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The Effect of the Closure of the Double Irish Arrangement on the Location of U.S. Multinational Companies' Profits*

Navodhya Samarakoon†

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Abstract.

In 2015, the Irish government announced the closure of the Double Irish; one of the largest tax loopholes used by U.S. multinational companies, giving existing users until 2020 to comply. Using U.S. administrative corporate tax data, I provide novel estimates on profit shifted back to the United States after closure of the Double Irish. I estimate that firms that used the Double Irish redirected $59 billion in royalty payments to the United States in 2020, the first year of full closure. To disentangle the effect of loophole closure from other major international tax reforms, I propensity score match to a comparable control group. Using this comparable control group, a difference-in-differences analysis suggests the average Double Irish user reports $609 million more in royalty payments after full closure. I use a log specification to demonstrate royalty payments shifted, although large, are driven by outliers. Multinational companies in my treated group funneled an estimated $1.2 to $1.4 trillion in profits to low-tax jurisdictions via the Double Irish from 1998 to 2018. The royalty payments redirected to the United States comprise 31 to 38 percent of profit within the Double Irish arrangement in 2018, meaning many Double Irish users continue to hold large amounts of profit abroad. Lastly, my estimates on the size of the arrangement suggest the current literature may underestimate the U.S. tax base shifted abroad.

Keywords: international taxation, profit shifting, corporate taxation, multinational company

JEL Classifications: F23, H25, H26, H32

1 Introduction

Policymakers and academics are increasingly interested in understanding and mitigating the misalignment between where profits are reported and the location of real business activity of multinational companies (MNCs). Estimates of the outsized ratios of profit to real activity in low-tax jurisdictions reflect the movement of paper profits from where sales are generated, in large high-tax markets, to the optimal tax-saving locations. Tørsløv et al. (2022) find that, globally, companies collectively shifted $616 to $646 billion in profits to low-tax jurisdictions in 2015. Increased tax avoidance by large corporations, and the consequent tax base lost, comes at a time when governments play a vital role in securing a strained welfare state and addressing income inequality. In the United States, recent decades are marked by rising economic profits of corporations as a share of GDP and falling corporate tax receipts as a share of GDP, a trend largely attributable to the expanding gap between economic profits and the corporate tax base (Congressional Budget Office, 2023). A corporate tax base easily mobile between jurisdictions exacerbates this trend, posing a major obstacle to raising corporate tax rates and government revenues. The scale of this issue has generated initiatives such as the OECD's Base Erosion and Profit Shifting (BEPS) project and pressure from revenue losers, primarily high-tax, high-income governments, to legislate away common tax planning strategies that funnel profits into low-tax jurisdictions.

Researchers have attempted to measure the mobility of the tax base by taking advantage of variations in corporate tax rates between and within countries to produce a body of literature on profit shifting elasticities. Dharmapala (2014) provides an extensive comparative analysis of many of these studies. More recent works on elasticities include Dowd et al. (2017), Beer et al. (2020), Tørsløv et al. (2022), Garcia-Bernardo and Janský (2022), and Heckemeyer and Overesch (2017). Research on country-level corporate tax elasticities has demonstrated that reported profits are more sensitive to tax rate differentials than real activity measured by tangible assets and employment. These elasticities are heterogenous, varying across industries.

Central to this study, the literature has emphasized that difficulties in establishing arm's length standards when transfer pricing intellectual property (IP) enable MNCs to shift profit generated from the sale of IP to low-tax jurisdictions using complex tax planning arrangements. Despite consensus on the high tax elasticity of profit derived from the exploitation of IP, the literature lacks systematic evidence on the profit shifting behaviors of large IP-intensive firms on two major fronts: First, outside of court cases and investigative journalism, there is little evidence on the magnitude of tax base lost when U.S. MNCs shift profit into these IP tax planning arrangements. Second, we lack understanding of how the closure of major BEPS tools used by IP-intensive MNCs affects their tax planning strategies. The importance of documenting the use of IP tax planning

structures and exploring the effectiveness of policy aimed at curbing profit shifting by IP-intensive companies cannot be understated given the outsized contribution of these firms to the U.S. economy and corporate tax base. The driving question becomes "How successful is a given reform in realigning profit with the location of real business activity?"

