Externalities in International Tax Enforcement: Theory and Evidence*

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Abstract

We show that the fiscal authorities of high-tax countries can lack the incentives to combat profit shifting to tax havens. Instead, they have incentives to focus their enforcement efforts on relocating profits booked by multinationals in other high-tax countries, crowding out the enforcement on transactions that shift profits to tax havens, and reducing the global tax payments of multinational companies. The predictions of our model are motivated and supported by the analysis of two new datasets: the universe of transfer price corrections conducted by the Danish tax authority, and new cross-country data on international tax enforcement.

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1 Introduction

Multinational firms can avoid taxes by shifting profits from high-tax to low-tax countries. A number of studies suggest that this profit shifting causes substantial losses of tax revenue (Crivelli, de Mooij and Keen, 2015; Bolwijn et al., 2018; Clausing, 2016; Tørsløv et al., 2020). In principle, tax authorities in high-tax countries can attempt to reduce profit shifting by increasing the monitoring of intra-group transactions and enforcing more strongly the rules governing the pricing of these transactions.[1] Why, despite the sizable revenue losses involved, does profit shifting nonetheless persist?

This paper provides a novel answer to this question by studying the incentives faced by tax authorities. We show theoretically that the fiscal authorities of high-tax countries can lack the incentives to combat profit shifting to tax havens. Instead, they have incentives to focus their enforcement efforts on relocating profits booked by multinationals in other high-tax countries, which crowds out the enforcement on transactions that shift profits to tax havens and does not increase the global tax payments of multinational companies. This incentive problem can help explain why profit shifting to low-tax countries persists, even when the legal framework (such as general anti-avoidance provisions) to curb it exists.

To understand the logic of the argument, take the case of Denmark, a country where the corporate tax rate is 22%. One euro of profit re-located to Denmark by the Danish tax authority is worth the same to Denmark whether it comes from Sweden, where the corporate tax rate is also 22%, or from Bermuda, where the corporate tax rate is 0%. That is, the Danish tax authority does not internalize the externality of reducing the corporate tax base in the counterpart country. But it may be easier for the Danish tax authority to relocate one euro booked by a multinational company in Sweden, for two reasons. First, it is more likely to succeed, because firms are unlikely to spend much resources objecting to this transfer price correction: for them, whether profits are booked in Denmark or Sweden makes little difference to their global tax bill, since the tax rates in Denmark and Sweden are the same. Second, if there is a dispute between Denmark and Sweden, it is likely to be settled quickly through the dispute resolution agreements in force among OECD countries and within the European Union. The correction of transactions between Denmark and Sweden crowds out the correction of transactions between Denmark and low-tax countries. Such corrections are harder to make, as firms spend more legal resources to defend

[1] The general principle governing the pricing of intra-group transactions is that these transactions should be conducted at arm's length, that is, as if the subsidiaries trading goods, services, or assets internally were unrelated. See, e.g., Zucman (2014) for a description and history of these rules.

their transfer pricing optimization; and they take more time, due to a lack of cooperation with some tax havens. In this paper, we formalize this argument and make precise the conditions under which it is optimal for high-tax countries to focus their enforcement resources on relocating profits booked in other high-tax countries.

Our theoretical predictions are motivated and supported by two novel datasets analyzed for the first time in this paper. We first analyze the universe of transfer price corrections initiated by the Danish tax authority—confidential micro-data internal to the Danish administration to which we were granted access in the context of this research. We find that the vast majority of transfer price corrections (about 82%) initiated by the Danish tax authorities involve other high-tax countries. As Denmark has a moderate corporate tax rate (22% in 2015), this finding implies that the majority of transfer price corrections initiated by Denmark involve countries with higher rates. These corrections ultimately lower the taxes paid by the targeted multinationals globally. According to our estimates, the transfer-price enforcement efforts of the Danish authorities increased Danish tax collection by €320 million per year on average over the years 2009, 2014 and 2015; but they lowered tax collection abroad by €333 million. This result is at odds with the popular perception that the enforcement activities of tax authorities increase the taxes paid by multinationals. The global tax payments of companies operating in Denmark would increase by an amount equal to 0.8%–2.5% of current Danish corporate tax revenues if Denmark internalized the external effects of its enforcement efforts and aimed at maximizing global tax collection. However, this change in enforcement strategy would come at a hefty price for Denmark, reducing Danish corporate tax revenues by 1.6%–3.6%.

Second, we analyze data on tax disputes between tax authorities globally. We draw on a survey of tax authorities conducted by the audit firm EY, in which EY asked 26 major economies to list the countries that are the main focus of their transfer price correction efforts. Consistent with our theory, the data show that the majority of the enforcement efforts of high-tax countries are directed at other high-tax countries. These corrections typically do not increase the taxes paid by multinationals, but merely re-shuffle tax payments across high-tax places. From a global perspective, such corrections are welfare decreasing, since they consume resources without changing global tax payments. In effect, non-haven countries compete for revenue while letting tax havens flourish.

Our results highlight an overlooked inefficiency in the current international tax system. The uncertainties involved in determining arm's-length prices are large enough that they can soak up substantial enforcement resources, even though the related enforcement efforts do not in-

crease global tax payments. There is a view that fundamental reform is needed to curb profit shifting; a number of proposals suggest abandoning transfer pricing in favor of, e.g., apportionment formulas (e.g., Avi-Yonah and Clausing, 2007) or destination-based cash-flow taxation (e.g., Auerbach, 2010). This paper suggests another reason why such reforms may be worth considering: they could save resources currently wasted on inconsequential tax enforcement.

The paper proceeds as follows. Section 2 discusses the related literature. In Section 3, we discuss the institutional background of international tax corrections. In Section 4, we turn to the data and study patterns in transfer price corrections in Denmark and globally. Section 5 presents our benchmark model and Section 6 considers a number of extensions. We conclude in Section 7 with a discussion of the implications of our results for policy.

2 Related Literature

2.1 Profit Shifting and Transfer Pricing

A body of work suggests that multinationals shift profits to low-tax places to avoid taxation. Grubert and Mutti (1991) and Hines and Rice (1994) were the first to document that the affiliates of multinational companies located in relatively low-tax places tend to report relatively high profit. Since then, a number of studies have found that this relationship is likely to be causal and primarily driven by profit shifting (see Heckemeyer and Overesch, 2017, and Dharmapala, 2014, for an overview). Recent research suggests that profit shifting is non-linear, with more profit shifting to very low-tax locales (Dowd et al., 2017; Davies et al., 2018; Wier 2020).

Using customs data, a series of studies find that when trading goods with affiliates in low-tax countries, firms deviate from the arm's-length principle that is supposed to govern the pricing of intra-group transactions (e.g., Bernard et al. 2006, Clausing 2003, Cristea and Nguyen 2016, Davies et al. 2018, Liu et al. 2020, and Wier 2020). There is also evidence that firms can shift profit by manipulating intra-group transactions prices for services (Hebous and Johannesen 2015), and by moving debt, intangible property, and risk (Huizinga et al. 2008a, 2008b; Becker et al. 2018). The global loss of corporate tax revenues is sizable, of the order of 10% to 20% of global corporate tax revenues (Clausing 2016, Tørsløv et al. 2020, UNCTAD 2015). For comparison, Alvarez-Martinez et al. (2018) find that profit shifting between high-tax countries is small, about a tenth of the tax revenue loss due to profit shifting to low-tax countries.

Our contribution to this literature is to provide a new explanation for why this profit shifting persists, despite the substantial tax revenue cost for high-tax countries.

2.2 International Tax Enforcement

Our paper is also related to the literature on tax enforcement. In the classical Allingham and Sandmo (1972) model, there is an exogenous audit rate and penalty for non-compliance. Firms deviate from the true arm's length price until the point where the marginal tax saving equals the marginal increase in the expected penalty. The incentives of the tax authority are not taken into consideration. This framework, originally developed to study individual income tax evasion, has been adopted to analyze transfer pricing (e.g., Cristea and Nguyen, 2016; Liu et al., 2020; see Becker and Davies, 2014, for an overview). But the framework does not capture some key features of international tax enforcement. Through interviews with practitioners, Becker and Davies (2014) document that transfer pricing cases rarely involve penalties (but merely corrections) and that the likelihood of audit is mainly driven by firm size.

Becker and Davis (2014) propose an alternative model to analyze transfer price manipulation, in which multinationals are audited with certainty by high-tax countries. The equilibrium transfer price is the outcome of a negotiation game between a high-tax country's tax authority, a low-tax country's, and a firm. The firm influences the bargaining position of the low-tax country by providing supportive transfer price documentation, lowering this country's negotiation cost. Like in the Allingham and Sandmo (1972) model, the Becker and Davies (2014) model predicts we should only observe enforcement efforts that *increase* the global tax bill of multinationals, because in both models, firms never willingly shift profits to higher-tax countries. As we will see, however, in the data we observe a large number of corrections which reduce global tax payments. Our paper provides an explanation for this puzzle.

Last, a number of papers provide theories of why profit shifting persists, focusing on the idea that higher-tax countries might gain on balance from profit shifting (e.g., by lowering the effective marginal tax rate on especially mobile firms; see, e.g., Hong and Smart, 2010; Haufler et al., 2018). The tax authorities of high-tax countries might perceive that profit shifting and tangible capital mobility are strongly substitutable—with less shifting there would be more outflows of tangible capital, with potentially adverse effects on wages and employment—and rationally choose to limit enforcement for that reason. In the public debate, however, few elected officials in high-tax countries seem to openly defend profit shifting; rather, the more widespread position seems to be that this phenomenon ought to be combated by tax authorities. Our paper analyzes why profit shifting can persist in the current international tax system even if there is a sincere political will to curb it.

3 Institutional Background

3.1 The Transfer Pricing Unit

To ensure profits are taxed according to the prevailing internationally-agreed rules, tax authorities in high-tax countries routinely audit companies. This work is usually carried out by dedicated transfer pricing units. These units can ask for transfer pricing documentation, i.e., detailed reports prepared by firms to justify their internal transactions. These reports are usually long and time-consuming to audit. With limited resources available, the tax authorities must prioritize which companies are asked to deliver transfer pricing documentation. This choice is guided by the data available to the tax authorities, which is often scarce. In the case of Denmark, it is based on a screening of firms' financial and tax return data.[2]

After receiving the documentation, the transfer pricing unit checks that intra-group transactions are conducted at arm's length. When they consider this is not the case, they can ask multinationals to correct transactions. These corrections are usually referred to as "transfer price" corrections, even though the corrections go beyond transfer prices *per se.* All aspects of multinational activity are examined, including not only the transfer prices of goods and services, but also debt shifting, intra-group sales of intangibles, and abuses of double-tax treaties.

Unlike other form of tax enforcement, the enforcement of transfer prices is asymmetrical: it can never lower tax revenue. In the context of individual income tax audits, auditors investigate both over- and underpayment of taxes and hence audits can result in a reduction in taxes paid. This is not the case when it comes to transfer price enforcement. Each country tries to increase its own tax base. France, for example, audits French companies with the aim of correcting transactions that are disadvantageous to France, but it ignores any findings that would result in lowering the French tax base. The same goes for other countries.

As stated by the OECD (2010, pp. 2), "transfer pricing is not an exact science." Several methods are used to determine the correct arm's-length price: cost-plus pricing, comparable unrelated transactions, comparable related transactions, profit splits, etc. Moreover, in some cases—such as the purchase of intellectual property like brands—the correct arm's-length price is not conceptually clear (Devereux and Vella, 2017). There is thus uncertainty in determining what is the correct arm's-length price. This implies that firms will at times be at odds with tax authorities even when they do not voluntarily engage in tax planning.

[2]Source: Danish State Auditors (2014) and conversations with the Danish Transfer Pricing Unit. Historically, 100–400 firms have been asked to deliver documentation each year. Based on the transfer price documentation, the tax authority may chose to conduct a transfer price correction. Historically, 50–100 corrections have been conducted each year.

To conduct an adjustment, the tax authorities must first argue that the arm's length principle has not been applied well. Concretely, the authorities must be able to point to specific transactions that would have been priced differently if they had been conducted at arm's length, i.e., by unrelated parties. Firms can appeal corrections, and courts may overturn decisions.

Two points are worth noting here. First, there is an information and resource asymmetry between firms and tax authorities. Firms have a thorough understanding of their own business and are advised by transfer pricing specialists, both in-house and in accounting firms. Globally, as shown by Figure 1, around 330,000 people work in transfer pricing, of which about one percent are employed by tax authorities.[3] For each person working in transfer pricing within tax authorities, there are about 100 working in the private sector. Intra-group transactions are not systematically monitored by tax authorities; enforcement relies primarily on self-regulation, which comes at a cost for the private sector. According to our estimates the private sector spent \$15 to \$25 billion on transfer pricing services in 2019.[4]

Second, tax authorities depend on the willingness of counterpart countries to cooperate. Consider for instance the case of a Brazilian coffee producer that sells coffee to an affiliate in Switzerland, which then resells to an affiliate in Denmark. If the Danish tax authority suspects that the Swiss affiliate is charging too high a price to the Danish affiliate, it will try to seek information from Switzerland, in particular about the price at which the Swiss affiliate has purchased coffee from Brazil in the first place. Switzerland can either supply the requested information—easing the transfer price correction—or choose not to.

3.2 Mutual Agreement Procedures

If a tax authority increases the taxable profits of a firm operating in its jurisdiction without another tax authority lowering profits correspondingly, profits may be taxed twice. A procedure, known as the Mutual Agreement Procedure, exists to avoid such double taxation. It works as follows. After a tax authority has decided on a transfer price correction, the targeted firm can ask the tax authority to enter into a Mutual Agreement Procedure with the counterpart country (or countries) where taxable income has presumably been overbooked. The tax authority that seeks to increase its tax base will ask the counterpart countries to reduce their tax bases by the

[3] LinkedIn highlights 328,261 individuals when searching for "transfer pricing" under "people" (as of January 4, 2020). Spot checks confirm that LinkedIn correctly identifies individuals working in transfer pricing. The number of government employees is identified by restricting the search by industry to "government administration" (3,368 as of January 4, 2020); it is corroborated by the head count in EY's 2014 Transfer Pricing Tax Authority Survey.

[4] We arrive at \$25 billion using the average base salary of a transfer pricing specialist (\$74,000 as of Jan 4, 2020) computed by Glassdoor `https://www.glassdoor.com/Salaries/transfer-pricing-salary-SRCH_KO0,16.htm` and \$15 billion using a conservative salary of \$45,000.

same amount—i.e., in effect, to pay for the transfer price correction. Globally, more than 90% of Mutual Agreement Procedures result in an agreement, either an offsetting decrease in the tax base of counterpart countries or a withdrawal of the initial correction.[5] Within the European Union, an agreement is guaranteed: a strict system—known as the Arbitration Convention—is in place to ensure that disputes among EU countries are settled within two years if the Convention is invoked.

