxembourg at a rate of less than 1 percent.[17] Public allegations voiced in the media and in national parliaments expressed concern that MNCs were receiving illegal state aid through such tax rulings. These concerns, which prompted the EC to investigate tax ruling practices in the EU, increased the demand for transparency surrounding state aid.

Consequently, since 2016 EU countries must disclose on a public website the beneficiaries of all state aid awards above €500,000. The EC set up a State Aid Transparency Public Search database to promote the accountability of the granting authorities and to let firms

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[17] A tax ruling is a written interpretation of tax laws issued by a tax authority to a business that requests clarification or certainty surrounding a taxation arrangement (Diller et al. [2017]). For a list of recent state aid tax ruling cases, see: https://ec.europa.eu/competition/state_aid/tax_rulings/index_en.html.

in the EU better determine whether aid granted to their competitors is legal.[18] The EC website is

an attempt to standardize and aggregate the information, offering the ability to search the

database in 20 different languages. While these data provide beneficiary-level information on EU

tax subsidies, they are not a comprehensive compilation of all aid awards because of the

€500,000 reporting threshold and an exception that allows EU countries to satisfy the

requirements by posting the information instead on a national or regional website.

Large scale empirical analyses of tax subsidies are generally limited by data availability.

Redonda and Neubig [2018] describe why tax expenditure reporting, despite its importance for

evaluating various aspects of government spending, is neither widely available nor comparable

across countries. Even at the aggregate country level, we know very little about the comparative

use of tax subsidies in the administration of a tax system. We know arguably less about specific

firms that benefit from the use of tax subsidies. Much of the subsidy literature instead examines

tax subsidies to individuals (e.g., Finkelstein [2007]) or develops important but untested theories

of subsidy competition (Black and Hoyt [1989]; Glaeser [2001]). Recently, researchers have

begun to look at business subsidy competition in the US state setting, aided by hand-collected

data compiled by *Good Jobs First* (e.g., Slattery [2018]; Slattery and Zidar [2020]). Ours is the

first study to examine the use of tax subsidies across EU countries and to explore the

distributional implications of those subsidies in a large sample of domestic and multinational

firms across countries over two decades.

3. Hypothesis development

In this section, we outline what we aim to learn from our empirical tests and provide

predictions based on existing theoretical and empirical studies. First, we examine cross-country

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[18] https://dbei.gov.ie/en/What-We-Do/EU-Internal-Market/EU-State-Aid-Rules/Transparency-of-State-Aid/

variation in the use of targeted tax subsidies to better understand the characteristics of countries that grant high amounts of tax aid. Second, we determine whether more mobile tax bases receive larger amounts of tax aid from governments. Third, we quantify the impact on firms' effective tax rates explained by cross-country variation in the amount of tax aid granted. We elaborate on each of these analyses and offer predictions in the sections that follow.

3.1   *Characteristics of countries that grant tax aid*

Tax systems are multidimensional. In addition to the statutory tax rate, a tax system has many non-rate aspects, including the definition of the tax base, administration, and enforcement of the rules (Robinson and Slemrod [2012]). Non-rate aspects of tax systems have generally been difficult to observe and measure in a way that can reasonably summarize cross-country variation. The EC enforcement data provide us with a way to study one important but otherwise unobservable aspect of countries' tax systems – the use of targeted tax subsidies. Tax subsidies are neither inherently right nor wrong, but they are distortionary in that they seek to alter patterns of economic activity to promote policy objectives.

Governments grant tax subsidies in three main ways: by providing tax credits, offering preferential tax rates, or reducing the tax base. These subsidies may be designed to benefit a broad class of activities conducted by any entity (e.g., R&D) or to benefit a narrower set of firms (e.g., R&D of a particular type, or firms of a particular size performing R&D). The availability of subsidies precludes the possibility of any country having a single well-defined statutory tax rate. By extension, subsidies also complicate the definition of a tax haven, which is usually associated with low statutory tax rates. Hines and Rice [1994] note that the definition of a tax haven is "necessarily arbitrary," because tax subsidies allow any country to serve as a tax haven

for certain activities. In the EU, for instance, five countries are identified as tax havens by Hines and Rice [1994] and DH [2009] but have statutory tax rates well over 10 percent.

DH [2009] examines characteristics of approximately 40 countries that adopt tax incentives, resulting in them being labelled as tax havens. The authors refer to these tax incentives as "low statutory tax rates" and "tax attributes designed to appeal to foreign investors" We extend their analysis by examining cross-country variation in the use of tax aid. Notably, their study documents that tax havens are better-governed countries than non-havens. They argue that the returns on being a tax haven are only sufficiently high for better-governed countries, because only then do the tax incentives induce higher levels of investment (thereby increasing the overall tax base). This argument naturally extends to a country's use of tax aid and leads to our first hypothesis:

H1: A country's use of tax aid increases with the quality of its governance.

3.2   The use of tax aid and tax base mobility

The elasticity of taxable income to cross-country differences in statutory tax rates gives national governments a clear incentive to compete over mobile tax bases (Dharmapala [2014]). As described in Section 2, the EU attempts to limit harmful tax competition by ensuring that preferential tax regimes are consistent with broader EU objectives. EU countries may compete on tax rates, but they may not engage in subsidy competition. This regulatory environment constrains EU countries that wish to offer targeted subsidies to mobile tax bases, as would generally be expected (Janeba and Peters [1999]; Keen [2001]; Janeba and Smart [2003]).

However, it is unclear whether the EU's regulatory constraints impede competition for mobile capital. If they do, then there may be no relation between the amount of tax aid awarded

and tax base mobility. It is also unclear whether tax subsidies are targeted, in practice, toward mobile capital. While subsidies may target mobile capital (i.e., focus on the extensive margin), they may also be granted to achieve particular environmental or industrial policy objectives that are blind to capital mobility (i.e., indifferent between the extensive and intensive margins). We proxy for tax base mobility by separating EU firms into those that are purely domestic and those that are part of an multinational company (MNC), using the MNCs to represent mobile capital. This leads to our second hypothesis:

H2: The amount of tax aid granted increases with the mobility of the tax base.

3.3   The impact of tax aid on the distribution of tax burdens

Here, we seek to understand the extent to which countries' use of tax aid impacts the tax burdens of resident firms. Dowd, Landefeld, and Moore [2017] note that statutory tax rates do not represent the tax costs of reporting income in a jurisdiction when countries lower tax rates on certain types of income, or facilitate the negotiation of lower tax rates. Tax aid data at the country-level is thus expected to impact the effective tax rates of firms operating in a country. If tax aid in the EU is targeted at mobile firms, then national tax systems will favor MNCs. Such tax incentives are not captured in country-specific statutory tax rates or tax base measures, because they apply only to MNCs. By extension, these preferential tax regimes cloud our ability to study MNC tax avoidance or to accurately measure profit shifting incentives (e.g., Alexander, Vito, and Jacob [2020]; Huizinga and Laeven [2008]). This leads to our third hypothesis:

H3: The extent to which a country's use of tax aid reduces a firm's tax burden
increases with the mobility of the tax base.

This analysis contributes to the literature on firms' tax avoidance practices (Hanlon and Heitzman [2010]), which examines differences in ETRs across firms and over time (e.g., Dyreng et al. [2017]; Dyreng et al. [2008]). Researchers focus on the firm and the actions it takes to reduce its ETR, recognizing that firm characteristics will explain some of the variation in ETRs. A consensus in this literature is that ETRs have been decreasing over time, with considerable unexplained cross-sectional variation. The general tenor is that firms take a tax system as given, and then tax plan (at risk) within that given legal framework. Although the literature recognizes the existence of subsidies, it does not separate tax planning from access to subsidies, largely due to data limitations.[19] One exception is Chow et al. [2020], which examines tax reductions granted by foreign governments to US MNCs. Using disclosures in U.S. MNC's financial statements, they find that foreign tax holidays reduce ETRs by between 1.9 and 3.3 percent; this is larger than the average ETR reduction of using a tax haven.[20]

4. Data and research design

4.1 Data sources

Here we describe each dataset that we use in our study and, in the next section, discuss how we incorporate each dataset into our research design. We use data from three primary sources: i) financial and ownership data for firms that are resident in the EU, collected by Bureau van Dijk (BvD); ii) state aid data reported by EU countries to the EC; and iii) country data collected by Comtax and the World Bank.

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[19] Generally, firm characteristics are included in ETR regressions to control for widely available (but not necessarily targeted, as in our data) legal tax subsidies, such as depreciation or investment tax credits and R&D tax incentives, by including PP&E, R&D expenditures, industry fixed effects, etc.

[20] Drake et al. [2018] look at non-income tax relief granted by governments, and Raghunandan [2018] looks at the relation between receiving a subsidy and committing financial fraud. Neither study focuses on the impact of subsidies in explaining ETRs. De Simone et al. [2019] examine the impact of subsidies on U.S. business activity.

4.1.1 BvD operating and financial data

We obtain historical financial data on EU firms for the period 2000-2018 through the Wharton Research Data Services (WRDS) interface with the *Amadeus* database maintained by BvD. A "firm" in these data represents a distinct legal entity residing in an EU country. We begin with all firms in the *financials_vlms* dataset which have unconsolidated data and non-missing values of year (*closdate_year*), identification number (*idnr*), operating revenue (*opre*), pretax income (*plbt*), tax expense (*taxa*), and total assets (*toas*).[21] We convert all financial variables to millions of euros. We calculate firm age by subtracting the date of incorporation (*DATEINC_year* from the *amadeus_vlms* database, described in the next section) from each observation's year.

Because firms can choose to operate within (and across) jurisdictions using a variety of ownership structures, we aggregate all financial variables within a company-country-year, where we define a "company" as a group of firms controlled by the same global ultimate owner (GUO). This approach allows us to treat all commonly controlled firms operating within each county as a single firm when calculating firm-level variables.[22] For industry, we assign each company-country-year to the industry of the firm with the most operating revenue. For age, we use the maximum of the ages of the firms within the company-country-year.