The 2020 closure of a popular tax planning arrangement, the Double Irish, serves as an ideal natural experiment to start addressing this question for several reasons. First, given the Double Irish was the largest BEPS tool in use by U.S. companies over the past three decades, closure subjects a large amount of profit to an expected tax rate increase. Additionally, examining the Double Irish focuses the profit shifting discussion on some of the largest U.S. multinational companies that derive a substantial portion of income from the use of IP. Further, given the announcement of closure happened five years ahead of time, I can examine tax planning behavior as a reaction to an expected tax rate increase, from 2015 through 2019, versus a real tax increase upon full closure in 2020. Do MNCs proactively pivot away from a tax arrangement when closure is grandfathered in? Finally, the counterfactual location of profit is likely the United States, which serves as the location of IP research and development as well as the location of IP exploitation. Therefore, a misalignment between royalty payments to the United States after full closure and the profit historically funneled through the Double Irish arrangement would suggest continued profit shifting in the short run.

Before 2015, firms could bypass taxation under Irish and U.S. law on profits generated in high-tax jurisdictions, where consumers resided, by moving this profit to low-tax jurisdictions, such as Bermuda and the Cayman Islands, avoiding taxes altogether. The arrangement essentially took advantage of Irish domestic and treaty law, and the "check-the-box" regulations under U.S. law. The arrangement was primarily utilized by U.S. multinational software and pharmaceutical companies. The details of the Double Irish structure, which allow me to finely identify my treated group within the U.S. administrative tax data, are detailed in Section 2.

In October 2014, Irish Finance Minister Michael Noonan announced the phaseout of the Double Irish as part of the government's 2015 budget. The government modified the Irish tax code such that all companies registered to do business in Ireland must be tax resident in the country. The law went into effect for new entrants on January 1, 2015, and the government gave existing companies based in Ireland and managed in another jurisdiction a five-year window to comply. This means that U.S. companies following the calendar year could no longer utilize the arrangement starting in tax year 2020.

The use of firm-level administrative tax data to study a policy shock announced five years in advance allows me to study the changing tax planning architecture of firms that likely took advantage of the Double Irish arrangement. Additionally, the administrative tax data is well-suited for studying profit shifting for several reasons: the data does not

suffer from jurisdiction coverage issues found in public accounting data such as Orbis and Cap IQ[1]; the accounting standards reflect where profit is taxed, not earned (see Appendix A); and the administrative data carries tax implications.

I utilize a difference-in-differences design to study the amount of gross royalties that return to the United States pre- versus post-closure. My study design enables me to provide a strong counterfactual to MNCs exposed to closure by observing the behavior of large multinational companies with no Double Irish structures in 2014, the year before closure to new entrants. To finely identify my treated group, I use the SOI Form 8858 sample, which contains disregarded entities (DE) of U.S. domestic corporations, and the SOI Form 5471 sample, which contains CFCs owned by U.S. domestic corporations. The presence of an Irish DE and Irish CFC is essential to the tax planning structure as detailed in Section 2. The SOI Form 1120 sample contains information on the domestic activities of U.S. MNCs and provides the dependent variable, gross royalties. I define a treated group of 134 observations comprised of MNCs that likely took advantage of the Double Irish arrangement and a control group of 268 MNCs that did not have the tax planning structure in tax year 2014. I use nearest neighbor propensity score matching to find control MNCs that most closely resemble my treated group on a range of variables, proxying for size, measured by tangible assets and revenue, and propensity to profit shift, measured by the number of low-tax jurisdictions in which the MNC has a presence.

My findings follow in three parts and include several novel elements: I start by identifying the Double Irish structure, providing the first methodology to discern the complex tax planning arrangement in administrative tax data. I use a combination of SOI datasets containing detailed tax information for the DEs and CFCs of large U.S. corporations to identify 134 MNCs in tax year 2014 that likely used the arrangement.

The use of affiliate-level data allows me to identify income flows within the Double Irish structure. Thus, the identification strategy enables me to estimate the amount of profit accumulated within the arrangement between 1998 and 2018 by likely Double Irish users identified in 2014. My treated group alone accumulated $1.2 to $1.4 trillion dollars within the arrangement between 1998 and 2018. The structure is, functionally, made up of profit that would otherwise be booked in the United States. Consequently, my year-by-year estimates provide an extreme lower bound on U.S. tax base lost. In comparison to the existing literature, my findings suggest some methodologies underestimate U.S. tax base lost, although a comprehensive profit shifting analysis using administrative data is an avenue of future research.