4 An Empirical Analysis of Transfer Price Corrections

In this section we analyze the universe of transfer price corrections in Denmark using a unique micro dataset. We then study patterns in transfer price corrections globally using a newly assembled macro dataset.

4.1 Transfer Price Corrections in Denmark

For the purpose of this research, the Danish tax authority has given us access to internal confidential micro-data on the universe of transfer price corrections undertaken by the Danish tax authority for the years 2009 and 2014-15 (the only years for which comprehensive data are available). These corrections involve transfer prices of goods and services, but also debt shifting, intra-group sales of intangibles, and abuses of double-tax treaties. The data includes the increase in the tax base demanded by the Danish tax administration and the name of the counterpart countries. The Danish tax authority does not systematically track the ultimate outcome of the cases it initiates, which depends on whether the taxpayers request a Mutual Agreement Procedure and/or file for an appeal in court. To partially address this shortcoming, we supplement our main transfer-price correction dataset with two auxiliary sources: data on completed Mutual Agreement Procedures covering the period 2008-15, and data on court appeals covering the years 2011-16. These different sources could not be linked at the micro level (so that we cannot follow a particular case from start to finish), but taken together they allow us to provide a comprehensive picture of how the Danish enforcement activities affect tax payments domestically and abroad.[6]

Table 1 presents macroeconomic estimates of the amount of profit shifted out of Denmark, and compares these aggregates to summary statistics of the Danish tax authority's transfer pricing corrections.

[5] See OECD Mutual Agreement Procedure statistics 2016-2019.

[6] We do not have data on transfer pricing audits that did not result in any corrections.

Macroeconomic estimates of profit shifting out of Denmark (Panel A of Table 1) suggest that from 2012-2015, about €2.2 billion on average per year were shifted on net out of Denmark to other countries, the equivalent of 6% of the Danish corporate tax base (col. 1). Cols. 2 and 3 decompose this total into profits shifted out of Denmark to tax havens in 2015 as estimated by Tørsløv et al. (2020),[7] and profits shifted out of Denmark to non non-haven countries in 2012 as estimated by Alvarez-Martinez et al. (2018). Alvarez-Martinez et al. (2018) estimate that Denmark *attracts* profits from non-haven countries, because of its moderately low corporate tax rate of 25% in 2012 (reduced to 22% in 2015). More precisely, Alvarez-Martinez et al. (2018) estimate that Denmark is a net recipient of €455 million from non-tax havens (€532 million in profits shifted inwards minus €77 million in profits shifted outwards) in 2012. Huizinga and Laeven (2008) obtain similar results, using earlier data (for 1999). These amounts are small in comparison to the profits shifted out of Denmark to tax havens, which amount to about €2,670 million in 2015 according to Tørsløv et al. (2020).[8]

Panel B of Table 1 presents summary statistics on the transfer price corrections initiated by the Danish tax authority. In 2009, 2014, and 2015, a total of 185 corrections were initiated, or 62 cases on average per year (col. 1). The main type of correction involved intra-group sales of intangible assets, which accounted for more than 75% of tax adjustments (Danish State Auditors, 2014). On average over 2009, 2014 and 2015, corrections amounted to €1.5 billion a year, the equivalent of about 4 percent of the Danish corporate tax base. This large amount is the result of 62 cases per year, meaning that the average case size is large (€24 million). Small cases are not prioritized due to the high costs of conducting a transfer price correction (Danish State Auditors, 2014).

Our analysis of the Danish transfer pricing corrections reveals five main findings, which we now describe in turn.

[7]The list of tax havens includes Belgium, Cyprus, Ireland, Netherlands, Hong Kong, Luxembourg, Malta, Marshall Islands, Puerto Rico, Switzerland, Singapore as well as the following smaller havens: Andorra, Anguilla, Antigua and Barbuda, Aruba, The Bahamas, Bahrain, Barbados, Belize, Bermuda, the British Virgin Islands, the Cayman Islands, Gibraltar, Grenada, Guernsey, the Isle of Man, Jersey, Lebanon, Liechtenstein, Macao, Mauritius, Monaco, the Netherlands Antilles, Panama, Samoa, Seychelles, St. Kitts and Nevis, St. Lucia, St. Vincent & Grenadines, Turks and Caicos, Vanuatu.

[8]The estimates from Tørsløv et al. (2020) are consistent with the aggregate estimates of profit shifting to low-tax locales by (among others) the OECD (2020), Garcia-Bernando et al. (forthcoming) and UNCTAD (2015). For a comparison of existing estimates of global profit shifting to low-tax places, see Appendix Table D1a and D1b in Tørsløv et al. (2020). Few studies estimate profits shifted at the country level. One exception is Janský and Palanský (2019), which finds Denmark loses 7% of its corporate tax base due to shifting to low-tax countries, a number very close to the estimate (8%) in Tørsløv et al. (2020).

4.1.1 The Counterpart Countries of Danish Transfer Price Corrections

Our first finding, reported in the Panel B of Table 1, is that the vast majority (about 75%) of the corrections initiated by Denmark involve other high-tax countries. This fraction is larger (82%) when cases are euro-weighted. Only 18% (€266 million per year) of the profits that the Danish tax authorities attempt to relocate to Denmark come from tax havens (col. 4). This is only 10% (€266 million out of €2,670 million) of the estimated amount of profit shifted out of Denmark to tax havens. Meanwhile, Denmark relocates large amounts of profit booked by firms in other high-tax countries, where it is unlikely that there is intentional profit shifting.

Figure 2 provides a more detailed analysis of these patterns by showing the distribution of the tax rate differentials (Danish tax rate minus foreign country's tax rate) for the universe of cases pursued by the Danish tax authority. As discussed in Section 2, a large literature documents the effect of statutory tax rate differentials on the pricing of intra-group transactions. On a priori grounds, we thus expect that transactions involving countries with lower corporate tax rates than Denmark should be over-represented in the Danish tax authorities' enforcement efforts. However, as shown by the blue line in Figure 2, 80% of the transfer pricing cases initiated by Denmark involve countries with similar or higher statutory tax rates than Denmark. The average rate differential is -4.1% and statistically significant. We find similar results when using using effective (instead of statutory) tax rates; see Online Appendix Figure A1.

One potential interpretation concern with this result is that most firms related to Danish companies (parents, subsidiaries, or sister companies) might be located in high-tax countries. It is therefore useful to consider how the geographical distribution of the Danish tax authority's transfer pricing corrections would look like if audits were conducted randomly.[9] To construct this benchmark we use the ORBIS database from Bureau van Dijk, from which we can construct the distribution of tax differentials between all Danish multinational entities (parents or subsidiaries) and their foreign related parties. The result of this exercise is shown in red in Figure 2. Because Denmark has a moderately low corporate tax rate, the average tax rate differential between Denmark and the countries where related parties are located is negative (-2.3%). The average tax differential for the cases pursued by the tax authority (-4.1%) is even more negative than the random tax differential (-2.3%). In other words, the Danish tax authority targets transactions involving high-tax countries above and beyond what the geography of intra-group links would predict. We find similar results when weighing foreign tax rates by foreign direct investment

[9]Since the tax law can be hard to interpret and international tax enforcement efforts are asymmetric (they can only raise revenue), even random audits would result in extra tax collection.

income; see Online Appendix Figure A2.

In principle, firms could have tax reasons to shift income to high-tax places: Danish firms may shift profit out of Denmark to loss-making subsidiaries located in high-tax countries. Imagine for example that a firm makes 90 million in losses in Sweden, where the corporate tax rate is 22% (as in Denmark), and 500 million in profit in Denmark. This firm could try to shift 100 million out of Denmark to Sweden, reducing its global tax payments by 19.8 million.[10] However, most EU countries (including Denmark) and their close trading partners have unlimited loss-carryforward, and all EU country allow losses to be carried forward for at least four years. When losses can be carried forward, there is little incentive to shift profit to loss-making subsidiaries; and indeed from conversations with the Danish transfer price unit it appears that loss-shifting is not an important driver of corrections.[11]

4.1.2 The Global Tax Revenue Effects of Danish Transfer Price Corrections

Our second finding is that the transfer price corrections initiated by Denmark slightly reduce the global tax bills of the targeted multinationals (Panel C of Table 1). Specifically, the Danish transfer price corrections increase tax payments in Denmark by €320 million on average per year. But they reduce tax payments abroad by €333 million, implying a reduction in the global tax bill of the targeted firms of €13 million. When using effective tax rates (from Tørsløv et. al, 2020) instead of statutory rates to compute the decline in tax revenue abroad, the reduction in global tax payments is slightly larger, €49 million; see Online Appendix Table A1.

These results assume that profits are lowered abroad to offset the increase requested by Denmark, and that the corrections are not overturned in court. Two pieces of evidence support these assumptions. First, we analyzed the sample of cases for which a Mutual Agreement Procedures was completed over the period 2008–2015.[12] The advantage of this sample is that we can know the change in global tax liability, which results from the correction requested by Denmark combined with the offsetting adjustment agreed by counterpart countries. The

[10] In Denmark the tax bill on the 100 million in profit would be 22 million whereas in Sweden it would be 22% $\times$ 10, i.e., 2.2 million.

[11] 85% of Danish transfer price corrections involve counterpart countries that allow losses to be carried forward for 17 years or more. Moreover, 99.6% of all cases (euro-weighted) involve counterpart countries that allow losses to be carried forward for at least 5 years. For an overview of loss-carryforward rules see `https://www.dlapiperintelligence.com/goingglobal/tax/index.html?t=11-loss-utilization`.

[12] As Mutual Agreement Procedures take time, these completed procedures correspond for the most part to transfer price corrections initiated before 2014, and thus correspond mostly to different cases than those analyzed in our transfer-price correction dataset (which covers the years 2009, 2014 and 2015). Note, moreover, that following a correction, not all firms choose to request a Mutual Agreement Procedure, for instance because there is no point in requesting such a procedure if the taxes paid in the counterpart country are negligible.

distribution of completed Mutual Agreement Procedure cases is plotted in the Online Appendix Figure A4. In more than 90% of these completed cases, there is a reduction in the global tax bills of the targeted firms. The average tax differential in completed mutual agreement cases is -4.5%, in line with the tax differential seen in the initial transfer-price corrections dataset (Figure 2). Second, we conducted interviews with practitioners, including current and retired civil servants from Belgium, Denmark, Germany, Italy, Ireland, Netherlands, and the United Kingdom. From these interviews it emerged that transfer price correction are very rarely overruled in court. Thus the ultimate outcome of the cases initiated by Denmark is likely to be similar to what's implied by the original correction—i.e., lower the taxes paid by the targeted multinationals.

4.1.3 Firms Fighting Back

Our third finding is that firms are more likely to appeal transfer price corrections whenever these corrections increase their global tax bill. This result implies that for the tax authorities, some transactions are more costly to correct than others. While multinationals have no reason to spend legal resources fighting decisions that do not adversely affect their tax liabilities, they do spend significant resources when the tax authority attempts to challenge transactions that shift income to low-tax places.

We obtain this result by analyzing the appeals to Danish transfer pricing corrections initiated in court from 2011 to 2016. We do not observe the final outcome of these appeals, but we can use this dataset to analyze which cases firms bring to court. In the top panel of Figure 3, we plot the distribution of tax rate differentials (Danish minus foreign tax rate) for the transfer price cases brought to court. The distribution of rate differentials shifts to the right relative to the distribution seen for transfer price corrections initiated by the Danish tax authority. Firms have a higher tendency to appeal a correction whenever this correction increases their global tax bill.

From interviews with Danish tax officials, we learned that firms often initiate an appeal as a safety net while mutual agreement procedures are under way. This allows them to ensure they can fight corrections in court should no reduction of their profit abroad be made. In the bottom panel of Figure 3, we neutralize these "safety" appeals by restricting the sample of court cases to those involving EU countries—where a successful mutual agreement procedure is almost guaranteed. The distribution of tax rate differentials shifts further to the right. Similar findings are found when using effective tax rates (see Online Appendix Figure A3).

Firms may resist corrections through means other than appeals. For instance, they may

deliver more extensive transfer price documentation for certain transactions, complicating the work of the tax authority. In the context of this research, we did not get access to the transfer price documentation submitted by firms, but interviews with retired tax officials in the European Commission supported the notion that firms would provide more extensive documentation for transactions with tax havens. An interesting area for future research involves studying how the extent and quality of transfer price documentation correlates with tax differentials.

4.1.4 No Place Like Home? Parents vs. Subsidiaries

Our fourth finding is that the reduction in global tax payments caused by the Danish enforcement efforts is driven by a reduction in taxes for multinationals headquartered in Denmark. This is shown in Online Appendix Table A2, where we report our results on transfer-price corrections (Table 1) separately for multinationals headquartered in Denmark vs. Danish subsidiaries of foreign multinationals. Two-thirds of all the corrections initiated by Denmark involve Danish parent firms. This fraction falls to one-third for the corrections of transactions with tax havens.

There are several ways to explain these findings. First, during our period of study the Danish tax authorities had more information on the activities of firms headquartered in Denmark than on the activities of foreign multinationals.[13] Second, there may be a "home bias in auditing:" tax administrations in each high-tax country may prefer to focus on their own multinationals—a bias that would benefit both the multinationals (by reducing their global tax bills) and the tax authorities (by increasing tax collection). Third, there is evidence that multinationals are reluctant to shift profits away from their headquarters (even if these are located in high-tax countries) but more likely to shift profits inward (Dischinger et al., 2014). This could explain why, when it comes to tax havens, most Danish enforcement efforts are directed at foreign multinationals.

4.1.5 Impact on Global Tax Revenue of Shifting Attention to Tax Havens

Last, we use our Danish data to quantify how tax revenue would change in Denmark and globally if the Danish tax authority internalized the impact of its corrections on foreign tax collection (i.e., aimed at maximizing global tax collection). As reported in Figure 4, we find that global tax payments would increase by an amount ranging from 0.8% to 2.5% of current Danish corporate tax revenues. We obtain this finding by making the following assumptions.

[13] After our period of study, and as a result of the Base Erosion and Profit Shifting initiative launched under the auspices of the OECD, countries have started exchanging country-by-country reports automatically, so that the Danish authority now receives information on the country-by-country profit, sales, taxes, etc. of US or German multinationals, for example.

First, we assume that all the corrections initiated by Denmark involving non-tax havens would end, as these corrections reduce (or have a negligible impact) on global corporate tax payments. Everything else equal, this would lower Danish tax revenues by 3.6% of current Danish corporate tax revenues. However, the loss in Denmark would be more than offset by an increase in tax payments abroad, equivalent to 4.4% of current Danish corporate tax revenues.

Second, we assume that the enforcement resources currently devoted to pursuing non-tax havens would be redirected towards tax havens, where the scope for increasing global tax payments is the highest. A naive estimate, which we use as an upper bound, would extrapolate the tax revenue effects of these additional corrections by using the average value of the current corrections involving tax havens. However, intuitively and as confirmed to us by the Danish transfer pricing unit, marginal revenue falls with enforcement effort. Thus it is likely that increasing enforcement would lower the average value of corrections. In our benchmark scenario we therefore use the *median* value of the current corrections involving tax havens. In a lower bound scenario, we assume a zero return to these additional enforcement efforts.