4.1.2 BvD ownership data: Coding firms as MOBILE

We obtain ownership data from the BvD databases *amadeus_vlms* and *ish_duo_guo_vlms*, again through the WRDS interface. Ownership data, unlike the financial data described above, are static and only available as of the most recent year. We consider a firm to

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[21] Variable names in the database are listed in parentheses.
[22] Standalone firms (i.e., those that are neither controlled by another firm nor control another firm) are included in the data without any aggregation.

be mobile (i.e., part of an MNC) if it is the subsidiary of a parent firm (GUO) located in a different country or if it is itself the GUO of at least one foreign subsidiary. Our classification process is presented diagrammatically in Figure 5. To make these classifications, we use four variables (BvD variable name): independence indicator (indepind), GUO type (GUO_type), country of GUO (GUO_cntry), and country (cntrycde). BvD assigns each firm one of four independence indicators based on the concentration of ownership[23]: A (low; no shareholder with 25 percent direct or total ownership), B (medium-low; a shareholder with more than 25 percent, but none with more than 50 percent), C (medium-high; a shareholder with more than 50 percent total), and D (high; a shareholder with more than 50 percent direct ownership).[24]

We initially code all firms with independence indicator A or B as immobile (*Mobile*=0), because an entity cannot be foreign-owned if it is not controlled. To code the firms with independence indicator C or D, we use information about the GUO. BvD assigns each GUO one of 18 possible values for *GUO_type*. For firms with type B (banks), F (financial), A (insurance), and C (corporations), we code *Mobile*=1 (*Mobile*=0) if the country of the GUO is different from (the same as) the firm's country. For all other GUO types (e.g., individuals), we code *Mobile*=0.[25] We next identify a group of firms that are not foreign-owned but have foreign subsidiaries. Parent firms (GUOs) are coded *Mobile*=1 (*Mobile*= 0) if they are (are not) the owner of at least one foreign subsidiary. Firms that are not a GUO, but instead have a GUO, are coded *Mobile*=1 (*Mobile*=0) if their parent firm has (does not have) a foreign subsidiary.

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[23] There is a fifth category, U, for firms for which the degree of ownership concentration is unknown. We exclude this latter group of firms.

[24] There are also + and – divisions within each letter category. We ignore these sub-categories, as they are not germane to our purposes.

[25] The other categories are E (mutual and pensions funds), J (foundation/research institute), I (individuals or families), M (employees/managers/directors), H (self-ownership), P (private equity), Z (public), D (unnamed private shareholders, aggregated), L (other unnamed shareholders, aggregated), V (venture capital), Y (hedge fund), Q (branch), and W (marine vessel). Source: https://help.bvdinfo.com/mergedProjects/68_EN/Home.htm

4.1.3 European Commission state aid data

We use two complementary sources of state aid data; both contain information provided by EU countries to the EC. Our first source is the *State Aid Scoreboard* (or, "scoreboard data"), compiled by the EC "to provide a transparent and publicly accessible source of information on the overall state aid situation in each EU country."[26] The scoreboard data are based on annual reporting by EU countries, pursuant to Article 6 (1) of Commission Regulation (EC) 794/2004, and are disseminated by Eurostat. We downloaded these data for the period 2000-2018 from the competition section of the EC's website on May 11, 2020.[27] The dataset contains total state aid expenditures annually for each EU country. As we focus on tax subsidies, we captured the scoreboard data for state aid expenditures made through the tax system (as opposed to direct grants or interest rate subsidies, for example).

Our second source of state aid data is the *State Aid Transparency* database (or, "transparency data"), launched by the EC "to promote accountability of granting authorities and to reduce uncertainties on the market for state aid by allowing citizens and companies to access easily relevant information about awarded aid, such as the name of the beneficiary, amount, location, sector, and objective."[28] In this dataset, the beneficiary is the legal entity operating within a jurisdiction that receives the aid. These data date from 2016, when the EU began requiring countries to disclose on a public website the beneficiaries of all individual aid awards above €500k. Since EU countries may also satisfy the requirements by listing these awards on a regional or national website, the database maintained by the EC is not a complete listing of aid

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[26]
https://webgate.ec.europa.eu/comp/redisstat/databrowser/explore/all/COMP_TOP_2019?lang=en&display=card&sort=category

[27] The download date is important because the EC revises past expenditure data to be consistent with the actual tax benefits received by taxpayers who qualify for the subsidy. The lag between tax filings and expenditure reporting requirements causes some revisions to previous years' expenditure data.

[28] https://webgate.ec.europa.eu/competition/transparency/public/search/home/

awards at the beneficiary level. We revisit this limitation in Section 4.2.2, where we describe how we use these data in our empirical analysis.

We captured the transparency data for the period 2016-2020.[29] As of May 11, 2020, when we downloaded the entire database, there were 17,559 individual awards of tax aid across all EU countries. The award data contain disclosures from 21 of the 28 EU countries and are dominated by the UK and Germany, which combined represent approximately 80 percent of all awards in the database. Germany and the UK (along with France) grant the most significant amounts of aid. In terms of grant year, approximately 30 percent of all awards were granted in each of 2016, 2017, and 2018 while the remaining 10 percent were granted during 2019 and 2020. In our empirical analyses, we use the name of the beneficiary, the amount of the aid, and the grant year. Beneficiaries appear more than once in the data if they receive multiple subsidies.

4.1.4 World Bank and Comtax country data

We define macroeconomic indicators and governance measures for the EU countries using data maintained by the World Bank. From the World Bank, we downloaded data for the period 2000-2020 on gross domestic product (GDP) per capita, population, and country governance. The latter is the governance index published by the World Bank as part of its Worldwide Governance Indicators (Kaufmann, Kraay, and Mastruzzi [2010]).[30] From Comtax, we downloaded statutory corporate tax rates for the period 2000-2020 for all EU countries.

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[29] As of November 2020, data from aid awards granted in 2019 and 2020 are sparse, because the year refers to when the recipient actually benefited from the subsidy. Thus, we use data for the period 2016 to 2018 in our analysis.
[30] See https://data.worldbank.org/ and https://info.worldbank.org/governance/wgi/

4.2   Research design

4.2.1   Which countries grant more tax aid?

For each country-year in our sample, we determine the proportion of tax aid granted, according to the scoreboard data, as a percentage of total corporate tax revenue collected plus tax aid granted. This ratio, $\%TaxAid$, is interpreted as the total amount of corporate tax revenue *not* collected due to subsidies as a proportion of the total amount of corporate tax revenue that could have been collected if no tax subsidies were granted. This measure captures the extent to which the country grants tax aid to lower the tax burden of resident firms; it is our dependent variable.

In the spirit of Kanbur and Keen [1993] and DH [2009], who asked (theoretically and empirically, respectively) which kinds of countries adopt tax policies that result in them being labelled tax havens, we examine which EU countries use tax aid more extensively. To do so, we estimate the following equation at the country-year level for the period 2000-2018:

$$\%TaxAid_{it} = \alpha + \beta_1 GovernanceHigh_{it} + \beta_2 StatRateLow_{it} + \beta_3 Haven_i + \tag{1}$$
$$\beta_4 GDP\ per\ capita_{it} + \beta_5 Population_{it} + \beta_6 Landlocked_i + \varepsilon_{it}$$

where

$\%TaxAid_{it}$	= the amount of tax aid granted, scaled by the sum of tax aid granted and corporate income tax revenue collected by Country i in Year t.
$GovernanceHigh_{it}$	= 1 if Country i has an above-median governance index in Year t, 0 otherwise. The index ranges from -2.5 to 2.5, with higher values implying better governance.[31]
$StatRateLow_{it}$	= 1 if Country i has a below-median statutory corporate tax rate in Year t, 0 otherwise.
$Haven_i$	= 1 if Country i is identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, the Netherlands, and Malta).
$GDP\ per\ capita_{it}$	= the natural log of the gross domestic product per capita of Country i in Year t.
$Population_{it}$	= the natural log of the population of Country i in Year t.

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[31] In our empirical analysis, we follow DH [2009] by excluding one of the six measures of governance (regulatory quality) before aggregating the other five measures into a composite governance index for each country-year. Regulatory quality is excluded because it is (in part) impacted by the countries' tax systems.

$Landlocked_i$ = 1 if Country i does not have at least one port, 0 otherwise (i.e., Luxembourg, Slovakia, the Czech Republic, Hungary, and Austria).

We include the same set of explanatory variables as in DH [2009] (see Table 2 in their study), with the exception of "Distance by air" and "UN member," which have no meaningful variation within EU countries. We also do not include regional dummies, but instead include year fixed effects. $GovernanceHigh$ is the focal variable in DH [2009] and consists of the traditions and institutions by which authority in a country is exercised. These include the processes by which governments are selected, monitored, and replaced; the capacity of the government to formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern interactions among them. Our Hypothesis 1 predicts that the coefficient on $GovernanceHigh$ will be positive, complementing the finding in DH [2009] that good governance provides the necessary foundation for offering tax incentives.

4.2.2 *Do mobile firms receive larger amounts of tax aid than immobile firms?*

We perform our next analysis at the level of the beneficiary of tax aid, using the transparency data available beginning in 2016. We set up the empirical analysis below to take advantage of the available data, but also to recognize its limitations. As we discussed in Section 4.1.3, these data may not represent the full set of companies receiving tax aid. First, the EC requirement is to disclose any award exceeding €500k, so we cannot observe awards below this threshold. Second, a country may satisfy the EC disclosure requirement using a regional or national website, rather than the EC website. Thus, all EU awards requiring disclosure are not aggregated in a single location. The amount of tax aid disclosed as being received at the beneficiary level (in the transparency data) accounts for only 20 percent of the total tax aid

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disclosed as being granted at the country level (in the scoreboard data). The majority of aid either consists of many small awards or is disclosed elsewhere.[32]

Because we cannot construct a reliable control group of firms *not* receiving tax aid, we focus entirely on the set of beneficiaries disclosed in the transparency data, all of which received individual aid awards exceeding €500k. We match firms in the transparency data to BvD ownership data and use the same approach described in Section 4.1.2 to identify mobile firms.[33] To determine whether these firms receive more aid, controlling for other firm and country characteristics, we estimate the following equation for the period 2016-2018:

$$
\begin{aligned}
LogAid_{it} = \alpha + {} & \beta_1 Mobile_i + \beta_2 StatRateLow_{it} + \beta_3 Haven_i + \\
& \beta_4 Size_i + \beta_5 Age_{it} + \beta_6 GDP\ per\ capita_{it} + \beta_7 Population_{it} + \\
& \beta_8 Landlocked_i + \varepsilon_{it}\ ,
\end{aligned}
\tag{2}
$$

where

$LogAid_{it}$	= the natural log of the total € amount of tax aid (using the midpoint of the range disclosed) received by Firm i in Year t;
$Mobile_i$	= 1 if Firm i is part of a multinational group, 0 otherwise;
$StatRateLow_{it}$	= 1 if Firm i is in a country that has a below-median statutory corporate tax rate in Year t, 0 otherwise;
$Haven_i$	= 1 if Firm i is in a country identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, the Netherlands, and Malta);
$Size_i$	= 1 if Firm i is a "large enterprise," 0 if a "small or medium enterprise," as disclosed in the transparency data;[34]
Age_{it}	= the natural log of the number of years since Firm i's date of incorporation in Year t;
$GDP\ per\ capita_{it}$	= the natural log of the gross domestic product per capita of the host country of Firm i in Year t;
$Population_{it}$	= the natural log of the population of the host country of Firm i in Year t;

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[32] To determine the 20 percent, we use the midpoint of the range disclosed at the beneficiary level. We then add up the total € amount of tax aid in the transparency data for each year from 2016 through 2018 and compare it to the total € amount of tax aid in the scoreboard data for those same years.