Lastly, I provide the first estimate on the short-run royalty payments redirected to

[1]Orbis contains better coverage at the consolidated level for key financial variables such as profit-before-tax and revenues. Accurate and complete documentation at the subsidiary level varies by headquarter jurisdiction and location of the affiliate. See Cobham and Loretz (2014) and Bajgar et al. (2020) for a discussion on Orbis coverage issues.

the United States after partial and full closure of the Double Irish arrangement. To do so, I successfully disentangle the effects of Double Irish closure from the phase-in of the Tax Cuts and Jobs Act of 2017 (TCJA) and other confounding events by observing the treated group in relation to a propensity score matched control group. I find that existing users, on average, do not redirect the flow of royalty payments to the United States ahead of full closure, waiting until the end of the five-year window. The average royalty payments reported after full closure is statistically significant. On aggregate, the treated group redirects roughly $59 billion in royalty payments to the United States in tax year 2020. However, roughly 62 to 69 percent of 2018 Double Irish profit levels remain abroad, providing evidence that multinationals continue to hold large amounts of profit derived from U.S.-developed intangibles outside the United States. Currently, it is unclear if this is a short-run effect, signaling sticky cost-sharing arrangements. However, considerations within Irish law suggest Ireland itself is an optimal tax-saving location irrespective of its role as a conduit of profit to low-tax jurisdictions.

The rest of the paper is laid out as follows: Section 2 provides an overview of the Double Irish arrangement and details how changes in U.S. international tax law during my study period affect incentives faced by MNCs in my sample. Section 3 delves into the literature on profit shifting. Section 4 describes the three data sources briefly mentioned above, section 5 details the research design, section 6 presents and discusses results, and section 7 concludes.

2 An Overview of the Double Irish Loophole

2.1 The Irish tax regime

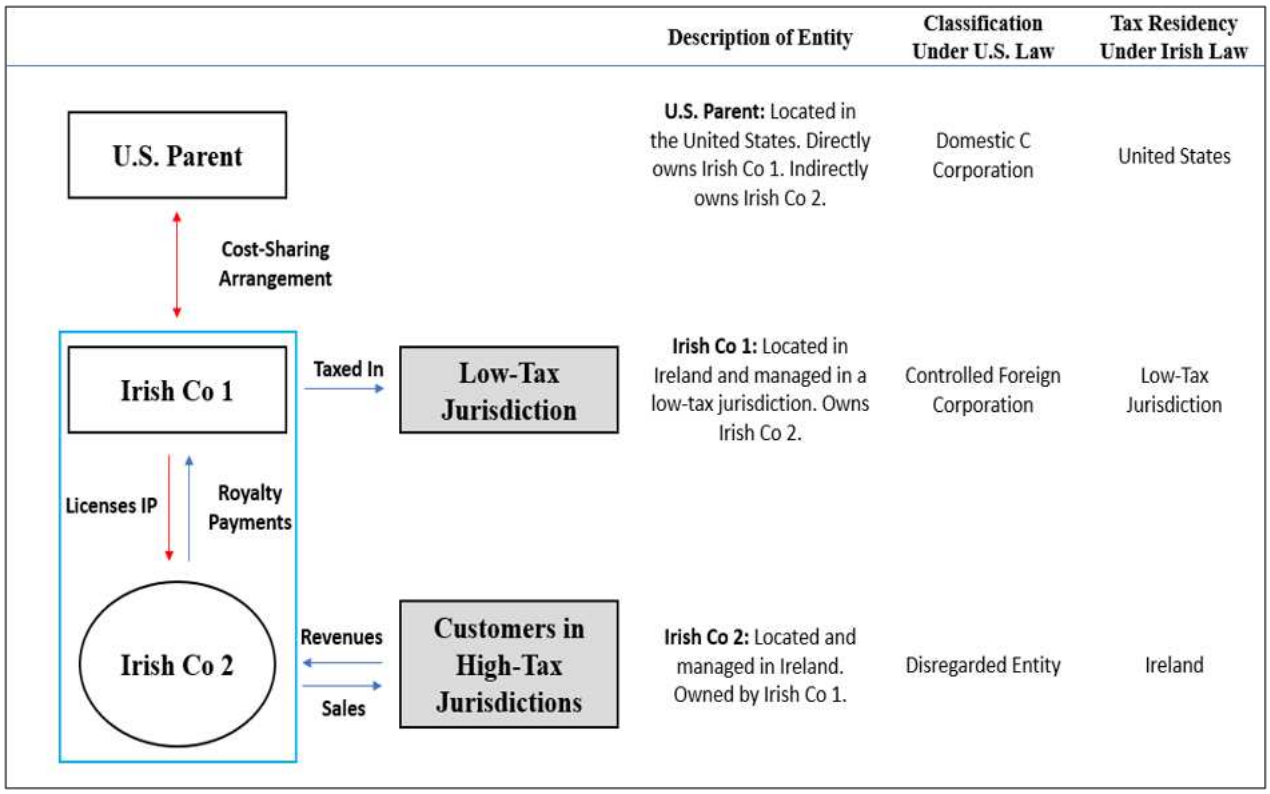
The Irish tax regime contains two categories of taxable corporate income taxed at a flat rate: trading income, which is income earned from trading and selling products, is taxed at 12.5 percent, and non-trading, or passive income, which includes income from investments and properties, is taxed at 25 percent. Before 2015, Irish law notably contained some of the most business-friendly residency requirements. A foreign corporation in Ireland could elect non-residency for tax purposes if it was "managed and controlled" in another jurisdiction, a status conditional on passing the management and control test.[2] This test consists of largely qualitative questions to determine which location meets the standard of demonstrating general control of the business activities and investment decisions of its Irish affiliate. Although the location of control and management can be a subsidiary incorporated outside of Ireland, the rules do not necessitate this. Therefore, the Irish subsidiary can take on a hybrid structure whereby it is located in Ireland and taxed