An increase in global tax payments of in between 0.8% (lower bound scenario) to 2.5% (upper bound) of current Danish corporate tax revenues would be a significant development. In comparison, the global crackdown on profit shifting proposed by the OECD is anticipated to raise global tax revenues by 1%–4% (OECD, 2020). However, such a change in Denmark's audit strategy would come at a hefty fiscal price for Denmark, as it would reduce Danish tax revenues by 1.6%–3.6%. Under current incentives, this change in audit strategy is thus unlikely.

One caveat to the computations reported in Figure 4 is that we do not attempt to incorporate the behavioral responses of firms. From a qualitative perspective, how would these responses affect our findings? First, an increased focus on correcting profit shifting to tax havens would change the calculus of firms. Internalizing the greater likelihood of correction, firms would be less likely to shift profit to tax havens, increasing tax revenues in Denmark and globally. Second, an increased global tax bill may lower global investment, and thus ultimately reduce taxable profit and tax revenues. The net effect on Danish and global tax revenues of these two potential behavioral responses is ambiguous.

4.2 Global Patterns in Transfer Price Corrections

We now turn to the analysis of three cross-country aggregate data sources: the EY (2014) transfer price authority survey, Mutual Agreement Procedure statistics from the European Union joint transfer pricing forum, and the OECD Mutual Agreement Procedure statistics. These

data are less detailed than the Danish data, since they are not at the case-level but aggregated by country; but they cover a large cross-section of countries.

In 2014, the audit firm EY conducted a transfer price authority survey in which 26 major economies were asked which countries were the main focus of their transfer price correction efforts. As shown by the top panel of Figure 5, throughout the world countries most often targeted in transfer price disputes are high-tax countries. The United States comes first, followed by Germany and Japan. Among tax havens, only Switzerland and the Netherlands show up as being sometimes targeted. Ireland (which according to the estimates in Tørsløv et al., 2020, is the number one profit shifting destination globally) is never among the top-3 targets. Tax authorities also say they look at "low-tax jurisdictions" in the EY survey, but with the exception of Switzerland and the Netherlands, prominent tax havens are almost never named by tax authorities as being involved in actual disputes. Although tax authorities might intend to go after tax havens, actual transfer price corrections seem to mostly involve non-havens.

Figure 6 shows the distribution of active mutual agreement procedures in the European Union in 2011, the most recent year for which bilateral information is available. These are cases where (i) a transfer price correction has been conducted by a EU country, (ii) the targeted firm has asked the tax authority to initiate a mutual agreement procedure to lower the tax base in the counterpart country, and (iii) the Arbitration Convention has been invoked, giving the tax authorities involved two years to reach an agreement before an external panel is brought in to settle the case. Strikingly, we see that only 10.7% of mutual agreement procedures initiated by high-tax EU countries involve an EU tax haven,[14] while close to 90% involve EU high-tax countries. One caveat is that a company may not bother to request a mutual agreement procedure if profits are being relocated away from a tax haven where the firm's effective tax rate is close to zero. The EY and Danish data do not suffer from this limitation, since they do not condition on the existence of a mutual agreement procedure.

In an effort to curb profit shifting the OECD has launched an Inclusive framework on Base Erosion and Profit Shifting. As part of this process, 137 countries (including all major tax havens) have committed to publishing statistics on the number of mutual agreement procedures opened, closed, and the inventory of ongoing cases.[15] In Figure 7, we plot the number of mutual agreement cases closed in 2018, by counterpart country (i.e., country asked to reduce its tax base). Only 8% of all mutual agreement procedures closed targeted tax havens. The number

[14] As defined by Tørsløv et al. (2020), i.e., Belgium, Cyprus, Ireland, Malta, Netherlands, and Luxembourg.

[15] The statistics follow an internationally-agreed reporting framework and are made publicly available on the OECD webpage

of cases against Ireland is remarkably low, 8 cases closed in 2018. Similarly, Singapore, the world's second largest shifting destination according to Tørsløv et al. (2020) only closed 11 cases. The caveat that a company may not bother to request a mutual agreement procedure if profits are relocated from a zero-tax locale still applies. This may explain why no mutual agreement procedures were closed in the Cayman Islands, Jersey and the Isle of Man.

5 Explaining the Patterns in Transfer Price Corrections

Why, if there is intentional (and by some estimates large) profit shifting to tax havens, do tax authorities in high-tax countries focus on correcting mistakes in transactions involving high-tax countries? This section presents a model that can explain this puzzle.

In our model, a tax authority in a high-tax country seeks to maximize revenue collected from transfer price corrections. The tax authority is constrained in the number of corrections it can undertake. There are two representative firms: a non-tax planning firm and a tax planning firm. The non-tax planning firm conducts intra-group transactions between subsidiaries located in high-tax countries with identical tax rates. It has no incentive to shift profits between subsidiaries. However, when setting its transfer prices the non-tax planning firm sometimes deviates from the arm's-length price unintentionally. The tax-planning firm seeks to shift income from high-tax to low-tax countries. The firm does this by intentionally mispricing an internal service transaction between the high-tax country and the low-tax country. There is no time in the model (all actions are taken simultaneously).

5.1 Setup of the Model

We begin with the simplest setup: A tax authority in a high-tax country deciding whether to correct transactions with another high-tax country or transactions with a low-tax country.

The model has three agents:

1. A non-tax planning firm consisting of 2 entities: one in high-tax country H1 and the other in high-tax country H2.

2. A tax authority operating in high-tax country H1.

3. A tax planning firm consisting of 2 entities: one in high-tax country H1 and the other in low-tax country L.

The choice variables of the agents are:

1. The tax planning firm chooses the transfer price p^L on its internal transaction between the high-tax country H1 and the low-tax country L.

2. Country H1 chooses which transfer prices to correct.

The exogenous variables are:

1. p^a, the arm's length price (constant for simplicity).

2. p_i^H, the price of service i imported by the non-tax planning firm in country H1 from its affiliate in country H2, where $i \subset [0, N]$.

3. $\epsilon_i = p_i^H - p^a$, the *accidental* transfer price deviation on transactions between the two high-tax countries. We assume these mistakes are symmetric and follow a uniform distribution with standard deviation b and mean zero. These mistakes are unknown to the non-tax planning firm and result from the blurry nature of transfer pricing.

4. $t_{H1},\ t_{H2}, and\ t_L$, the corporate tax rates in countries H1, H2 and L, respectively. We assume that $t_{H1} = t_{H2} >> t_L$.

5. $\bar{N}$, the number of corrections the tax authority in country H1 can make given their resource constraint. We also note $\bar{n} = \bar{N}/N$ the maximum fraction of transactions with the high-tax country that the tax authority can correct.

Variables that are exogenous in the basic model, but later made endogenous:

1. γ_H, the ease of correcting transfer prices between the two high-tax countries H1 and H2.

2. γ_L, the ease for country H1 of correcting transfer prices involving the low-tax country L.

5.2 The Non-Tax Planning Firm

The non-tax planning firm has an affiliate in country H1 which is importing a continuum of services indexed by i from its affiliate in country H2 at price p_i^H. An increase in any of the transfer prices increases the taxable income of the firm in H2 and lowers its taxable income in H1 by the same amount, leaving the global income of the firm unchanged. For simplicity, we assume that $t_{H1} = t_{H2}$, such that the global tax bill of the firm is also unaffected.

According to prevailing rules, the non-tax planning firm should price its intra-group transactions at the arm's-length price p^a, which is for simplicity assumed to be constant across services. However, since the choice of the transfer prices is inconsequential for the firm, the firm is inattentive and sometimes deviates from the the arm's-length price.[16] Another way to interpret these deviations is that the conceptually correct transfer prices for services are not well defined, leading to conflicts on what the right price is even when all actors are honest. This leads the non-tax planning firm to mis-price its transactions by $\epsilon_i = p_i^H - p^a$. We assume that these mistakes are uniformly distributed around the correct transfer price such that $\epsilon_i \sim U(-b, b)$ and $\int_0^N \epsilon_i \, di = 0$. If all transactions between the two high-tax countries where priced correctly the total value of internal imports would be $\int_0^N p^a \, di = Np^a$. If the non-tax planning firm was never corrected the total value of internal imports would be $\int_0^N p^a - \epsilon_i \, di = Np^a$. This implies that while specific transactions between the two high-tax countries may be mis-priced, if the transfer prices of the non-tax planning firm are not corrected by the tax authorities, there will be no aggregate deviation from the arm's-length principle.

5.3 The Tax Authority in Country H1

We first consider the behavior of the tax authority in country H1. We assume that it seeks to maximize tax revenue collected from transfer price corrections. We also assume that the tax authority has limited resources, which implies that investigating a case lowers the resources available to pursue another case. We model this constraint by assuming that the tax authority can correct at most $\bar{N}$ transactions per year. We also define $\bar{n} = \bar{N}/N$ as the maximum fraction of transactions with the high-tax country that the tax authority can correct.

Corrections may ultimately be invalidated or reduced in the context of a mutual agreement procedures and/or in court. We allow the expected reduction in the initial correction to depend on the counterpart country. The expected reduction in a correction of the non-tax planning firm is $(1 - \gamma_H)$ and the expected reduction in a correction of the tax planning firm is $(1 - \gamma_L)$. A plausible hypothesis is that the tax-planning firm will resist corrections that move taxable income away from the low-tax country, implying that $\gamma_L < \gamma_H$. This assumption, however, is not necessary to show Proposition 1 below.

[16] This assumption can be justified by assuming a fixed cost of finding the actual arm's-length price p^a, or by non-tax considerations, such as the needs and opportunity costs of the firm (as generally taught in Management Accounting). For instance, firms with idle resources in their headquarter may chose a zero transfer price on headquarter services. See Nielsen and Raimondos-Moller (2008) for a discussion of the trade-off between tax and non-tax motivated transfer pricing.

5.4 Correcting Mistakes Only

We begin by disregarding the tax-planning firm and by describing a situation where the tax authority only corrects the mistakes of the non-tax planning firm. The expected yield of correcting service transaction i of the non-tax planning firm is $t_{H1}\gamma_H\epsilon_i$. For any $z \in [-b, b]$ we denote the share of service transactions for which $\epsilon_i > z$ as $F(z)$. Following the properties of the uniform distribution we note that:

$$F(z) = \frac{b - z}{2b} \tag{1}$$

The tax authority will correct the $\bar{N}$ largest mistakes (ϵ_i) of the non-tax planning firm conditional on $\epsilon_i > 0$ in all $\bar{N}$ cases. We let ϵ^N denote the $\bar{N}$'th largest mistake and note that:

$$F(\epsilon^N) = \frac{b - \epsilon^N}{2b} = \bar{n} \Rightarrow \epsilon^N = b - 2b\bar{n} \tag{2}$$

This implies that the correction of the $\bar{N}$'th largest mistake of the non-tax planning firm will generate a yield of $Y^N = t_{H1}\gamma_H(b - 2b\bar{n})$. If $Y^N < 0$ the tax authority will not correct all $\bar{N}$ corrections (as doing so would reduce the taxable income of country H1) but only correct the number of transactions for which $Y^N > 0$. From equation 2 it follows that:

$$t_{H1}\gamma_H(b - 2b\bar{n}) > 0 \Rightarrow \bar{n} < \frac{1}{2} \tag{3}$$

The tax authority will hence correct $\bar{N}$ transactions unless $\bar{n} > \frac{1}{2}$ in which case it will only correct half of all transactions. At the optimum the expected marginal yield (Y^*) of correcting the non-tax planning firm alone is:

$$Y^* = \begin{cases} t_{H1}\gamma_H(b - 2b\bar{n}) & \text{if } \bar{n} < \frac{1}{2} \\ \\ 0 & \text{if } \bar{n} \geq \frac{1}{2} \end{cases} \tag{4}$$

5.5 Intentional Profit Shifting in Equilibrium

The tax-planning firm imports one service from its affiliate in the low-tax country L at transfer price p^L.[17] The goal of the tax-planning firm is to maximize p^L to transfer as much income as possible from the high-tax to the low-tax country. For simplicity, we assume the tax-planning

[17]Introducing more transactions by the tax-planning firm does not change the qualitative findings.

firm does not make mistakes when choosing p_L.[18] The expected yield to the tax authority of correcting the tax planning firm is $t_{H1}\gamma_L(p^L - p^a)$. The tax-planning firm knows the expected marginal yield of correcting the non-tax planning firm (Y^*). It will hence ensure that the tax authority does not correct p^L by making it more attractive to correct the marginal transaction of the non-tax planning firm. The optimal transfer price p_*^L thus satisfies:

$$Y^* = t_{H1}\gamma_L(p_*^L - p^a) \tag{5}$$

$$p_*^L - p^a = \begin{cases} \frac{\gamma_H}{\gamma_L}(b - 2b\bar{n}) = \frac{\gamma_H}{\gamma_L}\epsilon^N & \text{if } \bar{n} < \frac{1}{2} \\ \\ 0 & \text{if } \bar{n} \geq \frac{1}{2} \end{cases} \tag{6}$$

If the tax authority has sufficient capacity $\bar{n} > \frac{1}{2}$, it can pursue all cases that increase the taxable income of country H1. There is no need for the tax authority in country H1 to prioritize between cases, and the tax-planning firm will not be able to shift profit to the low-tax country. In reality tax authorities only have capacity to audit a small fraction of transactions, so we focus on the situation where the tax authority is constrained, i.e., $\bar{n} < \frac{1}{2}$. In this case we have the following Proposition:

Proposition 1: *If the tax authority is sufficiently constrained ($\bar{n} < \frac{1}{2}$), the amount of intentionally shifted profits to the low-tax country ($p_*^L - p^a$) depends positively on b (the size of the mistakes made by the non-tax planning firm), negatively on γ_L (the ability to correct the tax-planning firm) and positively on γ_H (the ability to correct the mistakes of the non-tax planning firm).*

Proposition 1 shows how corrections of non-intentional profit shifting crowds out corrections of intentional profit shifting by the tax-planning firm. The larger the mistakes of the non-tax planning firm (b) and the larger the success rate of correcting these mistakes (γ_H/γ_L), the fewer resources will be devoted to correct intentional profit shifting and the higher the transfer price deviation $p_*^L - p^a$ will be.

[18] This is a reasonable way to model the tax-planning firm, since the point of tax-planning through transfer pricing is to maximize after-tax profits. For example, the prices chosen by Google for its transactions with its affiliate in Bermuda are likely to overwhelmingly reflect an objective of intentional profit shifting rather than unintentional mistakes that can occur in the difficult space of transfer pricing.