[33] We use the national ID in the transparency data when possible and match it to the national ID in the BvD data. When we are unable to match using the national ID, we match based on firm name. We are able to match 8,760 firms across the two data sources, with some firms receiving multiple awards for a total sample of 9,977, out of the starting sample of 17,559 observations.

[34] Using the size indicator in the transparency data to control for firm size, rather than requiring information about total assets from BvD, allows us to avoid a further loss in sample size.

| $Landlocked_i$ | = 1 if the host country of Firm i does not have at least one port, 0 otherwise (i.e., Luxembourg, Slovakia, the Czech Republic, Hungary, and Austria). |

We include year and industry fixed effects when estimating Equation (2), and country fixed effects when variables of interest vary within countries. Note that this analysis is concerned with understanding the distribution of aid across firms *within* a country, rather than the overall level of aid granted at the country level. The variable of interest is *Mobile*, and Hypothesis 2 predicts that its coefficient will be positive. We also augment Equation (2) to include interactions of firm mobility with *StatRateLow* and *Haven*. If low tax rates and/or being characterized as a tax haven are substitutes for tax aid as tools for attracting mobile capital, then we anticipate a differential effect of mobility on the size of the tax aid award in low-tax and/or tax havens.

4.2.3 *Does the use of tax aid have a larger effect on the tax burden of mobile firms?*

The previous analysis examines the distribution of aid across firms disclosed as receiving individual awards in the newly available transparency data. It does not explore more broadly how a country's use of tax aid alters the distribution of tax burdens across all firms operating within its jurisdiction. While this issue cannot be examined directly, it can be examined indirectly by searching for an empirical relation between a country's use of tax aid, firm mobility, and their interaction to explain the ETRs of EU firms. Note that these tests estimate the pooled effect of tax aid on ETRs, rather than the impact on specific firms.

To establish a baseline relation between the use of tax aid and ETRs, we first examine the general effect of tax aid use on companies' ETRs, controlling for firm-level and other country-level determinants of ETRs. We estimate the following equation at the firm level for the period

2000-2018 (as discussed in Section 4.1.1 above, a "firm-year" is all commonly controlled entities within a company-country-year):[35]

$$ETR_{it} = \alpha + \beta_1 TaxAidHigh_{it} + \beta_2 StatRateLow_{it} + \beta_3 Haven_i + \beta_4 Size_{it} + \beta_5 Age_{it} + \varepsilon_{it} \ , \qquad (3a)$$

where

ETR_{it}	= tax expense scaled by pretax income for Firm i in Year t;
$TaxAidHigh_{it}$	= 1 if Firm i is in a country that had an above-median value of $\%TaxAid$ (as defined in Equation (1)) in Year t, 0 otherwise;
$StatRateLow_{it}$	= 1 if Firm i is in a country that has a below-median statutory corporate income tax rate in Year t, 0 otherwise;
$Haven_i$	= 1 if Firm i is in a country identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, Netherlands, and Malta);
$Size_{it}$	= the natural log of the total assets of Firm i in Year t;
Age_{it}	= the natural log of the number of years since Firm i's date of incorporation in Year t.

We include industry-year fixed effects when estimating Equation (3a) and country fixed effects where possible. The coefficient of interest is $TaxAidHigh_{it}$, which we expect to be negative, indicating that a firm's tax burden is lower when it is domiciled in a country that uses more tax aid. We include $StatRateLow$ and $Haven$ to determine whether the effect of tax aid on tax burdens is incremental to these two tax system characteristics known to be associated with reduced tax burdens. We control for size and industry, two consistently significant factors associated with ETRs in the literature (see Balakrishnan, Blouin, and Guay [2019], which utilizes industry and size-adjusted ETRs), and age to control for the possibility that the availability of tax preferences varies with the life cycle of a firm.

To test Hypothesis 3, which anticipates that the effect of tax aid on firms' ETRs will vary depending on firm mobility, we augment Equation (3a) with an interaction term. Specifically, we estimate the following Equation (3b) at the firm level over the same period:

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[35] If two or more firms within a country in a particular year are commonly controlled, we treat the aggregate data pertaining to these firms as a single observation.

$$ETR_{it} = \alpha + \beta_1 Mobile_i + \beta_2 TaxAidHigh_{it} + \beta_3 TaxAidHigh_{it} * Mobile_i +$$
$$\beta_4 StatRateLow_{it} + \beta_5 Haven_i + \beta_6 Size_{it} + \beta_7 Age_{it} + \varepsilon_{it} \ . \tag{3b}$$

The variables are defined as for Equation (3a), with *Mobile* equal to 1 if Firm i is part of

an MNC, and 0 otherwise. The estimated coefficient on β_3 will tell us if there is a differential

impact of tax aid on the ETRs of mobile firms, relative to immobile firms.

5. Descriptive data and empirical results

5.1   Which countries grant more tax aid?

Table 1 Panel A shows correlations among the country-level variables in our sample of

503 country-years from the period 2000-2018. The only variable showing a significant

correlation with *%TaxAid* is *GDP per capita,* suggesting that richer countries use less tax aid.

We also see in Panel A that richer and smaller countries tend to be tax havens and that tax haven

countries have better governance, consistent with DH [2009]. There is no correlation between tax

haven status and the statutory tax rate within this sample of EU countries.

Panel B provides descriptive data. The use of tax aid varies significantly in our sample;

by granting aid, the average country-year forgoes 8 percent of the total potential corporate tax

revenue. Eighteen percent of our observations represent tax havens and statutory tax rates range

from 9 to 52 percent. Panel C provides the country-mean of each variable in Equation (1) over

the sample period. EU countries generally exhibit good governance, but quality of governance

does vary across the EU countries. Interestingly, Luxembourg is the only EU country that never

reports granting tax aid, despite the LuxLeaks investigations (Huesecken, Overesch, and Tassius

[2018]).[36]

Table 2 reports our coefficients from estimating Equation (1). The estimated coefficient

in column (2) of 0.032 on *GovernanceHigh* implies that a country's governance index has a

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[36] We confirm that none of our results are sensitive to the exclusion of Luxembourg in untabulated robustness tests.

positive and highly significant association with its use of tax aid. This is consistent with the effects expected from DH [2009], that the institutions and processes of good governance provide the necessary foundation for a country to offer tax incentives. Our results show that countries ranking high on governance forego approximately 3.2 percent of corporate tax revenue to subsidies. We control for low statutory tax rates and tax haven status, separately and together, in columns (3) through (5). The coefficient on governance remains positive across all specifications. In columns (4) and (5), tax haven status (*Haven*) is not significantly associated with the use of tax aid. In contrast, a relatively low tax rate (*StatRateLow*) is negatively associated with tax aid usage. This finding is consistent with the theoretical literature on tax competition, which predicts that low tax rates and tax subsidies will act as substitute policies.

5.2   Do mobile firms receive larger amounts of tax aid than immobile firms?

Table 3 Panel A provides descriptive data for our limited sample of 9,977 tax aid awards granted to EU firms by EU governments from 2016-2018. The average annual aid award is €2.19 million, with the largest award being €38.2 million. There are relatively more large firms than small ones in the sample; approximately half of all firms in this sample are considered mobile (i.e., are part of an MNC). Panel B provides the country-mean of each variable in Equation (2) over the sample period. The data are sparsely populated for some countries (e.g., France) and show that the size of tax aid awards to mobile firms varies across countries.

Table 4 reports our coefficients from estimating Equation (2). Our variable of interest (*Mobile*) is positive and significant across all specifications, indicating that mobile firms receive larger aid awards than immobile firms. When we include an indicator for a below-the-median statutory corporate tax rate (*StatRateLow*) and its interaction with firm mobility (column (5)), we find that mobile firms receive larger aid awards, but less so in low tax rate countries. In contrast,

when we include an indicator for tax haven status (*Haven*) and its interaction with firm mobility (column (6)), we find that mobile firms receive larger aid awards, but more so in tax haven countries. This pattern remains when both indicators and their interactions with firm mobility are included in the regression together (column (7)).

We interpret these results as showing that countries with relatively low statutory tax rates do not need to target tax aid toward mobile capital, because the low tax rate already provides an incentive for firms to earn income in the country. In contrast, EU tax haven countries do not generally have low statutory tax rates, so they aim to attract foreign investors by lowering their tax burdens by using tax aid. This analysis confirms that the definition of a tax haven in DH [2009] necessarily includes "other tax attributes designed to appeal to foreign investors". The availability of tax aid data at the country and/or individual firm level can therefore improve and expand our ability to observe and measure tax incentives to relocate income.

5.3 What is the impact of tax aid use at the country level on firm-level ETRs?

5.3.1 The impact of tax aid on ETRs of all firms

Table 5 reports descriptive data for our sample of approximately 11.9 million EU firms for the period 2000-2018. Panel A provides descriptive data for each variable in Equation (3a), while Panel B reports means by country. In Panel A, we see that the average *ETR* in the sample is 24 percent, consistent with other studies using a sample of EU firms (Joshi [2020]; Markle, Mills, and Williams [2019]). Approximately 7 percent of our sample firms are mobile (i.e., are part of an MNC). In Panel B, we see that the use of tax aid varies considerably across both countries and time. When *TaxAidHigh* is less than 1.0 (greater than 0), the country is not consistently classified as high aid (low aid) across all sample years.

Table 6 Panel A reports coefficients from estimating Equation (3a). Our primary variable

of interest across all specifications is *TaxAidHigh*, which is equal to one for countries that grant above-median (determined each year) amounts of tax aid to firms. Our results show that firms operating in those countries exhibit significantly lower ETRs. The negative coefficient on *TaxAidHigh* in column (1) implies that, on average, firms in high tax aid countries enjoy a 1.221 percentage point lower ETR. When high tax aid, low tax rate, and tax haven status indicators are included in the regression simultaneously, the marginal reduction in the ETR is 2.687 percentage points for high tax aid, 14.864 percentage points for low statutory rates, and 7.490 percentage points for tax haven status.