[2]See page 7 of the Office of the Revenue Commissioner's Tax and Data Manual for details on pre-2015 standards for determining the location of management and control:

in another jurisdiction. Non-resident companies are only subject to Irish corporate tax and withholding tax on trading profits of their Irish affiliates. In most other European countries, a transfer of income to a low-tax jurisdiction would be subject to withholding tax. However, unlike low-tax locations such as Bermuda and the Cayman Islands, Ireland's extensive network of bilateral treaties permits corporations located in treaty jurisdictions to transfer royalty payments generated from the sale of IP to Irish related parties without incurring withholding tax in the payer jurisdiction. The amalgamation of low tax rates on trading income and a favorable regulatory environment makes Ireland an attractive European hub for investment.

2.2 The Double Irish structure

Diagram 1: The Double Irish structure



Note: Circles denote disregarded entity status. Rectangles denote controlled foreign corporations. Arrows represent flows of income, in blue, or licensing rights, in red, between entities. Created using MS Office Powerpoint application.

The management test and a network of bilateral treaties are central to Ireland's role as a conduit of royalty payments from high- to low-tax jurisdictions. The simplified Double Irish structure is presented in Diagram 1 and consists of the U.S. parent company, two Irish entities, and another entity in a low-tax jurisdiction.[3] All four entities are, for U.S. tax purposes, part of the same MNC. The U.S. parent company represents the consolidated domestic operations of the MNC. Within the first tier of ownership, the U.S. parent company owns Irish Co 1.[4] Irish Co 1 is a CFC located in Ireland and managed in a low-tax jurisdiction. Under Ireland's residency rules, Irish Co 1 is tax resident in its country of management and control, meaning any taxable income generated by Irish Co 1 is taxed at the rate established in the low-tax jurisdiction. In the second tier of ownership, Irish Co 1 owns Irish Co 2 which is located and managed in Ireland.

For Irish tax purposes, Irish Co 1 and Irish Co 2 are distinct entities. However, for U.S.

[3]See Darby and Lemaster (2007) for a detailed and complete description of the Double Irish.