5.6 Equilibrium vs. Social Optimum

What would be the optimal allocation of resources if the tax authority aimed at maximizing global tax collection? As the two high-tax countries have identical tax rates, a transfer price correction between these two countries does not affect global tax collection. Moreover, if the tax authority is sufficiently constrained, corrections of intentional profit shifting to the low-tax country are crowded out by corrections between the two high-tax countries in equilibrium (Proposition 1), from which Proposition 2 follows:

Proposition 2: *If the tax authority is sufficiently constrained ($\bar{n} < \frac{1}{2}$), corrections of intentional profit shifting to the low-tax country will be crowded out by corrections between the two high-tax countries in equilibrium. As a result, tax collections fall below the global maximum.*

Proposition 2 tells us that a social planner seeking to maximize global tax collection would not conduct any transfer price corrections between the two equally taxed countries. All countries could be made better off (in terms of tax revenue) if the tax authority only corrected intentional profit shifting and shared the additional tax receipts. Of course, this would require an ad-hoc mechanism for countries to share tax receipts.

Propositions 1 and 2 imply that any policy that increases the relative ease of doing corrections between high-tax countries (γ_H/γ_L) will increase profit shifting in equilibrium and lower global tax revenue. Such policies include the exchange of information between high-tax countries and the facilitation of dispute settlement. If adopted, such policies (keeping policies involving low-tax countries fixed) incentivize the tax authority to chase profit booked in other high-tax countries, shifting resources away from chasing profit shifting to low-tax countries. We discuss in the Online Appendix A and B how certain elements of recent OECD-led reforms might inadvertently lead to such outcomes.

6 Extensions of the Model

6.1 Tactical Use of Transfer Price Documentation & Legal Pressure

In our baseline model, the tax-planning firm is assumed to always chose the tax-minimizing transfer price p_*^L. The non-tax-planning does not make any choice. We now introduce the option of applying legal pressure (e.g., through court procedures), creating a veil of opacity (e.g., through limited liability companies), or investing in higher-quality transfer price documentation.

The simplest way to model this is by making γ_i endogenous, so that firms can lower the chance of a successful transfer price corrections by incurring some costs C. We assume that:

$$\frac{\delta\gamma_i}{\delta C} < 0, \frac{\delta^2\gamma_i}{\delta^2 C} > 0 \tag{7}$$

As there is no benefit to the non-tax planning firm of lowering the likelihood of a transfer price correction, the non-tax-planning firm will not incur any cost ($C = 0$). By contrast, following proposition 1 the tax-planning firm can increase its tax benefit from transfer mis-pricing by lowering the likelihood of a transfer price correction as long as the tax authority is sufficiently resource constrained. Using equation 6, the maximization problem for the tax-planning firm becomes:

$$Max_{wrt\ C}\left[(t_H - t_L)\cdot(p_*^L - p^a)\right] = \begin{cases} Max_{wrt\ C}\left[\frac{(t_H - t_L)\gamma_H}{\gamma_L}(b - 2b\bar{n}) - C\right] & \text{if } \bar{n} < \frac{1}{2} \\ Max_{wrt\ C}\left[(0 - C\right] & \text{if } \bar{n} \geq \frac{1}{2} \end{cases} \tag{8}$$

From equations 7 and 8 it follows that if the tax authority is sufficiently constrained ($\bar{n} < \frac{1}{2}$) the tax-planning firm will incur legal costs up to the point in which the marginal benefit of distracting the tax authority equals the marginal cost $-(t_H - t_L)\gamma_H(b - 2b\bar{n}) = \frac{\delta C}{\delta\gamma_L} \Rightarrow C > 0$. As long as the tax authority is sufficiently constrained, the tax-planning firm will invest in making it difficult to correct its profit shifting. Other things equal, it will become relatively more costly for the tax authority to correct the tax-planning firm than the non-tax planning firm. As a result, the tax authority will be less likely to target the tax-planing firm. Following proposition 1, profit shifting will increase.

Proposition 3: *In equilibrium the tax planning firm will incur legal costs $C > 0$ to dissuade the tax authority to correct its intentional profit shifting—as long as the tax authority is sufficiently constrained ($\bar{n} < 1/2$). This will increase profit shifting.*

6.2 High-Tax Countries Arms Race

We now introduce the tax authority of high-tax country H2. It has the same objective as the tax authority of H1 (maximizing its own revenue). We allow the tax authorities to have different capacity and let $\bar{n}_{H1}, \bar{n}_{H2}$ denote the constraints in H1 and H2, respectively. For simplicity, we assume that the number of transactions is N in both cases. We continue to assume that the tax authorities are constrained to the point where $\bar{n}_{H1}, \bar{n}_{H2} < \frac{1}{2}$. Without loss of generality

we assume that the only multinational operating in country H2 is the non-tax planning firm. While the tax authority in country H1 wants to correct the mistakes of the non-tax planning firm whenever the transfer price is too high ($\epsilon_i = p_i^H - p^a > 0$), the tax authority in country H2 faces the opposite incentive. Its tax base increases with p_i^H and it will aim at correcting transfer prices that are too low ($p_i^H - p^a < 0$). We allow the enforcement capacities (captured by γ_H) of the two tax authority to differ. We let γ_H^{H1} denote the success rate of the tax authority in H1 and γ_H^{H2} denote the success rate of the tax authority in H2.

As the number of services for which $\epsilon_i > z$ is given by equation 1, the total value of the $\bar{N}_{H1}$ largest corrections of the non-tax planning firm in country H1 is:

$$t_{H1}\gamma_H^{H1}\int_0^{\bar{N}_{H1}} b - 2bx\ dx = N \cdot t_{H1}\gamma_H^{H1}\left[bx - bx^2\right]_0^{\bar{n}_{H1}} = N \cdot t_{H1}\gamma_H^{H1}(b\bar{n}_{H2} - 2b\bar{n}_{H1}^2) \tag{9}$$

Similarly, the value of the $\bar{N}_{H2}$ largest corrections of the non-tax planning firm in country H2 is:

$$-\,t_{H2}\gamma_H^{H2}\int_0^{\bar{N}_{H2}} -(b - 2bx)\ dx = N \cdot t_{H2}\gamma_H^{H2}\left[bx - bx^2\right]_0^{\bar{n}_{H2}} = N \cdot t_{H2}\gamma_H^{H2}(b\bar{n}_{H2} - 2b\bar{n}_{H2}^2) \tag{10}$$

The total direct impact of *all* transfer price corrections on the tax base of each country is the sum of each country's own corrections *less* the corrections of the counterpart country. Moreover, since $t_{H1} = t_{H2}$, the direct net impact on global tax revenue of any transfer price correction between the two high-tax countries is zero.

We now allow the success rate of each tax authority to depend on an investment in tax capacity of I (training, technology, etc.):

$$\frac{\delta\gamma_H^{H1}}{\delta I^{H1}} > 0, \quad \frac{\delta^2\gamma_H^{H1}}{\delta^2 I^{H1}} < 0 \tag{11}$$

$$\frac{\delta\gamma_H^{H2}}{dI^{H2}} > 0, \quad \frac{\delta^2\gamma_H^{H2}}{d^2 I^{H2}} < 0 \tag{12}$$

where I_{H1} is the investment made by country H1 and I_{H2} is the investment made by H2. From a global point of view any investment in conducting transfer price corrections between the two high-tax countries is sub-optimal. When H2 corrects H1, the corrections have no impact on global tax payments and they carry a social cost but no social value. When H1 corrects H2, the corrections lower global tax payments by crowding out the corrections involving the low-tax country—allowing the tax-planning firm to shift more profits. However, since each tax

authority tries to maximize the sum of corrections, in a Nash equilibrium both tax authorities will invest in γ_H up to the point where the marginal private return equals the marginal cost:

$$\frac{\delta \gamma_H^{H1}}{\delta I_*^{H1}} = N \cdot t_{H1} \left[b\bar{n}_{H1} - 2b\bar{n}_{H1}^2 \right] \tag{13}$$

$$\frac{\delta \gamma_H^{H2}}{\delta I_*^{H1}} = N \cdot t_{H2} \left[b\bar{n}_{H2} - 2b\bar{n}_{H2}^2 \right] \tag{14}$$

Several interesting conclusions follow from equations 13 and 14. First, in equilibrium both high-tax countries will invest a positive amount in relocating revenue from each other by correcting mistakes—leading to a sub-optimal outcome from a global perspective. Second, other things equal, the tax authority with the highest capacity will invest more and obtain a higher share of total tax revenue. This has implications when considering the dynamic of transfer price corrections between high- and low-income countries. Severely resource-constrained tax-authorities in developing countries might be unable to match the efforts of high-income countries and as a result lose in this (non-tax driven) game for profit.

Proposition 4: *In a Nash equilibrium, both high-tax countries will invest in relocating some tax base away from the other country, despite this having no effect on global tax revenue—hence leading to a socially sub-optimal equilibrium. Other things equal, the tax authority with the highest capacity will end up obtaining the most tax revenue.*

6.3 An Alternative Explanation

Another explanation for the lack of enforcement observed against tax havens is that tax authorities may not really be interested in enforcing taxes on multinationals. With territorial tax systems, lax enforcement can encourage domestic investment by lowering effective marginal tax rates. The tax authorities of high-tax countries might perceive that profit shifting and capital mobility are strongly substitutable—with less shifting there would be more outflows of tangible capital, with potentially adverse effects on wages and employment—and rationally chose to limit enforcement for that reason (see, e.g., Hong and Smart, 2010). From the viewpoint of the individual tax authority you can increase tax revenue (in your country) while keeping constant (or even lowering) the excess burden of taxation by correction transactions with foreign high-tax countries. Following the theoretical framework for optimal tax administration of Keen and Slemrod (2017), the tax authority should prioritize cases that would lower the tax burden of the firm—i.e., the tax authority should chose cases involving high-tax countries. This explanation

implies that tax authorities and firms in effect collude to ensure that corrections only involve transactions with little consequences for their global tax bills.

This alternative explanation has three main limitations. First, it is not a highly realistic depiction of reality. If anything, policymakers (including Danish officials) ask their transfer price units to focus on transactions with tax havens (see EY 2014), not to target high-tax countries. The mandate auditors receive is to maximize the value of corrections, not to lower effective marginal tax rates. Second, as we saw in Section 4.1.3, firms do object to the corrections made by tax authorities, especially when these corrections increase their tax bills. This is at odds with the notion that tax authorities and firms may be colluding. Multinationals spend significant legal resources defending their internal pricing arrangements, which they would not do if tax authorities were not genuinely interested in curbing profit shifting. Last, governments can use many policy tools to lower effective marginal tax rates, such as offering reduced rates on certain forms of highly mobile income (e.g., lower rates on royalties via patent boxes). These tools—codified in law—are a clearer and more rational way to attract investment than the use of confidential audit strategies.

6.4 Minimum Taxation and Mutual Agreement Procedures

Our model has implications for current policy discussions of international tax reforms. In the Online Appendix A and B, we model the impact of country-by-country minimum taxation and strengthened Mutual Agreement Procedures. Both of these reforms are currently discussed as part of the OECD's work on corporate taxation. We find that these policies might further shift the attention of tax authorities away from tax havens and towards high-tax countries.

First, by making it easier to correct transactions with other high-tax countries, mutual agreement procedures increase the opportunity cost of correcting transactions with low-tax countries. This allows tax-planning firms to shift more income to tax havens.

Second, with country-by-country minimum taxation, income declared in a tax haven would in part be subject to taxation in a high-tax country, while income declared in another high-tax country would not. Everything else equal, relocating income shifted to tax havens would generate less tax revenue than relocating income booked in high-tax countries—exacerbating the current incentives to focus enforcement on high-tax countries. The tax loss due to changes in transfer price enforcement could, however, easily be swamped by the direct gains from minimum taxation, making the overall revenue effects ambiguous.

7 Conclusion

This paper investigates the enforcement of taxes on multinational companies. The available evidence suggests that tax authorities in high-tax countries spend the bulk of their resources correcting non-intentional deviations from arm's length pricing occurring in transactions between high-tax countries, while spending a small fraction of their resources correcting transactions involving tax havens. We show how this behavior can be explained by the incentives that tax authorities face. Tax authorities do not internalize the externality of their transfer price corrections on foreign nations. These incentives can lead to a socially sub-optimal arms race, in which high-tax countries spend resources on competing for revenue from each other with little impact on the global tax bill of multinationals. Meanwhile, tax-planning firms reap the benefits of distracted tax authorities by shifting more profits to tax havens.

As with other issues in international taxation, a coordinated effort (such as a federal transfer pricing unit at the EU or global level) could go a long way towards fixing the problem. Another potential solution involves abandoning transfer pricing. A number of proposals for fundamental reforms that would make profit shifting harder have been formulated, for instance the adoption of a destination-based corporate cash flow tax (Auerbach, 2010), the use of apportionment formulas (e.g., Avi-Yonah and Clausing, 2007), or a mix of worldwide taxation for domestic firms and minimum tax for foreign firms (Saez and Zucman, 2019). This paper suggests that these reforms might increase welfare by freeing resources currently used for wasteful tax enforcement.