In columns (5) and (6) we augment Equation (3a) to include interactions of high tax aid with low tax rates, and high aid with haven status, respectively. This specification allows us to examine, for example, whether high aid *and* low tax rates point to further ETR reductions, or whether governments use these two policy levers as substitutes. In both columns, the interaction term is positive and significant. The coefficients suggests that ETR reductions from tax aid are smaller in tax haven (by 1.691 percentage points) and low rate (by 0.958 percentage points) countries. These results indicate that subsidies and low tax rates are substitutes; i.e., firms enjoy ETR reductions from tax aid or from low rates and tax haven status, but not from both.

5.3.2   *The impact of tax aid use on ETRs of mobile firms*

In Table 6 Panel B we report the results of estimating Equation (3b), which examines whether mobile firms enjoy greater ETR reductions than immobile firms. Our primary variable of interest across all specifications is *Mobile*, which is equal to one for firms that are part of an MNC, in contrast to purely domestic firms. Our results indicate that mobile firms enjoy significantly lower ETRs. The negative coefficient on *Mobile* in column (1) implies that, on

average, mobile firms enjoy a 1.777 percentage point lower ETR. This is consistent with tax competition for mobile bases manifesting itself through lower ETRs in these firms.

In columns (2) to (4) we include high tax aid, low tax rate, and tax haven status, along with an interaction term for each of these tax system characteristics with firm mobility. Interpreting the coefficients in column (2), mobile (immobile) firms enjoy ETR reductions of 0.599 (1.267) percentage points in high aid countries, relative to low aid countries. We observe the same pattern in low rate and tax haven countries in columns (3) and (4); this is consistent with there being less of an incentive to target ETR reducing subsidies toward mobile firms in tax haven countries or in countries that already have low statutory tax rates. However, in column (5), which includes low rate and tax haven status in the regression, the coefficient estimate on *TaxAidHigh*Mobile* is negative and significant. This suggests that, conditional on the prevailing statutory tax rate, tax aid targets mobile capital; consistent with the results in Table 4.

We report our final set of results in Table 6 Panel C. Here we re-estimate the specifications from columns (5) to (7) of Table 6 Panel A in subsamples of mobile and immobile firms. The coefficients of interest are shown in bold. This estimation allows us to determine whether the effects of country-level tax incentive policies differ across mobile and immobile firms. In other words, does the impact of tax aid – in an already low tax or tax haven country – have a differential impact on the ETRs of mobile and immobile firms? Indeed, we find that it does. Columns (1) and (2) of Panel C show that, as in Panel A, tax aid reduces ETRs, but less so in low tax rate countries. However, this effect is significantly stronger in immobile firms. In columns (3) and (4) we observe the same pattern in tax haven countries.

Interpreting the coefficients in columns (1) and (3) *for immobile firms (mobile=0)* reveals that ETR reductions from tax aid are smaller in tax haven countries (by 4.313 percentage

points) and low rate countries (by 1.042 percentage points). However, our results *for mobile firms (mobile=1)* in columns (2) and (4) show that ETR reductions from tax aid are also smaller in low rate countries, but less so (by only 0.445 percentage points in column (2)), while ETR reductions from tax aid do not differ significantly by tax haven status (in column (4)). We estimate a fully interacted model to determine that the coefficients are significantly different across the two samples. In the last two columns, when we include both low tax rates and tax haven status, our results confirm that high tax aid use in both low rate and tax haven countries leads to a greater reduction in ETRs for mobile firms, *relative to immobile firms*. These results show that tax aid other tax incentives are used as *complementary* policy tools to target mobile firms, while being used as *substitute* policy tools for targeting immobile firms.

6. Conclusion

Tax planning is generally considered to include the conceiving of and implementation of various strategies in order to minimize the amount of taxes paid for a given period in a given jurisdiction. One "tax strategy" is to depend heavily on the existence of jurisdictions willing to facilitate reductions in tax burdens, often through negotiation. These negotiations may take many forms, but importantly will lower the tax burden of only a subset of firms operating in the economy. These discriminatory business tax subsidies, which are generally unobservable, thwart attempts by researchers to identify tax incentives of firms to relocate income across jurisdictions. We overcome this limitation using data from the European Commission on "tax aid" in the European Union (EU). This is an ideal setting to study discriminatory tax subsidies because EU law regulates subsidy competition among EU countries but not tax rate competition.

The aspect of discrimination we focus on is whether, and to what extent, national tax systems in the EU target mobile capital. Such so-called "preferential tax regimes," which allow

national tax codes to effectively impose lower rates on corporate tax bases with a higher degree of international mobility, are controversial in practice (Janeba and Peters [1999]; Keen [2001]; Janeba and Smart [2003]). Some studies argue that allowing the use of preferential regimes will reduce tax rate competition while others argue that disallowing preferential regimes will reduce tax rate competition. We use these previously unexplored data on tax aid granted by EU countries to ask three questions. What are characteristics of a country that grants a lot tax aid, relative to other countries? Do multinational companies (MNCs) receive larger tax aid awards than purely domestic firms? What impact does tax aid granted by a country have on the effective tax rates (ETRs) of resident firms?

We find that better-governed countries are more likely to grant tax subsidies and to direct larger amounts of this "tax aid" toward mobile firms (i.e., firms that are part of an MNC). Despite the EU regulations surrounding tax subsidy competition, we find that mobile firms enjoy significantly larger ETR reductions from tax aid than do immobile firms, even in countries already offering low tax rates as well as in tax haven countries. Taken together, our results show that a necessary condition for being labelled a tax haven need not include a low statutory tax rate. Any country can serve as a 'negotiated' tax haven for certain classes of business activities, as highlighted by DH [2009], by using targeted tax subsidies. With respect to the debate over the use of preferential tax regimes, our findings suggest that allowing countries to use preferential tax regimes to target mobile capital will not reduce tax rate competition.

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Figure 1 – Tax Aid, All Aid, and Corporate Tax Revenues
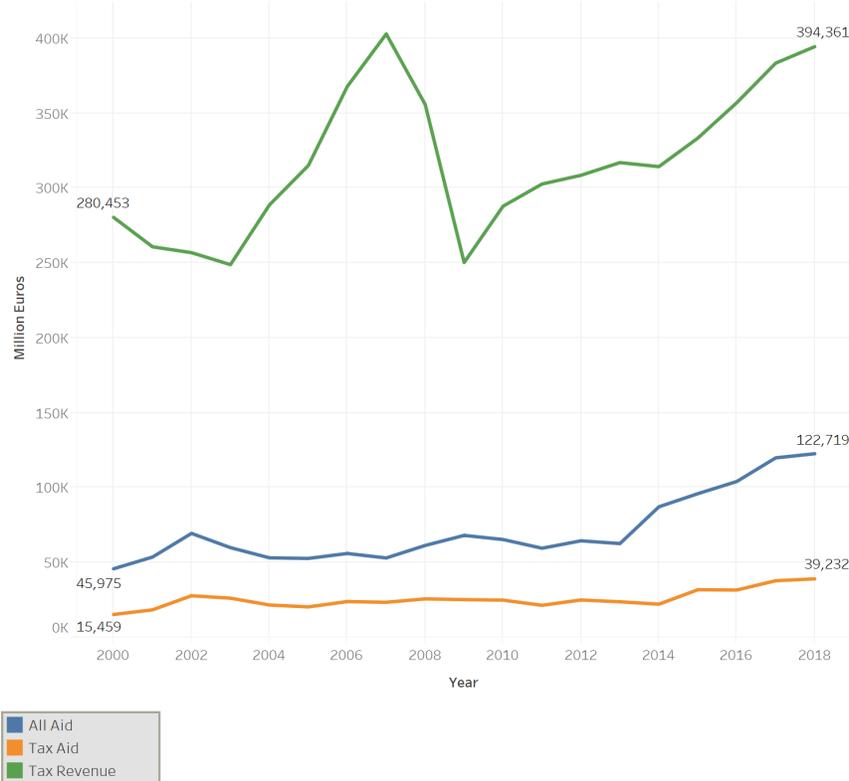
Notes: This figure reports the aggregate amounts of aid and tax aid granted and the amount of corporate tax revenues collected by all EU countries during the period 2000-2018.

Source: https://ec.europa.eu/competition/state_aid/scoreboard/index_en.html

Figure 2 – Average *%TaxAid* across EU countries
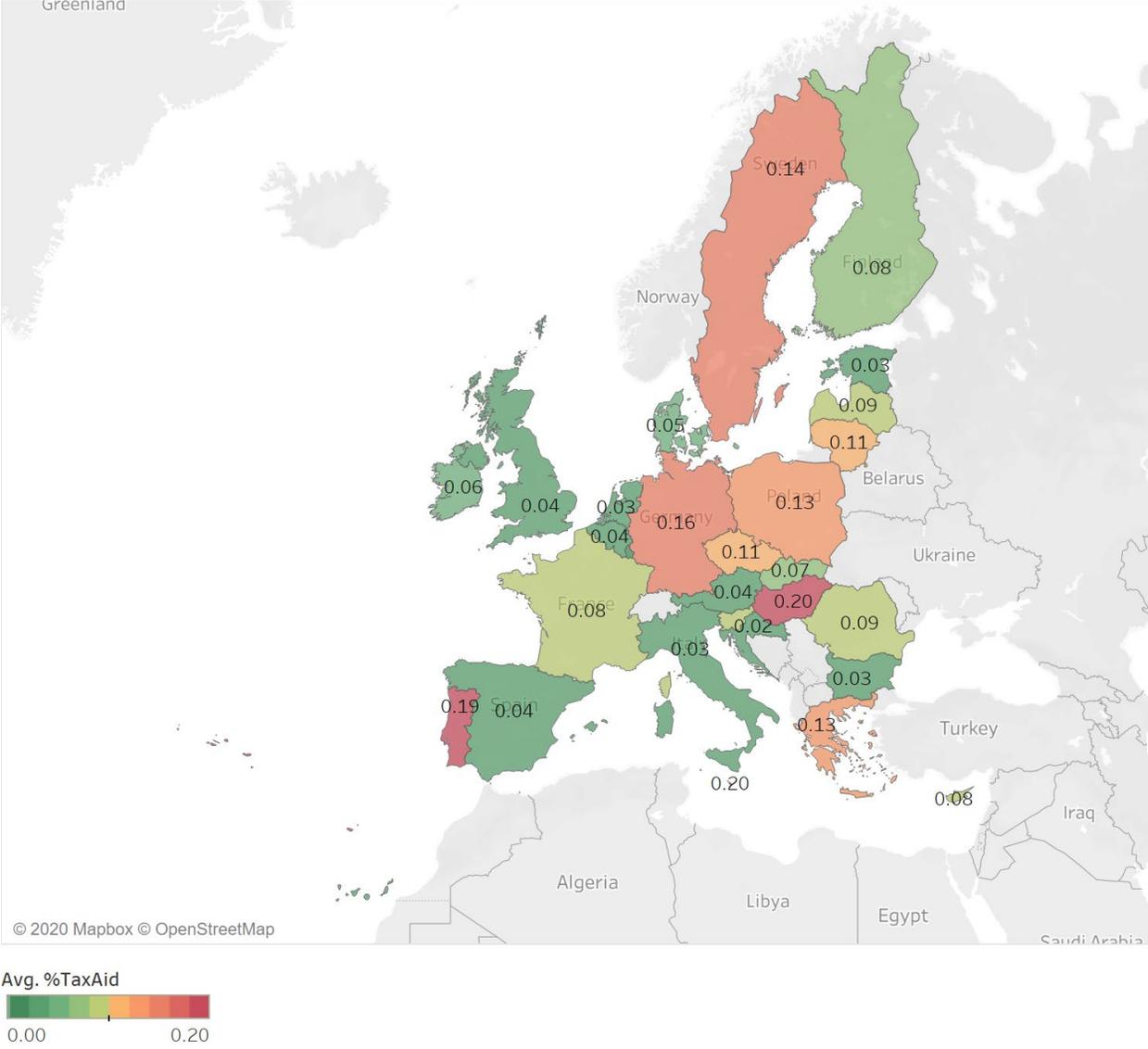
Notes: This figure reports the average %*TaxAid* (the amount of tax aid granted, scaled by the sum of tax aid granted and corporate income tax revenue collected) for each EU country during the period 2000-2018.