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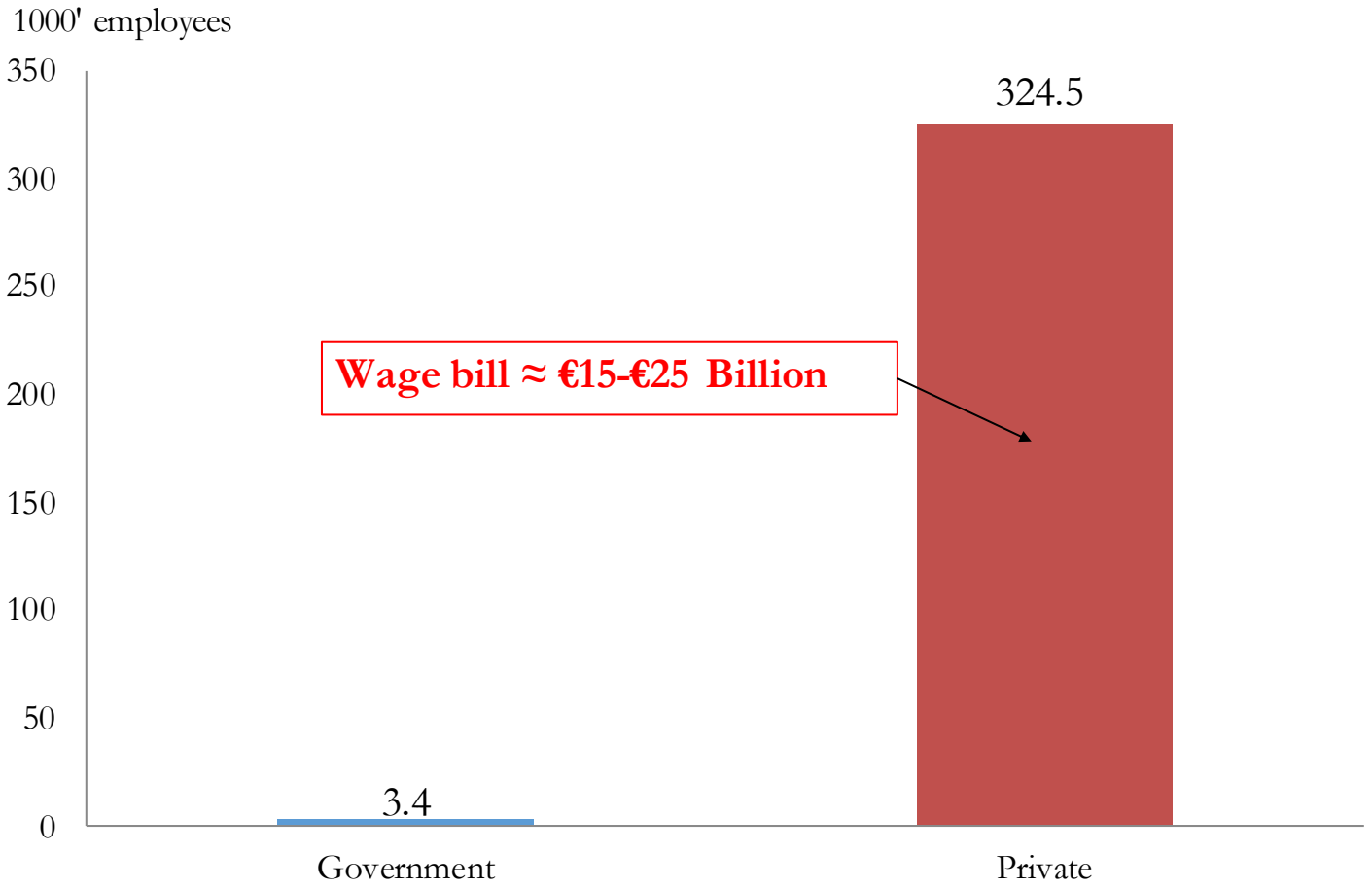
Table 1: Annual Profit Shifting out of Denmark and Annual Transfer Price Corrections

	[1]	[2]	[3]
Panel a: Tax-motivated profit shifting	**All countries**	Non-tax havens	Tax havens
Amounts (€, Millions)	**2215**	-455	2670
% of tax base	**6%**	-2%	8%
Panel b: Transfer price corrections			
Corrections (# of cases)	**62**	44	18
Corrections (€, Millions)	**1456**	1190	266
Corrections (% of total)	**100%**	82%	18%
Panel c: Estimated tax revenue impact (€, Millions)			
Implied increase in tax revenue in Denmark	**320**	262	58
Implied decrease in tax revenue abroad	**333**	323	10
Net change in global tax bill if fully realized	**-13**	**-61**	**48**

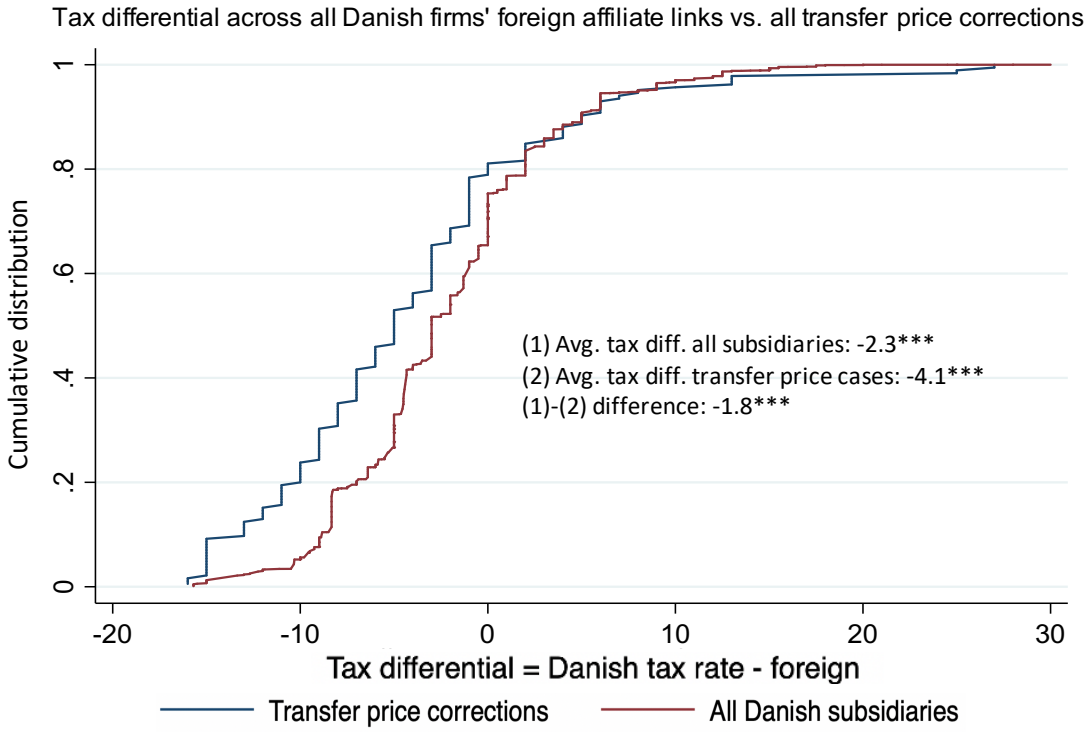
Notes: This table provides summary statistics of the transfer pricing cases initiated by the Danish tax authority, and reports available macroeconomic estimates of profit shifting out of Denmark. Panel A shows estimates of profit shifting out of Denmark. A negative number means that Denmark is a net recipient of profits. Profit shifting between non-tax havens is for 2012 and taken from Alvarez-Martinez et al. (2018). Profit shifting to tax havens is for 2015 and taken from Tørsløv et al. (2020). Panel B reports on the Danish tax authorities' transfer pricing cases; data are averages for the years 2009, 2014, and 2015. Panel C reports the effect of the transfer price corrections initiated by the Danish tax authorities on tax collection in Denmark and abroad, if the corrections are fully realized (i.e., assuming the corrections are not overturned in court or reduced in the context of a Mutual Agreement Procedure, and assuming that the profits increases in Denmark are matched by corresponding declines abroad). The decline in tax revenue abroad is computed using statutory tax rates for non-havens (from KPMG, 2018) and effective tax rates for havens (from Tørsløv et al., 2020). Source: Danish Inland Revenue, Alvarez-Martinez et al. (2018), Tørsløv et al. (2020), KPMG (2018), and authors' calculations (see text).

Figure 1: Private and Public Employment in Transfer Pricing Globally in 2020



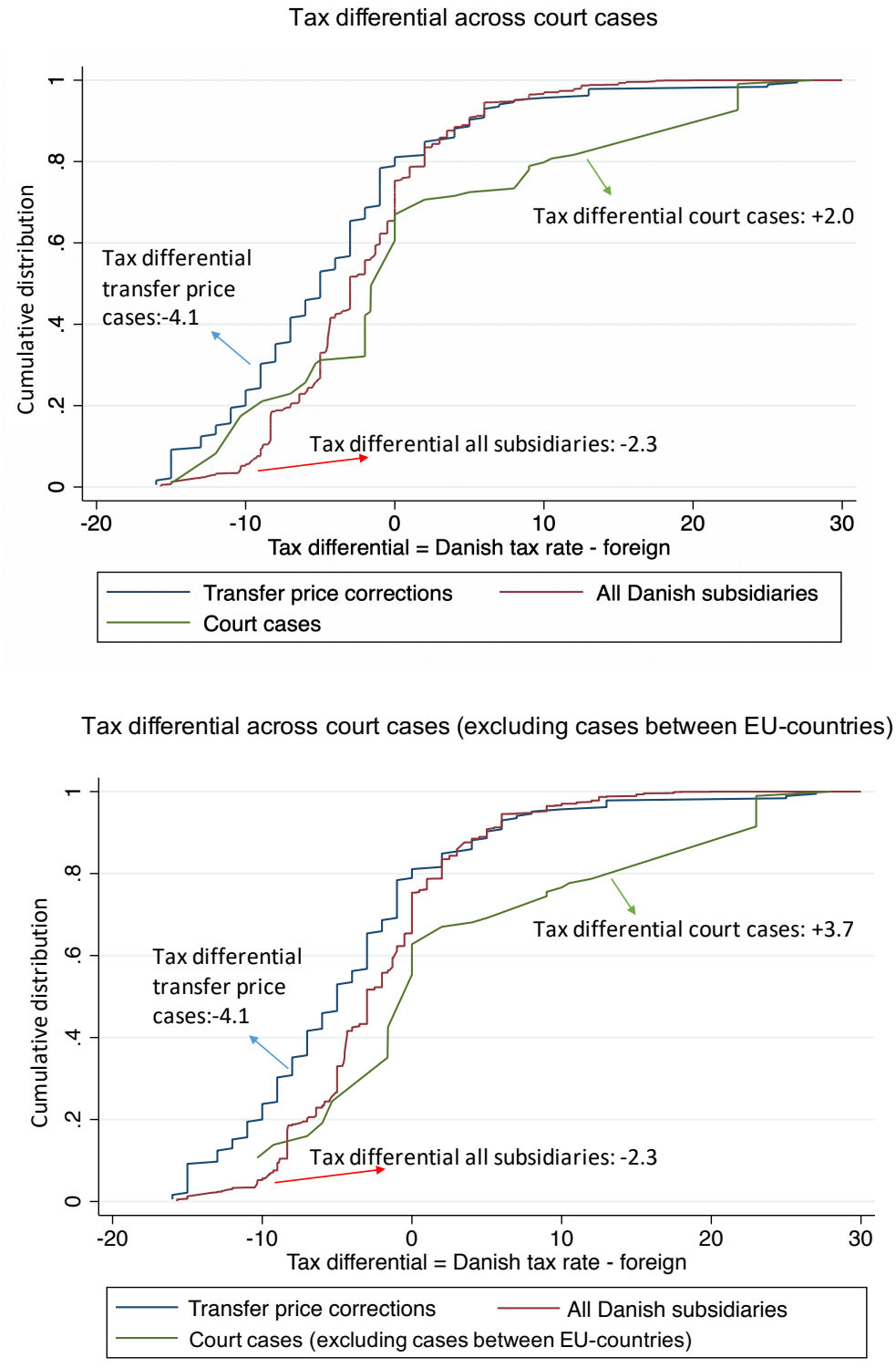
Notes: This figure shows the share of transfer pricing specialists working in the public and private sector. 328,261 is the number of individuals that LinkedIn highlights when searching "transfer pricing" under "people" (as of January 4, 2020). Spot checks confirm that LinkedIn correctly identifies individuals working with transfer pricing. The number of individuals working in government with transfer pricing is first identified by filtering the search by industry to "government administration" only (3,368 as of January 4, 2020) and corroborated by the head count in EY's Transfer Pricing Tax Authority Survey from 2014. The wage bill is estimated using the average base salary of a transfer pricing specialist ($74,000 as of January 4, 2020) computed by Glassdoor. Source: Authors' computations based on LinkedIn, EY and Glassdoor data.

Figure 2: The Distribution of Tax Differentials: Transfer Pricing Cases vs. Full Population



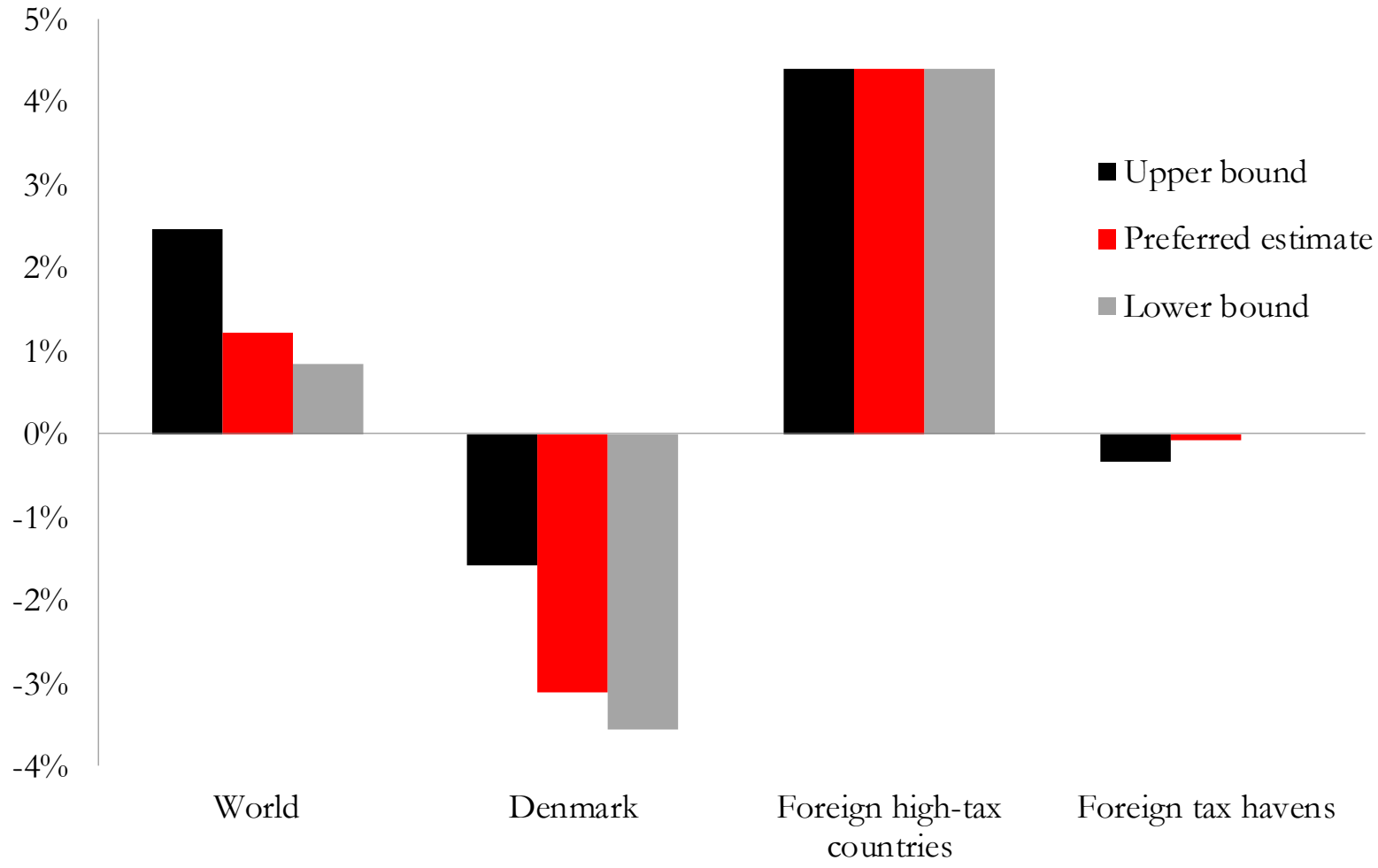
Notes: This figure shows the cumulative distribution of the tax differential between (i) Denmark and the counterpart countries in all Danish transfer pricing cases initiated in 2009, 2014 and 2015 (blue line); (ii) all Danish multinational entities (subsidiaries and parents) and their foreign related parties (red line). The tax differential is defined as the Danish corporate tax rate less the counterpart country tax rate. Tax rates are from KPMG (2018). Source: Danish Inland Revenue, Tørsløv et al. (2020), KPMG (2018), and authors' computations (see text).

Figure 3: Multinational Firms Fight Back... When it Suits Them



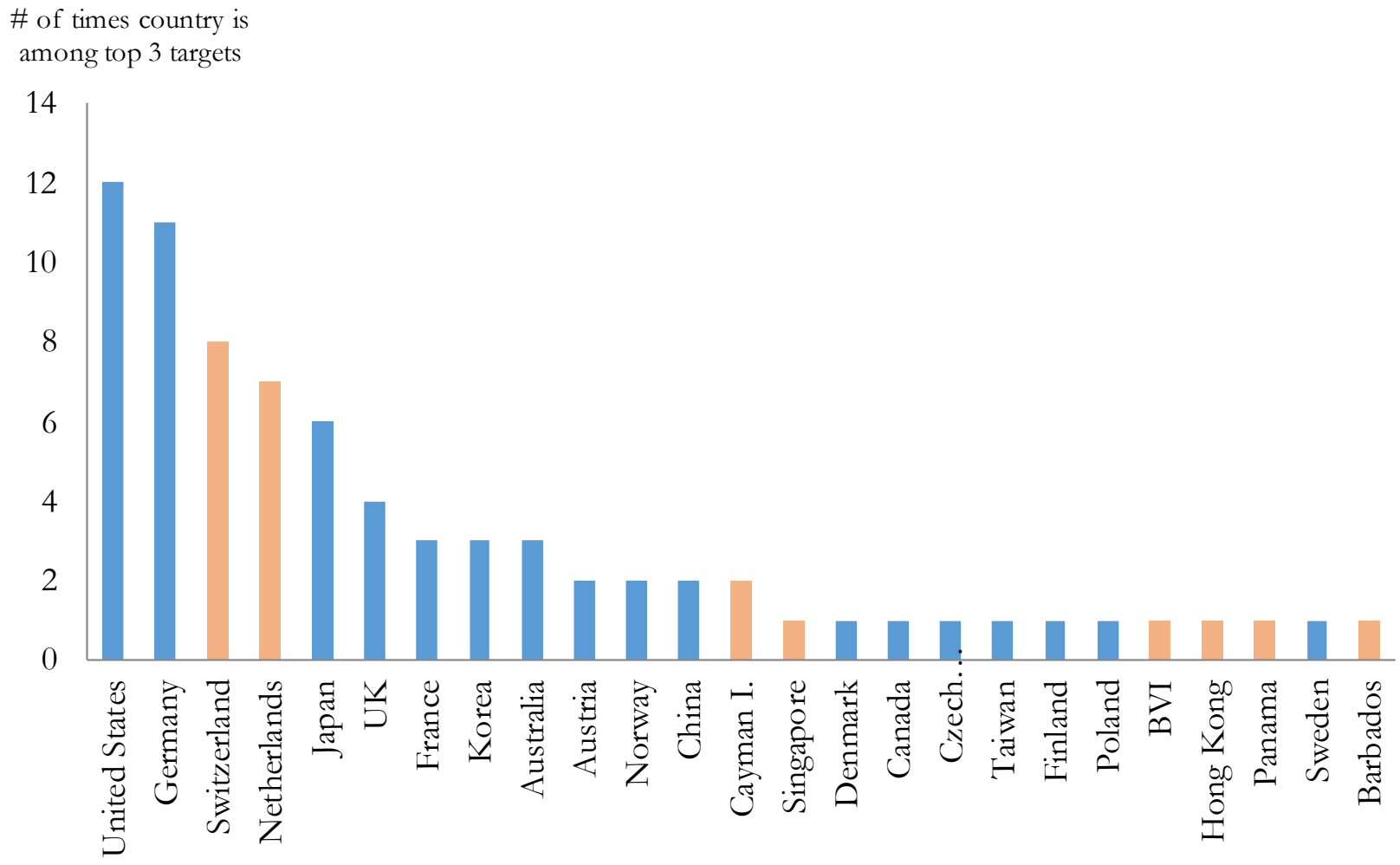
Note: This figure shows the cumulative distribution of the tax differentials (Danish minus counterpart country tax rates) in cases where firms appeal corrections in court. The red line shows the tax differential between all Danish multinational entities (subsidiaries and parents) and their foreign related parties. The green line shows the tax differential across court cases; the top panel includes all cases while the bottom panel only includes cases involving EU countries, where the likelihood of successful dispute settlement is larger. Source: Danish Inland Revenue, Tørsløv et al. (2020), KPMG (2018), and authors' computations (see text).

Figure 4: Change in Tax Payments (% of Danish Corporate Tax Revenue) if Denmark Aimed at Maximizing the Global Tax Payments of Audited Firms



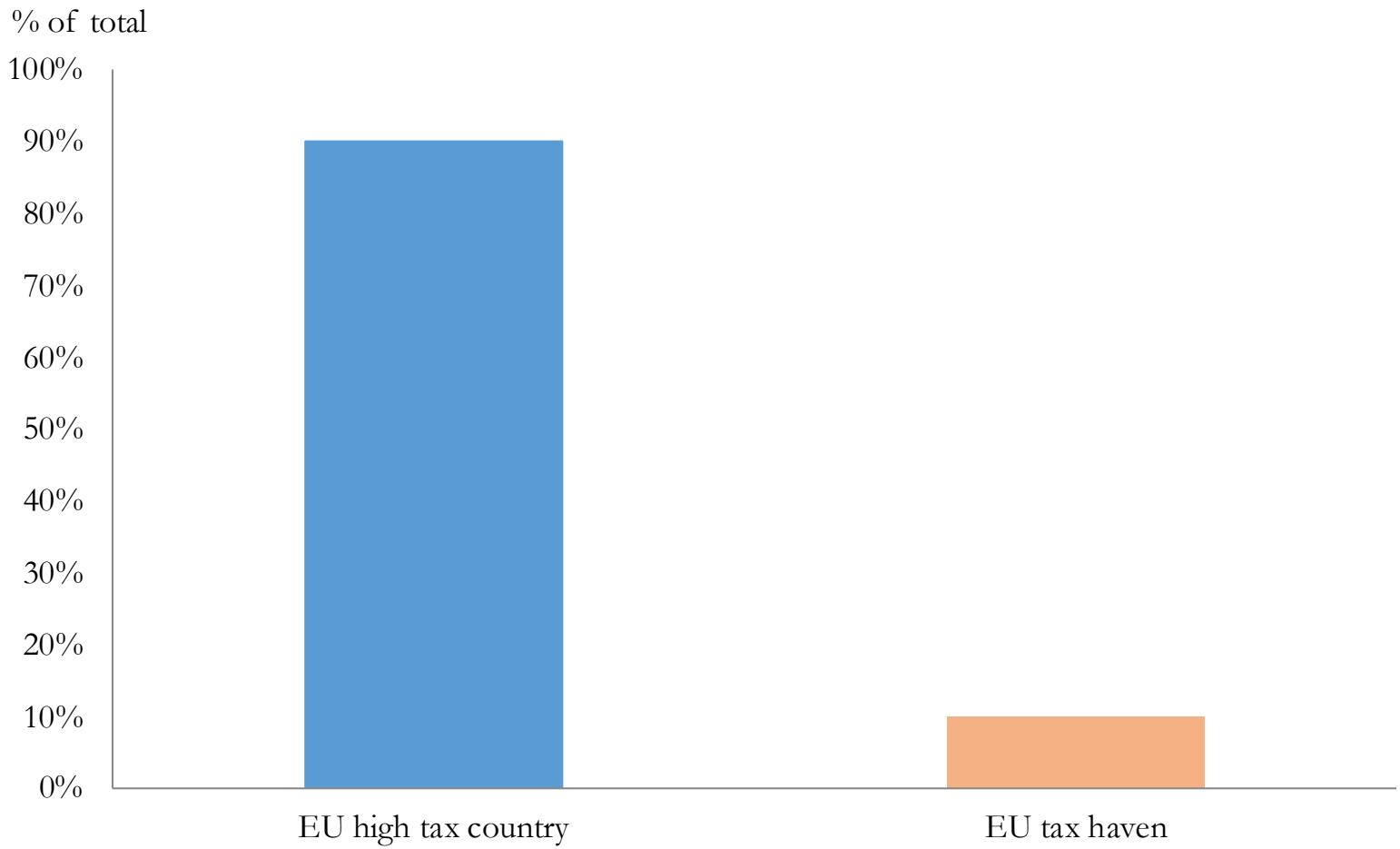
Notes: see text.

Figure 5: Top Targets in Transfer Price Corrections Globally



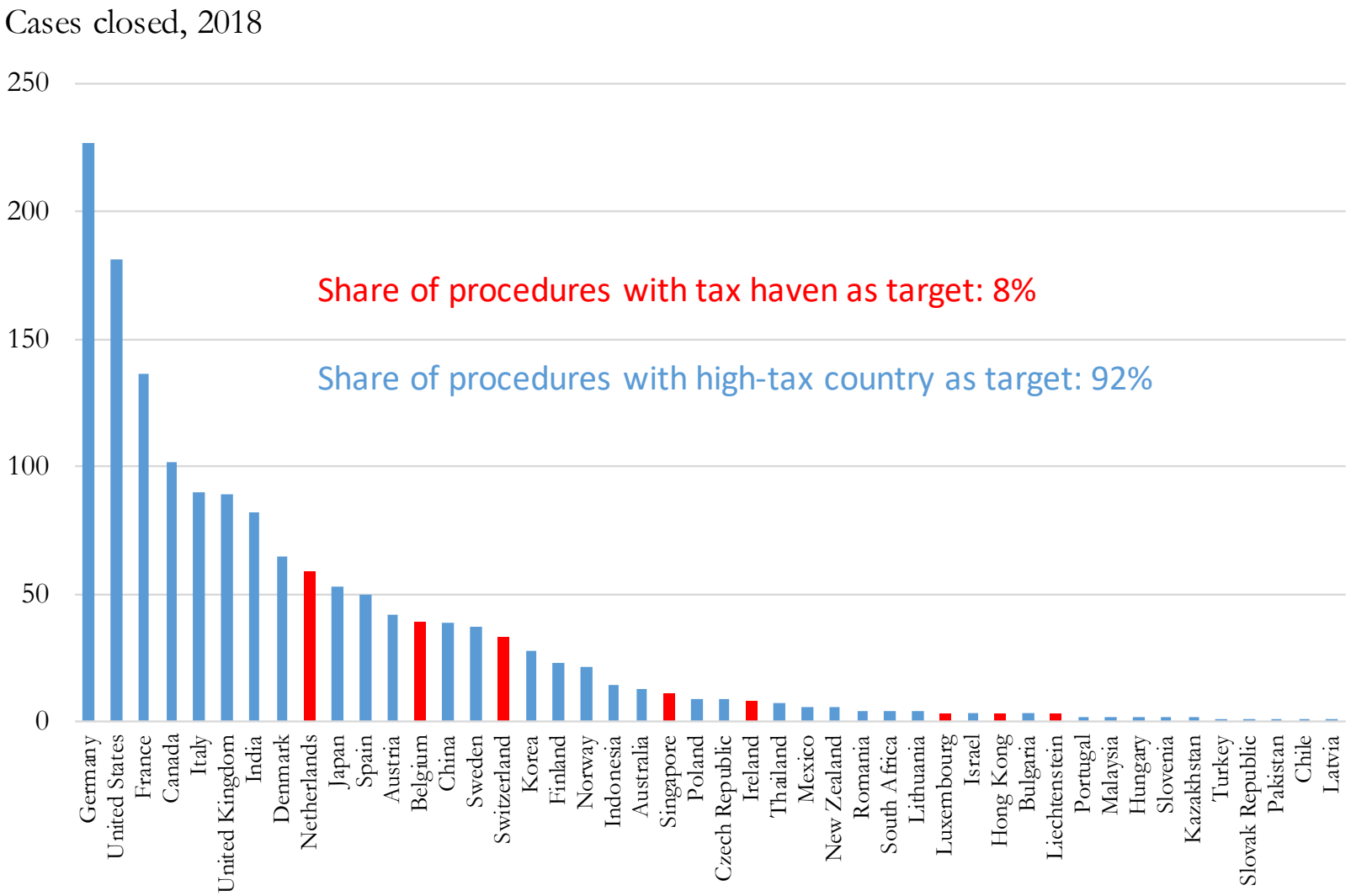
Notes: The figure shows the most frequently cited top-3 targets in transfer price correction cases among 26 major economies surveyed by EY in 2014. Tax havens are defined as in Tørsløv et al. (2020) and marked in orange. Source: EY (2014), authors' calculations (see text).

Figure 6: Counterpart Countries in Mutual Agreement Procedures in the European Union



Notes: The graph shows the counterpart countries in EU mutual agreement procedures initiated by an EU high-tax country with the Arbitration Convention invoked. EU tax havens are defined as in Tørsløv et al. (2020). Source: EU joint transfer pricing forum and Tørsløv et al. (2020).

Figure 7: Counterpart Countries in Mutual Agreement Procedures Globally



Notes: The graph shows the target of mutual agreement procedures following transfer price corrections in the 137 member countries of the OECD inclusive framework. Countries reporting zero mutual agreement procedures are left out of the chart. Tax havens are marked in red using the definition from Tørsløv et al. (2020). Source: OECD MAP statistics.

Online Appendix

In this appendix we investigate the theoretical effect of Mutual Agreement Procedures and minimum taxation on transfer price corrections.

A Potential Adverse Effects of Improving Mutual Agreement Procedures

Mutual agreement procedures facilitate agreements between tax authorities on the relocation of taxable profit. When an agreement is reached, a transfer price correction in one country is offset by an equal reduction in the tax base of the counterpart country. This matters to firms when the counterpart country has a high tax rate (since the corresponding tax reduction will be large) and matters less if the the counterpart country has a low tax rate. In the extreme case where the counterpart country has a zero tax rate, there is no point for a firm to request a mutual agreement procedure.

Since the end of the 1990s, there has been a push to advance mutual agreement procedures. The OECD has played a key role in this process through the 1996 OECD Model Tax Convention (article 25) and in 2014 through its Base Erosion and Profit Shifting (BEPS) initiative, whose action 14 seeks to "make dispute resolution mechanisms more effective." In parallel, the European Union has enhanced dispute resolution through the EU Arbitration Convention and the EU joint transfer pricing forum. In this forum EU states are held accountable as to the ease and speed with which they facilitate dispute resolutions.