Source: https://ec.europa.eu/competition/state_aid/scoreboard/index_en.html

Figure 3 – Average Tax Aid and Corporate Tax Revenue by Country
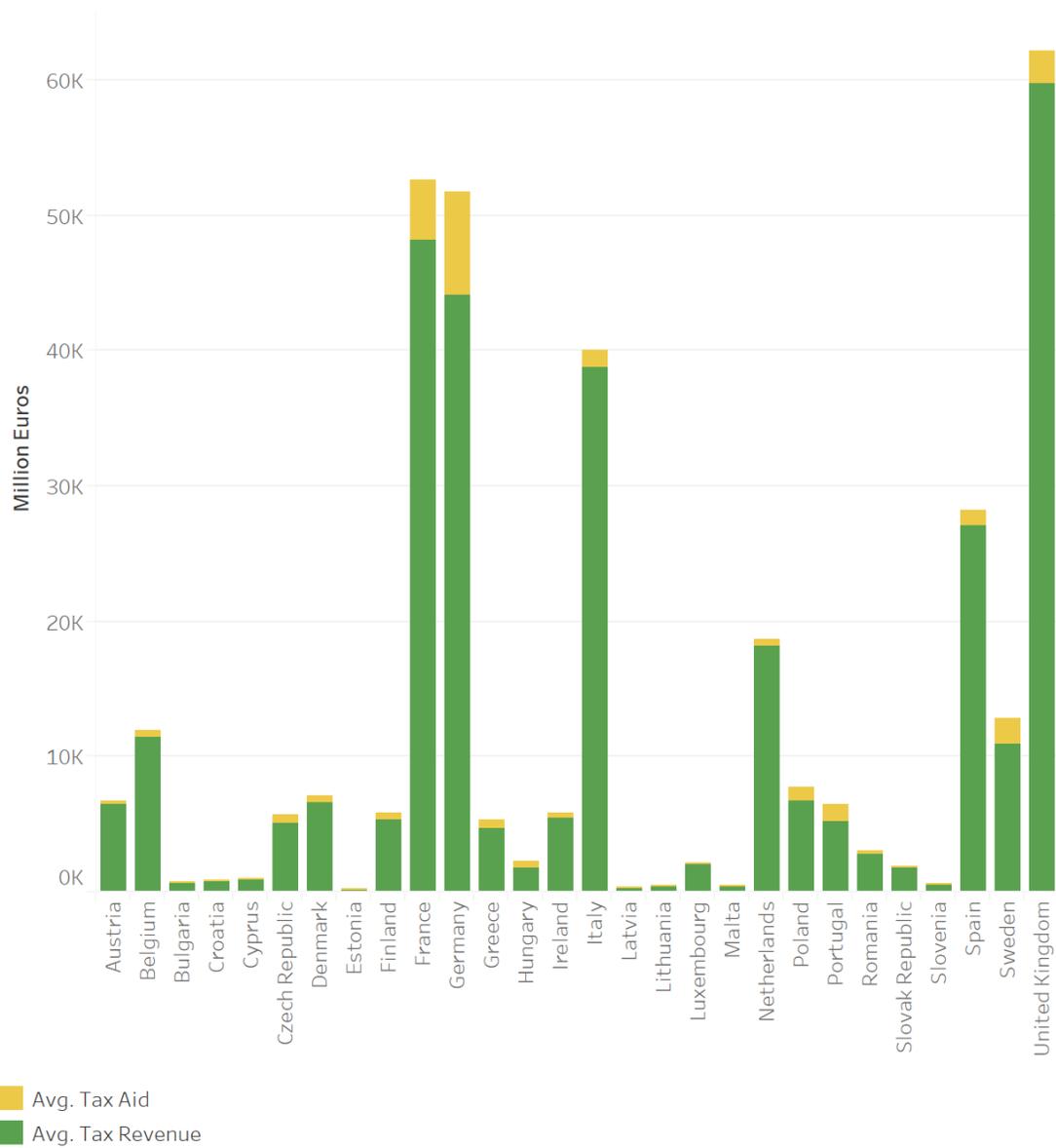
Notes: This figure reports the average amount of tax aid granted and the average corporate income tax revenue collected for each EU country during the period 2000-2018.

Source: https://ec.europa.eu/competition/state_aid/scoreboard/index_en.html

Figure 4 - *%TaxAid* 2000 – 2018
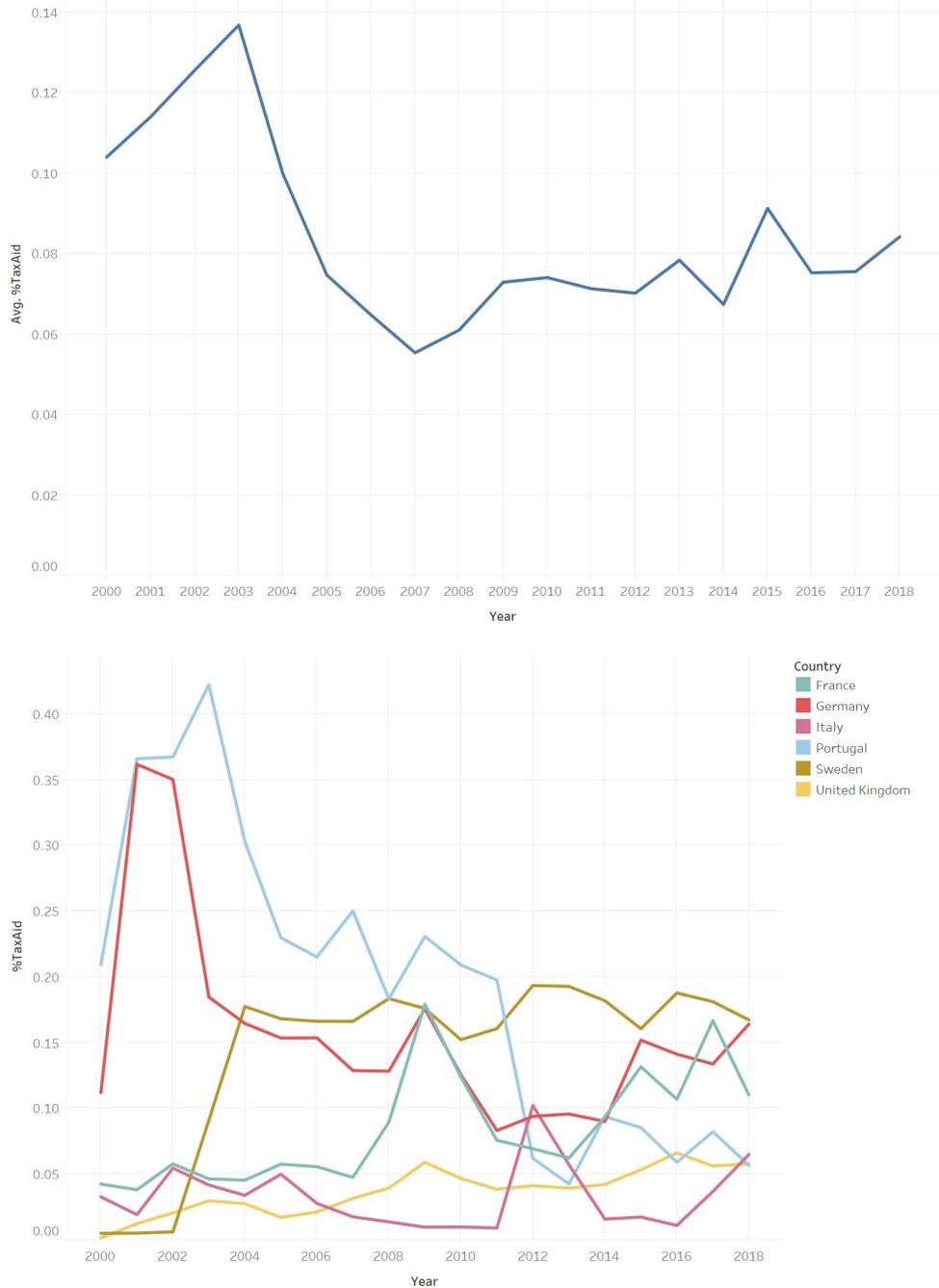
Notes: Panel A reports the average %*TaxAid* (the amount of tax aid granted, scaled by the sum of tax aid granted and corporate income tax revenue collected) for each EU country during the period 2000-2018. Panel B reports %*TaxAid* of the six EU countries with the largest aggregate amounts of tax aid granted during the sample period.