The push for facilitating mutual agreement procedures has lowered the length of procedures and increased the number of cases markedly—particularly in high-tax countries. The OECD has since 2006 collected statistics on the number of newly started and closed mutual agreement procedures. The number of cases has more than doubled from 2006 to 2018, from 1,036 cases initiated in 2006 to 2,385 in 2018.[19] The push for making dispute settlement more efficient accelerated in 2016, when the OECD began implementing BEPS through the inclusive framework (consisting of 137 countries). The average time to settle disputes fell after 2016, from 40 months to less than 7 months.[20] The number of initiated mutual agreement procedures rose 59% from 2016 to 18. This increase was primarily driven by an increase of new cases involving non-tax havens, which accounted for 87% of new procedures (see Online Appendix Figure A5).

We model mutual agreement procedures as an increase in the relative yield from correcting transactions between high-tax countries compared to transactions with the low-tax country, i.e., an increase in $\frac{\gamma_H}{\gamma_L}$.

Proposition A1: *If we interpret an improvement of the mutual agreement procedures as an increase in* $\frac{\gamma_H}{\gamma_L}$ *it follows from proposition 1 that improving mutual agreement procedures will*

[19] See OECD MAP Statistics. Note that the increase in cases is likely larger, as numbers before the establishment of guidelines in 2016 may double count cases (`https://www.oecd.org/tax/dispute/mutual-agreement-procedure-statistics.htm`).

[20] See `https://www.oecd.org/tax/dispute/mutual-agreement-procedure-statistics-2017.htm`. Note that the the average time for cases after 2016 is under-estimated due to some cases being still ongoing.

increase the amount of profits shifted to the low-tax country—insofar as the tax authority is sufficiently capacity constrained ($\bar{n} < \frac{1}{2}$).

By increasing the yield of correcting transactions with high-tax countries, mutual agreement procedures increase the opportunity cost of correcting transactions with low-tax countries. The shift of resources by the tax authority allows the tax-planning firm to shift more income to tax havens. This implies that strengthening mutual agreement procedures may increase the scope for intentional profit shifting. We note, however, that mutual agreement procedures can raise welfare in ways not modeled here. For instance, they may enhance trade by reducing risks of double taxation.

B Effects of Country-By-Country Minimum Taxation

A number of countries have implemented country-by-country minimum taxation through controlled foreign corporation rules.[21] The OECD has laid out a Global Anti-Profit Shifting proposal that would include minimum country-by-country taxation (OECD 2019b). In such a regime, a subsidiary facing a tax rate t lower than a given minimum rate t_{min} would be taxed at rate $t_{min} - t$ in its home country.

To understand how minimum taxation would affect the incentives of tax authorities, we introduce country-by-country minimum taxation in country H1. To begin with we assume that the the minimum tax rate is above the tax rate in the low-tax country ($t_L < t_{min}$) but below the rate in the high-tax country H2 ($t_H > t_{min}$) and that both multinationals have their parent in country H1. These assumptions are consistent with the current country-by-country minimum tax rules in force and the OECD (2019b) proposal. In this case profits reported by the tax-planning firm will be subject to some taxation in country H1 (taxed at $t_{min} - t_L$) while none of the reported profits in country H2 are subject to taxation in country H1. The expected value for H1 of correcting the transfer price involving the low-tax country falls to $(t_{H1} - t_{min})\gamma_L(p^L - p^a)$, which is a fraction $1 - t_{min}$ of the expected value without minimum taxation. Country-by-country minimum taxation lowers the expected value of correcting the tax planning firm. In turn this allows the tax planning firm to shift more profits to the low-tax country. The new equilibrium level of profit shifting to the low-tax country becomes:

$$p_*^L - p^a = \begin{cases} \frac{\gamma_H}{\gamma_L \cdot (1 - t_{min})}(b - 2b\bar{N}) & \text{if } \bar{N} < \frac{1}{2} \\ \\ 0 & \text{if } \bar{N} \geq \frac{1}{2} \end{cases} \tag{15}$$

Profit shifting to the low-tax country increases by a factor of $1 - t_{min}$ if the tax authority is sufficiently constrained. Of course, this result changes dramatically if the minimum tax rate is set equal to the tax rate in country H1 (i.e., H1 adopts worldwide taxation). With $t_{min} = t_{H1} = t_{H2}$ the tax planning firm has no incentive to shift profit.

[21] A recent example is given by the US GILTI regime: `https://www.irs.gov/newsroom/irs-and-treasury-issue-guidance-related-to-global-intangible-low-taxed-income-gilti`.

Proposition A2: *With country-by-country minimum taxation binding in the low-tax country and non-binding in the high-tax country, profit shifting to the low-tax country rises in equilibrium, insofar as the tax authority is sufficiently capacity constrained ($\bar{n} < 1/2$).*

Importantly, the tax loss due to changes in transfer price enforcement may easily be smaller than the additional direct tax revenue gains from minimum taxation. It also easily may be lower than the tax revenue gains derived from the decrease in the incentive to shift profits caused by the reduction in the tax differential between high-tax and low-tax countries (not modeled in our paper). In the extreme case where $t_{min} = t$, there would be no loss of tax revenue from profit shifting anymore.

Table A1: Annual Revenue of Danish Transfer Price Corrections Using Effective Tax Rates

	[1]	[2]	[3]
Panel a: Tax-motivated profit shifting	**All countries**	Non-tax havens	Tax havens
Amounts (€, Millions)	**2215**	-455	2670
% of tax base	**6%**	-2%	8%
Panel b: Transfer price corrections			
Corrections (# of cases)	**62**	44	18
Corrections (€, Millions)	**1456**	1190	266
Corrections (% of total)	**100%**	82%	18%
Panel c: Estimated tax revenue impact (€, Millions)			
Implied increase in tax revenue in Denmark	**218**	178	40
Implied decrease in tax revenue abroad	**268**	260	8
Net change in global tax bill if fully realized	**-49**	**-81**	**32**

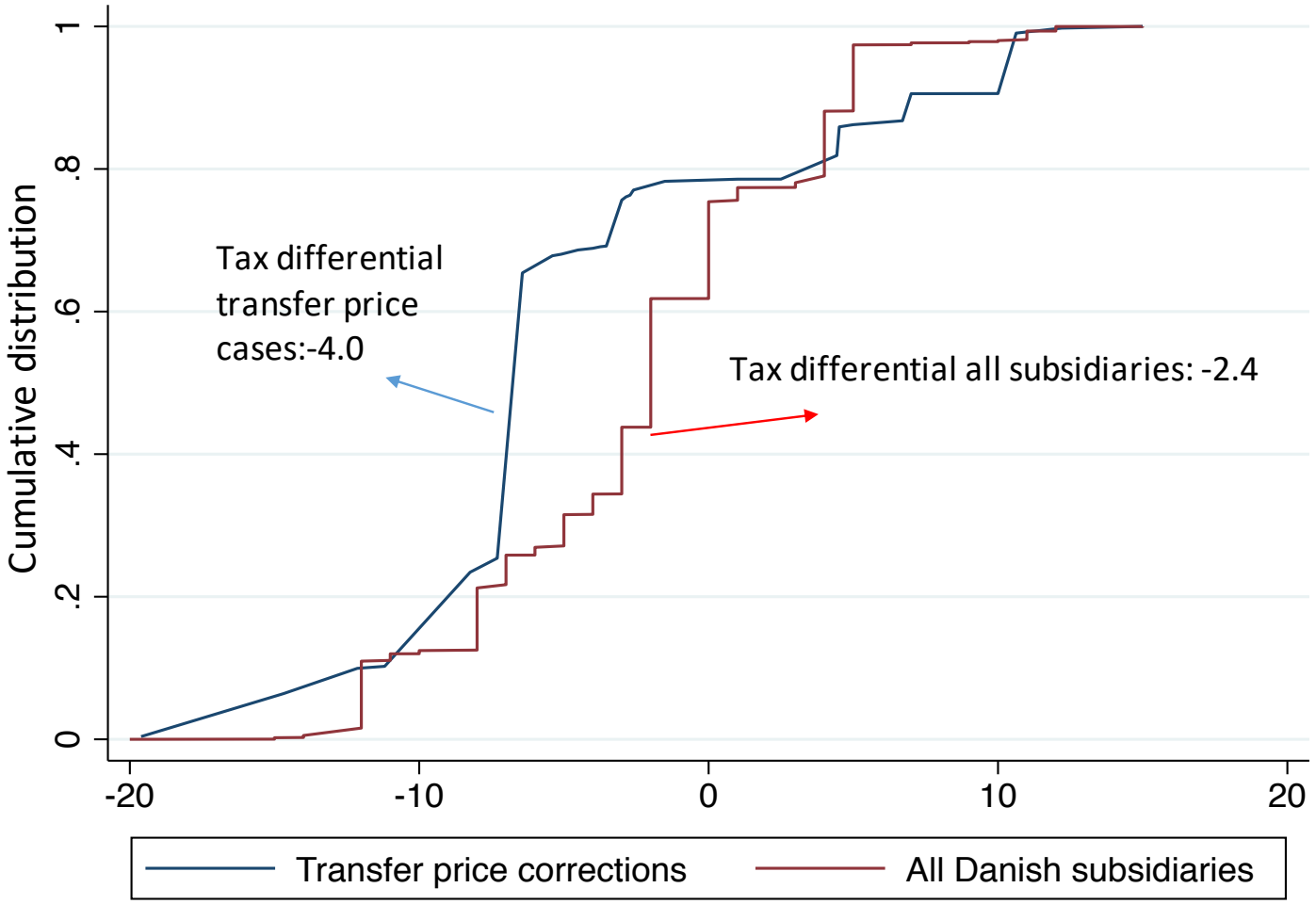
Notes: This table replicates Table 1 using effective tax rates instead of statutory rates for the computations in panel C. Effective tax rates from Tørsløv et al. (2020) are used. See notes to Table 1.

Table A2: Denmark's Transfer Price Corrections: Domestic vs. Foreign Multinationals

	[1]	[2]	[3]
Panel a: Transfer price corrections (HQ in Denmark)	**All countries**	Non-tax havens	Tax havens
Corrections (# of cases)	**20**	6	14
Corrections (€, Millions)	**434**	252	182
Corrections (% of total)	**100%**	58%	42%
Implied increase in tax revenue in Denmark	**95**	55	40
Implied decrease in tax revenue abroad	**75**	68	7
Net change in global tax bill if fully realized	**20**	**-13**	**33**
Panel a: Transfer price corrections (HQ outside Denmark)	**All countries**	Non-tax havens	Tax havens
Corrections (# of cases)	**41**	38	4
Corrections (€, Millions)	**1022**	943	79
Corrections (% of total)	**100%**	92%	8%
Implied increase in tax revenue in Denmark	**225**	207	17
Implied decrease in tax revenue abroad	**259**	256	3
Net change in global tax bill if fully realized	**-34**	**-49**	**14**

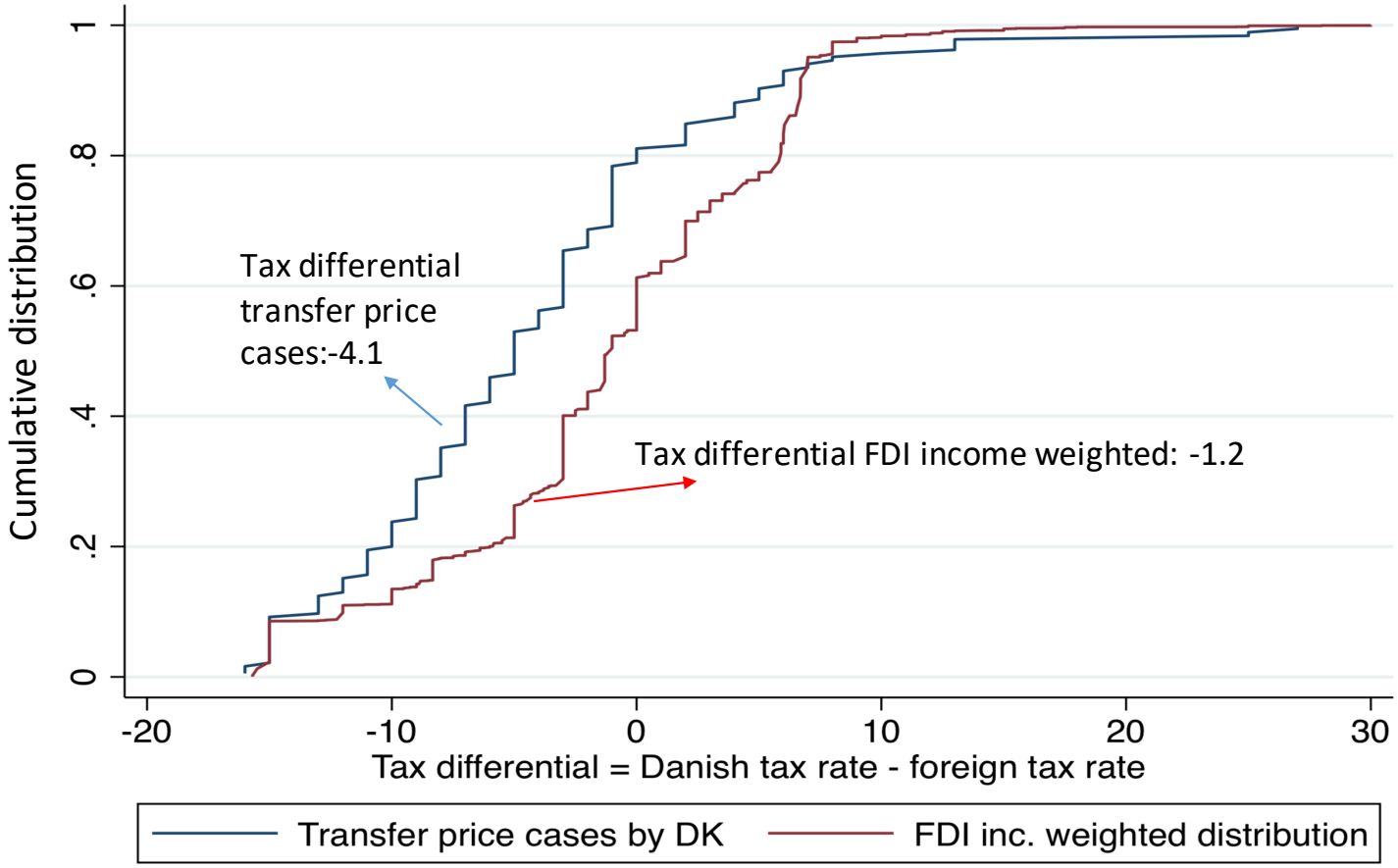
Notes: This table replicates Table 1 but separately reports results for multinationals headquartered in Denmark vs. subsidiaries of non-Danish multinationals. See notes to Table 1.