Source: https://ec.europa.eu/competition/state_aid/scoreboard/index_en.html

Figure 5 – Classification of Data

This figure illustrates the unit of observation in our firm-level analysis, the "company-country-year." Each numbered rectangle represents a legal entity, dashed blue lines are international borders, and solid tan lines indicate corporate control.
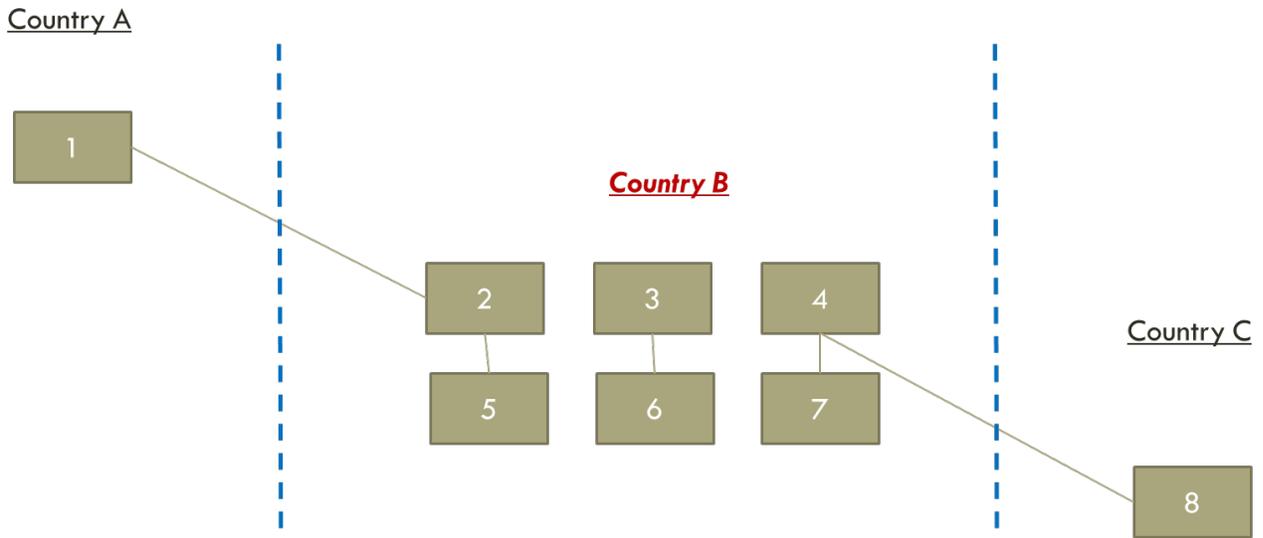
Observations in Country B in the dataset:

Company	**Mobile**	**ETR**	**Industry**	**Age**
Firm 2_5	1 (sub of MNC)	$\dfrac{Tax_2 + Tax_5}{Pretax\ Inc_2 + Pretax\ Inc_5}$	Industry of Firm 2 or Firm 5, whichever has larger Revenue	Max(age of Firm 2, age of Firm 5)
Firm 3_6	0	$\dfrac{Tax_3 + Tax_6}{Pretax\ Inc_3 + Pretax\ Inc_6}$	Industry of Firm 3 or Firm 6, whichever has larger Revenue	Max(age of Firm 3, age of Firm 6)
Firm 4_7	1 (GUO of MNC)	$\dfrac{Tax_4 + Tax_7}{Pretax\ Inc_4 + Pretax\ Inc_7}$	Industry of Firm 4 or Firm 7, whichever has larger Revenue	Max(age of Firm 4, age of Firm 7)

Table 1 – Descriptive Statistics, Country Analysis

Panel A - Correlations

	%TaxAid	Governance	Statutory tax rate	Haven	GDP per capita	Population
Governance	-0.0314					
Statutory tax rate	0.0778	0.371***				
Haven	-0.0678	0.311***	-0.0380			
GDP per capita	-0.232***	0.730***	0.217***	0.387***		
Population	0.0190	-0.0378	0.287***	-0.499***	-0.0149	
Landlocked	-0.0116	0.0420	-0.0557	0.0257	0.141**	-0.168***

*, **, *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel B – Descriptive statistics

	Mean	Median	Std Dev	Min	Max
%TaxAid	0.08	0.05	0.09	0.00	0.60
Governance	1.12	1.13	0.62	(0.26)	2.10
Statutory tax rate	24.49	25.00	7.78	9.00	52.03
Haven	0.18	0.00	0.38	0.00	1.00
GDP per capita (€K)	32.48	30.18	15.85	5.85	116.79
Population (M)	17.90	8.84	22.70	0.39	82.90
Landlocked	0.18	0.00	0.38	0.00	1.00
N	503				

Notes: This table presents descriptive statistics for the country-year variables included in Equation (1). Panel A reports Pearson correlation coefficients. Panel B reports descriptive statistics. $\%TaxAid$ is the amount of tax aid granted, scaled by the sum of tax aid granted and corporate income tax revenue collected by Country i in Year t; $Governance$ is the governance index score for Country i in Year t; $Statutory\ tax\ rate$ is the statutory corporate income tax rate in Country i for Year t; $Haven$ is = 1 if Country i is identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, Netherlands, and Malta); $GDP\ per\ capita$ is the per-capita gross domestic product of Country i in Year t; $Population$ is the population of Country i in Year t; $Landlocked_i$ is = 1 if Country i does not have at least one port, 0 otherwise (i.e., Luxembourg, Slovakia, the Czech Republic, Hungary, and Austria).

Table 1 – Descriptive Statistics, Country Analysis (cont.)

Panel C – Means by Country

	%TaxAid	Governance	Statutory tax rate	Haven	GDP per capita (€K)	Population (millions)	Landlocked
Austria	0.04	1.86	27.37	0	41.80	83.74	1
Belgium	0.04	1.37	34.46	0	38.96	108.24	0
Bulgaria	0.03	(0.08)	14.58	0	13.88	74.84	0
Cyprus	0.08	1.02	14.21	1	30.40	10.83	0
Czech Republic	0.11	0.96	23.05	0	27.17	103.94	1
Germany	0.16	1.68	34.76	0	39.23	819.44	0
Denmark	0.05	1.94	26.32	0	41.30	55.34	0
Estonia	0.03	1.11	22.42	0	22.16	13.42	0
Spain	0.04	1.12	31.08	0	31.04	448.98	0
Finland	0.08	1.98	25.05	0	37.59	53.43	0
France	0.08	1.44	37.20	0	35.36	644.41	0
United Kingdom	0.04	1.71	26.53	0	36.46	623.88	0
Greece	0.13	0.61	28.97	0	26.30	109.54	0
Croatia	0.02	0.16	20.58	0	19.16	42.71	0
Hungary	0.20	0.75	17.42	0	21.07	99.97	1
Ireland	0.06	1.65	13.68	1	48.80	44.04	0
Italy	0.03	0.47	32.33	0	34.29	589.47	0
Lithuania	0.11	0.75	16.84	0	20.75	31.47	0
Luxembourg	0.00	1.82	30.06	1	84.39	5.08	1
Latvia	0.09	0.72	17.16	0	18.43	21.34	0
Malta	0.20	1.36	35.00	1	28.18	4.20	0
Netherlands	0.03	1.82	28.24	1	43.99	165.64	0
Poland	0.13	0.62	20.95	0	19.88	381.03	0
Portugal	0.19	1.13	28.86	0	25.95	104.46	0
Romania	0.09	0.03	18.58	0	15.84	206.61	0
Sweden	0.14	1.93	25.75	0	41.08	93.69	0
Slovenia	0.09	1.00	21.32	0	27.52	20.32	0
Slovakia	0.07	0.51	21.58	0	22.54	53.97	1

Notes: This table presents the mean for each country of each of the country-year variables included in Equation (1). *%TaxAid* is the amount of tax aid granted, scaled by the sum of tax aid granted and corporate income tax revenue collected by Country i in Year t; *Governance* is the governance index score for Country i in Year t; *Statutory tax rate* is the statutory corporate income tax rate in Country i for Year t; *Haven* is = 1 if Country i is identified as a Tax Haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, the Netherlands, and Malta); *GDP per capita* is the per-capita gross domestic product of Country i in Year t; *Population* is the population of Country i in Year t; $Landlocked_i$ is = 1 if Country i does not have at least one port, 0 otherwise (i.e., Luxembourg, Slovakia, the Czech Republic, Hungary, and Austria).

Table 2 – Determinants of Tax Aid

	(1) %TaxAid	(2) %TaxAid	(3) %TaxAid	(4) %TaxAid	(5) %TaxAid
GovernanceHigh	0.027**	0.032***	0.023**	0.032***	0.028**
	(0.011)	(0.012)	(0.011)	(0.012)	(0.012)
StatRateLow			-0.023*		-0.024**
			(0.012)		(0.012)
Haven				0.015	0.017
				(0.013)	(0.013)
Population	-0.064***	-0.073***	-0.080***	-0.080***	-0.094***
	(0.014)	(0.015)	(0.017)	(0.018)	(0.021)
GDP per capita	0.001	0.001	-0.002	0.003	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Landlocked	0.012	0.014		0.016	0.017
	(0.011)	(0.011)		(0.011)	(0.011)
Constant	0.712***	0.791***	0.915***	0.821***	1.005***
	(0.153)	(0.162)	(0.198)	(0.172)	(0.215)
Observations	503	503	503	503	503
Adj R-squared	0.0594	0.0644	0.0706	0.0646	0.0729
Fixed effects	None	Year	Year	Year	Year

$$\%TaxAid_{it} = \alpha + \beta_1 GovernanceHigh_{it} + \beta_2 StatRateLow_{it} + \beta_3 Haven_i + \beta_4 GDP\ per\ capita_{it} + \beta_5 Population_{it} + \beta_6 Landlocked_i + \varepsilon_{it}$$

Notes: This table presents the results of estimating Equation (1). $\%TaxAid$ is the amount of tax aid granted, scaled by the sum of tax aid granted and corporate income tax revenue collected by Country i in Year t; $GovernanceHigh = 1$ if Country i has an above-median governance index in Year t, 0 otherwise; $StatRateLow = 1$ if Country i has a below-median statutory corporate tax rate in Year t, 0 otherwise; $Haven = 1$ if Country i is identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, the Netherlands, and Malta); $GDP\ per\ capita$ is the natural log of per-capita gross domestic product of Country i in Year t; $Population$ is the natural log of the population of Country i in Year t; $Landlocked_i = 1$ if Country i does not have at least one port, 0 otherwise (i.e., Luxembourg, Slovakia, the Czech Republic, Hungary, and Austria).