Figure A1: The Distribution of Tax Differentials, Using Effective Tax Rates



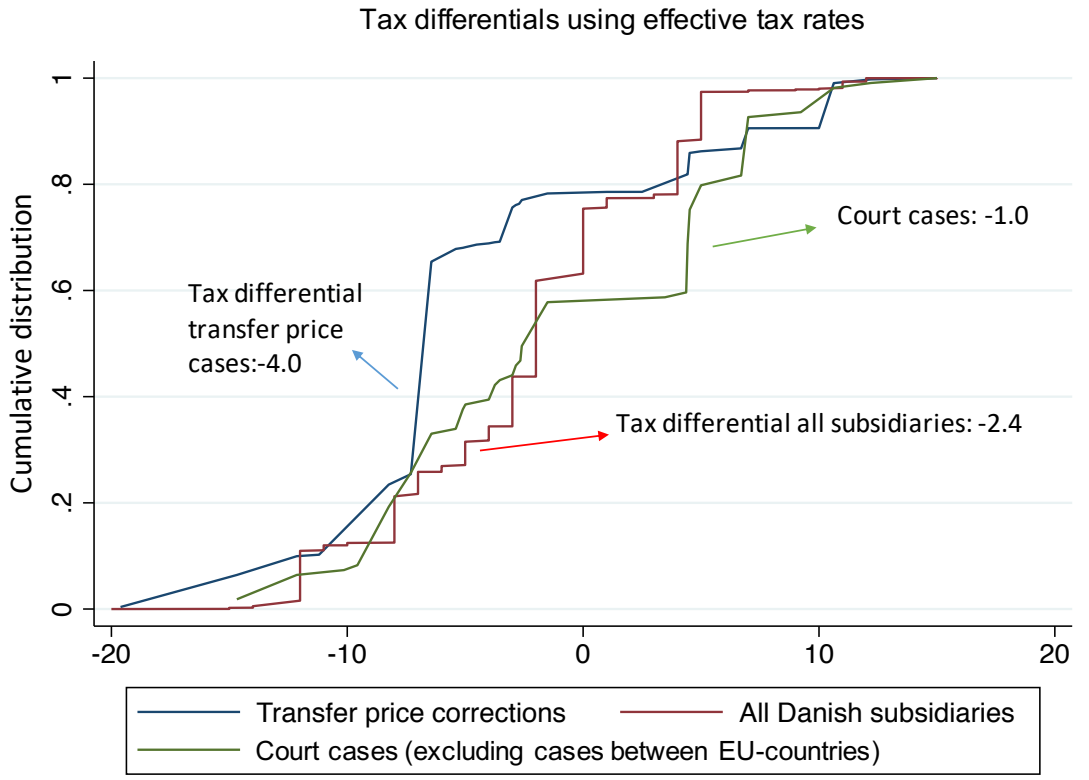
Notes: This figure replicates figure 2 using effective tax rates from Tørsløv et al. (2020) instead of statutory tax rates; see notes to Figure 2.

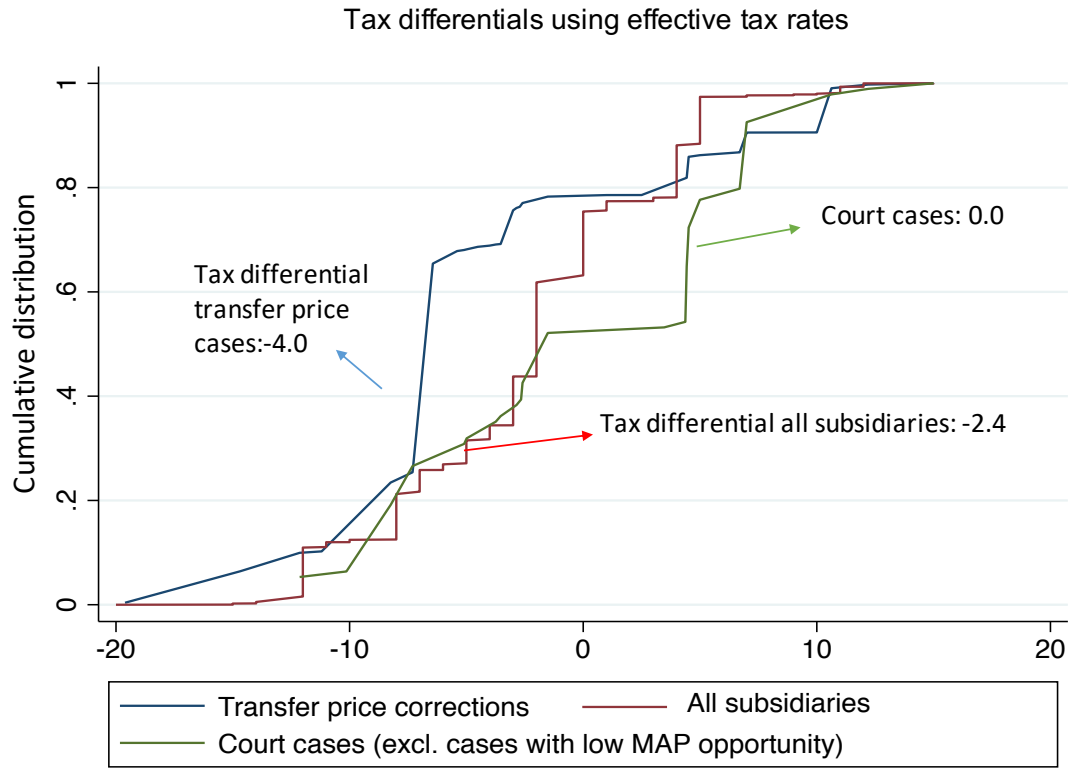
Figure A2: The Distribution of Tax Differentials, Using FDI Income Weights



Notes: This figure shows the cumulative distribution of the tax differentials across all Danish transfer pricing cases and across all Danish vis-a-vis foreign firm linkages. The tax differential is defined as the Danish corporate tax rate less the counterpart country tax rate. Tax rates are from KPMG (2018). The blue line shows the distribution of tax differentials in all transfer price corrections in 2009, 2014 and 2015. The red line shows the tax differential between between Denmark and all foreign countries weighted according to total (inward and outward) foreign direct investment (FDI) income in 2015. Source: Danish Inland Revenue, Tørsløv et al. (2020), KPMG (2018), Eurostat table "bop fdi6 inc" and authors' computations (see text).

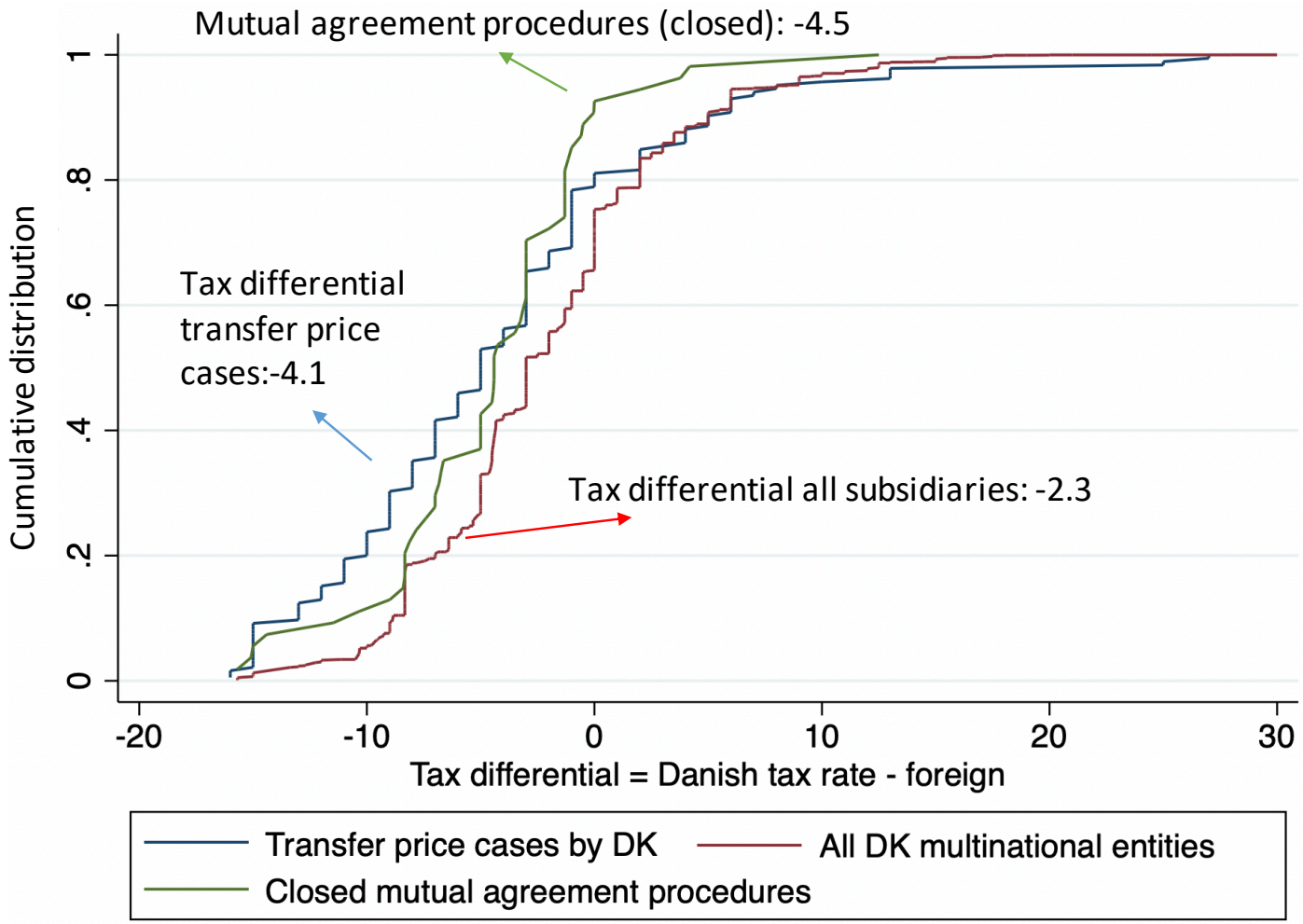
Figure A3: Tax Differentials in Court Cases Using Effective Rates





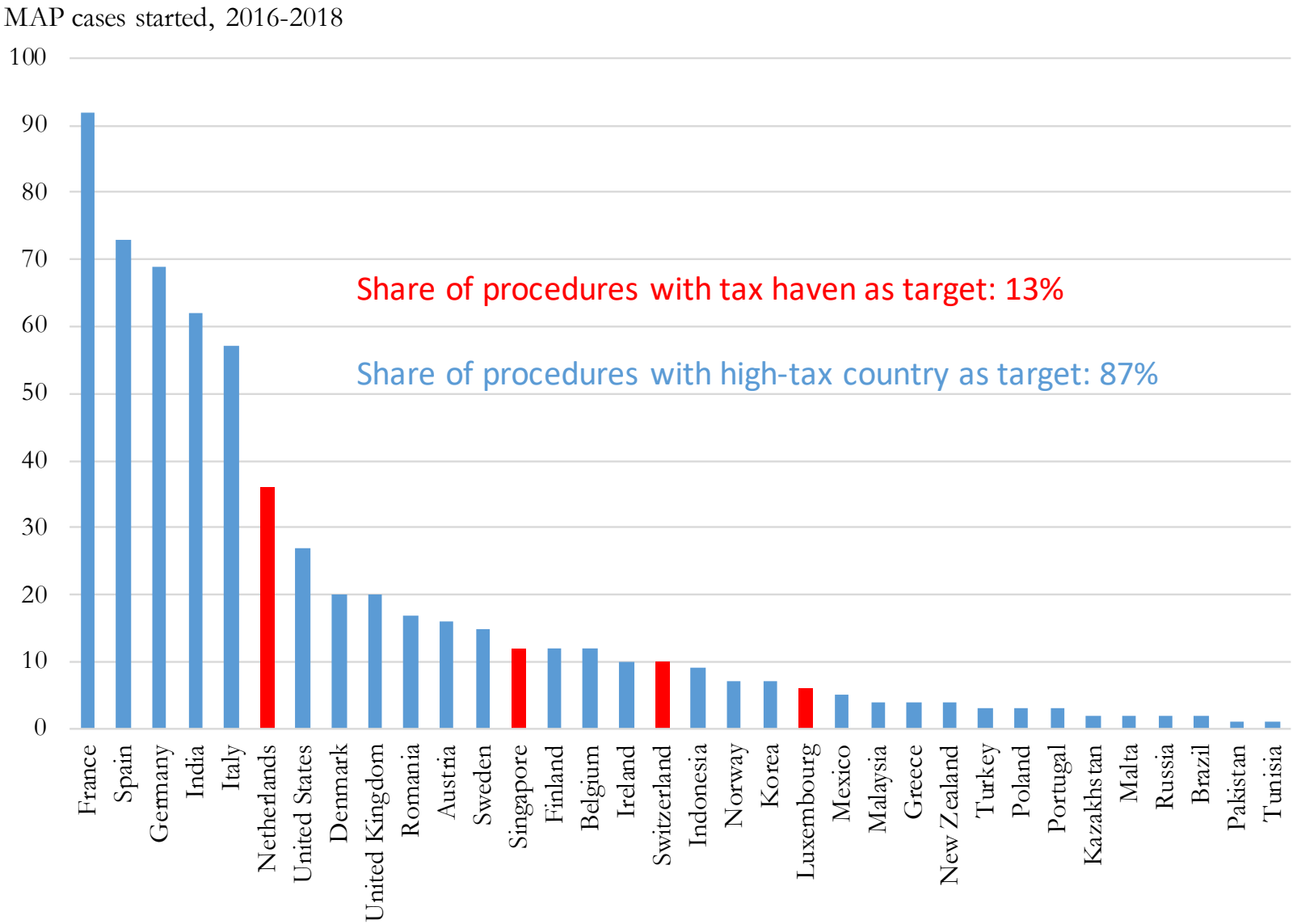
Note: This figure replicates figure 3 using effective tax rates from Tørsløv et al. (2020) instead of statutory tax rates (see notes for Figure 3).

Figure A4: Distribution of Tax Differentials in Completed Mutual Agreement Procedures



Notes: This figure shows the cumulative distribution of the tax rate differential (Danish minus foreign rate) across all mutual agreement procedures completed from 2008 to 2015 (green line). This distribution is contrasted to the distribution of the tax differential in Danish transfer pricing cases (blue line) and the distribution of the tax differential between all Danish multinational entities (subsidiaries and parents) and their foreign related parties (red line). Tax rates are from KPMG (2018). Source: Danish Inland Revenue, Tørsløv et al. (2020), KPMG (2018), and authors' computations (see text).

Figure A5: New Mutual Agreement Procedures Initiated Globally in 2016–2018



Notes: The graph shows the target of mutual agreement procedures following transfer price corrections in the 137 member countries of the OECD inclusive framework. Countries reporting zero mutual agreement procedures are left out of the chart. Tax havens are marked in red using the definition from Tørsløv et al. (2020). Source: OECD MAP statistics