*, **, *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table 3 – Descriptive Statistics, Beneficiary Analysis

Panel A

	Mean	Median	Std Dev	Min	Max
Aid (€M)	2.19	0.75	4.59	0.50	38.20
Mobile	0.49	0.00	0.50	0.00	1.00
StatRateLow	0.22	0.00	0.41	0.00	1.00
Statutory Tax Rate	26.34	29.80	4.74	9.00	40.00
Haven	0.03	0.00	0.16	0.00	1.00
Size	0.63	1.00	0.48	0.00	1.00
Age (years)	36.77	25.00	38.63	1.00	720.00
GDP per capita (€K)	50.43	50.56	4.93	21.18	71.92
Population (M)	62.40	82.30	30.50	0.47	82.90
Landlocked	0.02	0.00	0.14	0.00	1.00
N		9,977			

Panel B

	N	*Aid*	*Mobile*	*StatRateLow*	*Statutory tax rate*	*Haven*	*Size*	*Age*	*GDP pc*	*Population*	*Landlocked*
Belgium	73	0.26	0.21	0.00	30.56	0	0.08	27	50.77	11.38	0
Bulgaria	8	1.77	0.50	1.00	10.00	0	0.88	21	21.88	7.04	0
Czech Republic	153	5.28	0.76	1.00	19.00	0	0.85	18	39.01	10.61	1
Germany	6,018	1.70	0.45	0.00	29.80	0	0.69	42	52.11	82.55	0
Denmark	455	2.43	0.63	0.00	22.00	0	0.68	36	54.99	5.77	0
Estonia	7	0.51	0.43	1.00	20.00	0	0.14	28	34.91	1.32	0
Finland	354	5.27	0.71	1.00	20.00	0	0.90	29	47.70	5.51	0
France	2	0.75	0.00	0.00	40.00	0	0.00	48	42.92	66.72	0
United Kingdom	1,546	2.53	0.53	1.00	19.12	0	0.30	19	46.27	66.24	0
Greece	106	1.72	0.25	0.00	29.00	0	0.45	38	30.36	10.73	0
Hungary	47	1.39	0.15	1.00	9.00	0	0.64	14	30.53	9.78	1
Ireland	13	1.67	0.31	1.00	12.50	1	0.00	17	71.92	4.76	0
Italy	13	0.20	0.08	0.00	24.00	0	0.08	38	42.80	60.42	0
Lithuania	1	0.53	0.00	1.00	15.00	0	0.00	17	33.82	2.83	0
Latvia	35	3.93	0.69	1.00	19.43	0	0.57	18	29.22	1.94	0
Malta	7	1.80	0.29	0.00	35.00	1	0.14	17	41.79	0.47	0
Netherlands	239	0.46	0.14	0.00	25.00	1	0.07	20	56.24	17.18	0
Portugal	119	1.99	0.78	0.00	28.00	0	0.91	35	33.55	10.29	0
Sweden	762	4.08	0.71	0.00	22.00	0	0.82	52	52.97	10.10	0
Slovenia	5	2.65	1.00	1.00	19.00	0	0.80	44	37.49	2.07	0
Slovakia	14	3.16	0.93	0.00	21.00	0	0.86	12	31.76	5.44	1

Notes: This table presents descriptive statistics for the variables included in Equation (2). Panel A (B) reports descriptive statistics for the full sample (by beneficiary country). *Aid* is the total €M amount of tax aid (using the midpoint of the range disclosed) received by Firm i in Year t; *Mobile* = 1 if Firm i is part of a multinational group, 0 otherwise; *StatRateLow* = 1 if Firm i is in a country that has a below-median statutory corporate tax rate in Year t, 0 otherwise; *Statutory tax rate* is the statutory corporate tax rate in Country i for Year t; *Haven* = 1 if Country i is identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, the Netherlands, and Malta); *Size* = 1 if Firm i is a "large enterprise," 0 if a "small or medium enterprise," as disclosed in the transparency data; *Age* = the number of years since Firm i's date of incorporation in Year t; *GDP per capita* is the per-capita gross domestic product of Country i in Year t; *Population* is the population of Country i in Year t; *Landlocked$_i$* = 1 if Country i does not have at least one port, 0 otherwise (i.e., Luxembourg, Slovakia, the Czech Republic, Hungary, and Austria).

Table 4 – Determinants of Tax Aid Award Amount

	(1) Aid	(2) Aid	(3) Aid	(4) Aid	(5) Aid	(6) Aid	(7) Aid
Mobile		0.324***	0.360***	0.405***	0.433***	0.399***	0.416***
		(0.037)	(0.037)	(0.037)	(0.043)	(0.038)	(0.044)
StateRateLow			0.720***		0.925***		0.890***
			(0.053)		(0.061)		(0.062)
StateRateLow*Mobile					-0.349***		-0.326***
					(0.078)		(0.078)
Haven				-0.615***		-0.675***	-0.450***
				(0.069)		(0.072)	(0.072)
Haven*Mobile						0.368***	0.317***
						(0.123)	(0.108)
Size	0.798***	0.682***	0.726***	0.624***	0.729***	0.625***	0.712***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.032)	(0.031)	(0.032)
Age	0.024	0.029	0.050**	-0.002	0.055**	-0.001	0.050**
	(0.023)	(0.022)	(0.022)	(0.023)	(0.022)	(0.023)	(0.022)
GDP per capita	-5.083**	-4.541**	0.101	-0.607***	0.114	-0.608***	0.248*
	(2.148)	(2.143)	(0.129)	(0.153)	(0.132)	(0.153)	(0.140)
Population	-17.311*	-13.970	-0.185***	-0.211***	-0.186***	-0.211***	-0.202***
	(10.056)	(10.093)	(0.020)	(0.022)	(0.020)	(0.022)	(0.021)
Landlocked			0.197	0.432***	0.206	0.433***	0.236*
			(0.122)	(0.125)	(0.133)	(0.125)	(0.131)
Constant	372.950*	308.105	14.602***	23.153***	14.428***	23.175***	13.373***
	(191.774)	(192.342)	(1.329)	(1.564)	(1.362)	(1.564)	(1.395)
Observations	9,977	9,977	9,977	9,977	9,977	9,977	9,977
Adj R-squared	0.29833	0.31207	0.28789	0.26139	0.29115	0.26168	0.29325
Fixed effects	cty ind yr	cty ind yr	ind yr	ind yr	ind yr	ind yr	ind yr
Cluster	firm	firm	firm	firm	firm	firm	firm

$$LogAid_{it} = \alpha + \beta_1 Mobile_i + \beta_2 StatRateLow_{it} + \beta_3 Haven_i + \beta_4 Size_i + \beta_5 Age_{it} + \beta_6 GDP\ per\ capita_{it} + \beta_7 Population_{it} + \beta_8 Landlocked_i + \varepsilon_{it}$$

Notes: This table presents the results of estimating Equation (2). Aid is the natural log of the total €M amount of tax aid (using the midpoint of the range disclosed) received by Firm i in Year t; $Mobile$ = 1 if Firm i is part of a multinational group, 0 otherwise; $StatRateLow$ = 1 if Firm i is in a country that has a below-median statutory corporate tax rate in Year t, 0 otherwise; $Haven$ = 1 if Country i is identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, the Netherlands, and Malta); $Size$ = 1 if Firm i is a "large enterprise," 0 if a "small or medium enterprise," as disclosed in the transparency data; Age = the natural log of the number of years since Firm i's date of incorporation in Year t; $GDP\ per\ capita$ is the per-capita gross domestic product of Country i in Year t; $Population$ is the population of Country i in Year t; $Landlocked_i$ = 1 if Country i does not have at least one port, 0 otherwise (i.e., Luxembourg, Slovakia, the Czech Republic, Hungary, and Austria).

*, **, *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table 5 – Descriptive Statistics, Firm Analysis

Panel A – Descriptive statistics

	Mean	Median	Std Dev	Min	Max
ETR	24.46	20.69	20.27	0.00	100.00
Mobile	0.07	0.00	0.26	0.00	1.00
TaxAidHigh	0.44	0.00	0.50	0.00	1.00
StatRateLow	0.41	0.00	0.49	0.00	1.00
Statutory tax rate	23.48	24.00	7.72	9.00	44.40
Haven	0.00	0.00	0.06	0.00	1.00
Total assets (€K)	234.51	0.37	6642	0.00	655028
Age (years)	15.92	12.00	17.93	1.00	901.00
N		11,883,930			

Notes: This table presents descriptive statistics for the firm-year variables in Equation (3a). *ETR* is tax expense scaled by pretax income for Firm i in Year t (x 100); *Mobile* = 1 if Firm i is part of a multinational group, 0 otherwise; *TaxAidHigh* = 1 if Firm i is in a country that has an above-median value of %*TaxAid* in Year t, 0 otherwise; *StatRateLow* = 1 if Firm i is in a country that has a below-median statutory corporate income tax rate in Year t, 0 otherwise; *Statutory tax rate* is the statutory corporate tax rate in Country i for Year t; *Haven* is = 1 if Country i is identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, the Netherlands, and Malta); *Total assets* is the total assets in €000 of Firm i in Year t; *Age* is the number of years since Firm i's date of incorporation in Year t.

Table 5 – Descriptive Statistics, Firm Analysis (cont.)

Panel B - Means by country

	N	ETR	Mobile	TaxAidHigh	StatRateLow	Statutory tax rate	Haven	Total Assets	Age
Austria	17,155	18.92	0.61	0.20	0.00	25.00	0	2378	43.8
Belgium	84,745	26.80	0.52	0.27	0.00	33.07	0	878	37.8
Bulgaria	1,185,732	6.91	0.02	0.00	1.00	10.01	0	4	9.2
Cyprus	1,573	13.77	0.25	0.01	1.00	11.88	1	43	20.8
Czech Republic	510,260	16.53	0.09	0.24	1.00	19.17	0	45	11.9
Germany	144,242	25.44	0.36	1.00	0.00	30.38	0	1114	42.6
Denmark	15,286	18.68	0.40	0.91	0.00	22.49	0	755	28.2
Estonia	89,974	12.65	0.04	0.27	1.00	20.48	0	4	11.6
Spain	1,322,284	24.57	0.05	0.26	0.00	28.12	0	115	17.6
Finland	250,434	21.52	0.07	0.99	0.58	22.21	0	71	17.2
France	628,297	18.76	0.14	0.99	0.00	38.14	0	1956	26.4
United Kingdom	252,257	21.12	0.35	0.45	0.52	22.67	0	1298	32.7
Greece	57,781	26.40	0.09	0.77	0.29	25.54	0	102	22.4
Croatia	253,583	19.15	0.05	0.38	1.00	19.40	0	38	12.0
Hungary	18,044	12.53	0.58	1.00	1.00	16.72	0	352	21.4
Ireland	15,867	16.38	0.55	0.40	1.00	12.50	1	1225	19.2
Italy	2,620,299	42.49	0.05	0.32	0.00	29.22	0	156	17.1
Lithuania	36,590	14.52	0.16	0.54	1.00	15.00	0	22	13.2
Luxembourg	5,064	19.93	0.61	0.00	0.00	28.69	1	2315	33.9
Latvia	257,437	11.79	0.04	0.68	1.00	16.46	0	8	9.4
Malta	2,753	28.14	0.43	0.94	0.00	35.00	1	90	24.0
Netherlands	20,060	20.08	0.62	0.00	0.00	25.13	1	1294	33.6
Poland	165,595	21.43	0.17	1.00	1.00	19.00	0	756	23.3
Portugal	1,286,125	25.01	0.02	0.79	0.00	27.98	0	23	15.1
Romania	1,743,669	19.47	0.02	0.38	1.00	16.01	0	3	9.9
Sweden	290,456	20.97	0.19	1.00	0.10	23.46	0	274	26.8
Slovenia	172,684	18.01	0.05	0.83	1.00	18.25	0	35	13.0
Slovakia	435,684	23.35	0.05	0.10	0.32	21.06	0	17	9.1

Notes: This table presents mean values for each country for the firm-year variables in Equation (2). *ETR* is tax expense scaled by pretax income for Firm i in Year t (x 100); *Mobile* = 1 if Firm i is part of a multinational group, 0 otherwise; *TaxAidHigh* = 1 if Firm i is in a country that has an above-median value of %*TaxAid* in Year t, 0 otherwise; *StatRateLow* = 1 if Firm i is in a country that has a below-median statutory corporate income tax rate in Year t, 0 otherwise; *Statutory tax rate* is the statutory corporate tax rate in Country i for Year t; *Haven* = 1 if Country i is identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, the Netherlands, and Malta); *Total assets* is the total assets in €000 of Firm i in Year t; *Age* is the number of years since Firm i's date of incorporation in Year t.

Table 6 - The Impact of Tax Aid, Tax Rate, and Tax Haven Status on ETRs

Panel A – What is the baseline ETR reduction across all firms?

	(1) ETR	(2) ETR	(3) ETR	(4) ETR	(5) ETR	(6) ETR	(7) ETR
TaxAidHigh	-1.221***			-2.687***	-1.441***	-1.370***	-7.632***
	(0.015)			(0.020)	(0.020)	(0.022)	(0.030)
StatRateLow		-4.223***		-14.864***	-4.448***		-19.883***
		(0.039)		(0.024)	(0.043)		(0.031)
TaxAidHigh * StatRateLow					0.958***		11.745***
					(0.030)		(0.038)
Haven			-10.309***	-7.490***		-11.095***	-9.823***
			(0.201)	(0.195)		(0.210)	(0.220)
TaxAidHigh * Haven						1.691***	6.834***
						(0.440)	(0.388)
Size	-0.039***	-0.036***	1.223***	0.201***	-0.037***	1.247***	0.112***
	(0.010)	(0.010)	(0.015)	(0.012)	(0.010)	(0.015)	(0.011)
Age	0.723***	0.713***	-0.073***	-0.037***	0.713***	-0.036**	0.036***
	(0.011)	(0.011)	(0.015)	(0.012)	(0.011)	(0.015)	(0.012)
Constant	17.284***	17.056***	25.621***	32.047***	17.377***	26.152***	34.296***
	(0.335)	(0.337)	(0.044)	(0.036)	(0.335)	(0.045)	(0.036)
Observations	11,883,930	11,883,930	11,883,930	11,883,930	11,883,930	11,883,930	11,883,930
Adj R-squared	0.29863	0.29908	0.03976	0.14929	0.29950	0.04076	0.16686
Fixed effects	industry-year country	industry-year country	industry-year	industry-year	industry-year country	industry-year	industry-year
Cluster	Firm	Firm	Firm	Firm	Firm	Firm	Firm

$$ETR_{it} = \alpha + \beta_1 TaxAidHigh_{it} + \beta_2 StatRateLow_{it} + \beta_3 Haven_i + \beta_4 Size_{it} + \beta_5 Age_{it} + \varepsilon_{it}$$

Notes: This table presents the results of estimating variations of Equation (3a). ETR is tax expense scaled by pretax income for Firm i in Year t (x 100); $TaxAidHigh$ is = 1 if Firm i is in a country that has an above-median value of $\%TaxAid$ in Year t, 0 otherwise; $StatRateLow$ = 1 if Firm i is in a country that has a below-median statutory corporate income tax rate in Year t, 0 otherwise; $Haven$ is = 1 if Country i is identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, the Netherlands, and Malta); $Size$ is the natural log of total assets of Firm i in Year t; Age is the natural log of the number of years since Firm i's date of incorporation in Year t.

*, **, *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table 6 - The Impact of Tax Aid, Tax Rate, and Tax Haven Status on ETRs (cont.)

Panel B – Do mobile firms enjoy greater ETR reductions?

	(1) ETR	(2) ETR	(3) ETR	(4) ETR	(5) ETR
Mobile	-1.777***	-2.136***	-2.781***	-9.241***	-6.971***
	(0.069)	(0.088)	(0.094)	(0.101)	(0.131)
TaxAidHigh		-1.267***			-2.674***
		(0.016)			(0.018)
*TaxAidHigh*Mobile*		0.668***			-0.667***
		(0.107)			(0.133)
StatRateLow			-4.689***		-15.020***
			(0.042)		(0.025)
*StatRateLow*Mobile*			3.066***		7.948***
			(0.130)		(0.138)
Haven				-9.468***	-7.061***
				(0.225)	(0.236)
*Haven*Mobile*				3.817***	1.382***
				(0.383)	(0.360)
Size	0.051***	0.048***	0.050***	1.648***	0.432***
	(0.009)	(0.009)	(0.009)	(0.013)	(0.011)
Age	0.700***	0.702***	0.702***	-0.159***	-0.039***
	(0.011)	(0.011)	(0.011)	(0.015)	(0.012)
Constant	17.834***	18.223***	18.444***	26.787***	32.627***
	(0.336)	(0.334)	(0.330)	(0.043)	(0.035)
Observations	11,883,930	11,883,930	11,883,930	11,883,930	11,883,930
Adj R-squared	0.29851	0.29901	0.29974	0.05015	0.15429
Fixed effects	country and industry-year	country and industry-year	country and industry-year	industry-year	industry-year
Cluster	firm	firm	firm	firm	firm

$$ETR_{it} = \alpha + \beta_1 Mobile_i + \beta_2 TaxAidHigh_{it} + \beta_3 Mobile_i * TaxAidHigh_{it} + \beta_4 StatRateLow_{it} + \beta_5 Haven_i + \beta_6 Size_{it} + \beta_7 Age_{it} + \varepsilon_{it}$$

Notes: This table presents the results of estimating variations of Equation (3b). *ETR* is tax expense scaled by pretax income for Firm i in Year t (x 100); *Mobile* = 1 if Firm i is part of a multinational group, 0 otherwise; *TaxAidHigh* is = 1 if Firm i is in a country that has an above-median value of %*TaxAid* in Year t, 0 otherwise; *StatRateLow* = 1 if Firm i is in a country that has a below-median statutory corporate income tax rate in Year t, 0 otherwise; *Haven* is = 1 if Country i is identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, the Netherlands, and Malta); *Size* is the natural log of total assets of Firm i in Year t; *Age* is the natural log of the number of years since Firm i's date of incorporation in Year t.

*, **, *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table 6 - The Impact of Tax Aid, Tax Rate, and Tax Haven Status on ETRs (cont.)

Panel C – Does tax aid reduce ETRs of mobile firms more in low tax rate countries or tax haven countries?

	(1) ETR	(2) ETR	(3) ETR	(4) ETR	(5) ETR	(6) ETR
TaxAidHigh	-1.518***	-0.895***	-1.265***	-2.936***	-7.784***	-4.870***
	(0.019)	(0.127)	(0.020)	(0.139)	(0.026)	(0.177)
StatRateLow	-5.019***	-1.964***			-19.644***	-13.119***
	(0.042)	(0.174)			(0.030)	(0.159)
TaxAidHigh * StatRateLow	**1.042***	**0.445***			**11.822***	**6.967***
	(0.030)	**(0.170)**			**(0.034)**	**(0.211)**
Haven			-11.357***	-5.132***	-9.618***	-5.898***
			(0.232)	(0.308)	(0.263)	(0.311)
TaxAidHigh * Haven			**4.313***	**0.397**	**7.247***	**3.972***
			(0.610)	**(0.577)**	**(0.582)**	**(0.515)**
Size	0.216***	-0.921***	1.956***	-0.663***	0.517***	-0.835***
	(0.008)	(0.043)	(0.012)	(0.052)	(0.010)	(0.050)
Age	0.735***	-0.147**	-0.171***	0.825***	0.029**	-0.230***
	(0.010)	(0.072)	(0.013)	(0.093)	(0.012)	(0.088)
Constant	18.626***	23.641***	27.668***	24.941***	34.931***	32.894***
	(0.358)	(0.415)	(0.042)	(0.228)	(0.035)	(0.240)
	mobile-0	**mobile=1**	**mobile-0**	**mobile=1**	**mobile-0**	**mobile=1**
	(1) > (2): p<.001		(3) > (4): p<.001		(5) > (6): p<.001 (statratelow)	
					(5) > (6): p<.001 (haven)	
Observations	11,047,173	836,757	11,047,173	836,757	11,047,173	836,757
Adj R-squared	0.30742	0.21448	0.06088	0.03096	0.17768	0.09846
Fixed effects	industry-year country	industry-year country	industry-year	industry-year	industry-year	industry-year
Cluster	Firm	Firm	Firm	Firm	Firm	Firm

Notes: This table presents the results of estimating variations of Equation (3b) in subsamples of mobile=0 and mobile=1 firms. *ETR* is tax expense scaled by pretax income for Firm i in Year t (x 100); *Mobile* = 1 if Firm i is part of a multinational group, 0 otherwise; *TaxAidHigh* is = 1 if Firm i is in a country that has an above-median value of %*TaxAid* in Year t, 0 otherwise; *StatRateLow* = 1 if Firm i is in a country that has a below-median statutory corporate income tax rate in Year t, 0 otherwise; *Haven* is = 1 if Country i is identified as a tax haven by DH [2009], 0 otherwise (i.e., Cyprus, Ireland, Luxembourg, the Netherlands, and Malta); *Size* is the natural log of total assets of Firm i in Year t; *Age* is the natural log of the number of years since Firm i's date of incorporation in Year t. We estimate a fully interacted model to assess whether the coefficients on *TaxAidHigh*StatRateLow* and *TaxAidHigh*Haven* differ between subsamples.

*, **, *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.