[4]Ownership is defined as 50 percent or greater stock ownership

tax purposes, the MNC will take advantage of the "check-the-box" (CTB) classification rules which allow a U.S. company to elect if it is treated as a corporation or DE under U.S. law. Thus, Irish Co 2 elects DE status, which means the income of the company flows through to its immediate corporate owner, Irish Co 1. In other words, Irish Co 1 and Irish Co 2 are treated as one unit to avoid generating "foreign base company sales income" which is taxable at the U.S. statutory tax rate. To be characterized as foreign base company sales income, a transaction must meet two criteria: (1) The income is recognized by a CFC from the sale of personal property (such as software) purchased or sold from or on behalf of a related party. (2) The personal property is in turn produced and sold for consumption outside the country in which the CFC is organized. Thus, in the absence of DE status, transactions between Irish Co 1 and Irish Co 2 would be taxed at the U.S. corporate tax rate.

Using the setup in Diagram 1, an MNC will initiate a chain of royalty payments to avoid U.S. and Irish taxation. The first step in the arrangement serves to circumvent U.S. taxation. Under U.S. law, both pre- and post-TCJA, a transfer of IP from a U.S. domestic corporation to a related or unrelated foreign corporation triggers U.S. taxation on the income generated from the productive use of the property by the foreign corporation. A portion of the income generated by the foreign corporation from the sale of, for example, software licenses would flow through to the taxable income of the U.S. transferor. However, the MNC can avoid U.S. taxation by entering into a cost-sharing arrangement (CSA) that takes advantage of the difficulty in enforcing the arms-length standards in transfer pricing law related to IP transactions. By doing so, the MNC changes the characteristic of the transaction from a transfer of property to a co-development between the U.S. company and foreign company. The U.S. company retains the rights to the developed IP and the foreign corporation buys into the right to use the property to sell products overseas. Under U.S. law, the foreign corporation will have developed the IP outside of the United States, and any income generated from sales by the foreign corporation will not be subject to U.S. tax pre-TCJA unless it is repatriated to the United States. After the enactment of the TCJA in 2018, MNCs are subject to a 10.5 percent U.S. tax rate on their global intangible low-taxed income (GILTI) through 2025 and a 100 percent deduction on repatriated income.

Returning to Diagram 1, Irish Co 1, the foreign corporation, enters into a CSA to buy the rights to co-develop and exploit IP outside the United States. Then, Irish Co 1 will license the IP to Irish Co 2 who will sell the products in high-tax jurisdictions within Europe and the Middle East.[5] The payments sent from affiliates in high-tax jurisdictions to Irish Co 1 are excluded from withholding tax under bilateral treaties, so the MNC

[5]It is theoretically possible for Irish Co 2 to conduct additional sales in the United States, although complexities arise related to avoidance of U.S. tax. See Practical US/International Tax Strategies article Double Irish More than Doubles the Tax Savings, footnote 46.

minimizes taxes in the high-tax jurisdiction where the income is generated. When Irish Co 1 licenses to Irish Co 2, there is no U.S. tax triggered since the transaction is not recognized as between two separate entities. Next, as mentioned, any transactions to Irish Co 1 will be taxed at the rate set in the low-tax jurisdiction where the entity is managed. Thus, Irish Co 2 will optimally set royalty payments to Irish Co 1, and those payments will, for Irish tax purposes, be taxed at the rate of the affiliate in the low-tax jurisdiction. As before, the transaction from Irish Co 2 to Irish Co 1 does not generate U.S. tax.

The exponential growth of the Double Irish structure is depicted in Figure 1 and Figure 2. The time series in Figure 1 graphs the creation dates of DEs in Ireland. The promulgation of CTB regulations in 1997 was immediately accompanied by a large increase in the Irish DE population. Before 1997, the panel captures the creation of 159 DEs. During tax year 1997, the number of Irish DEs increased over ten-fold to 1,991. The effect of CTB on MNC tax planning strategies is nearly instantaneous and dramatic. Figure 2 mirrors this narrative by showing that every tax owner (Irish Co 1) within my treated group was created after the advent of CTB regulations.

In 2015, the Irish government modified the residency rules to require any new company located in Ireland to be tax resident in Ireland. Therefore, income within Irish Co 1 on or after 2015 could no longer be taxed within a low-tax jurisdiction. From 2015 through 2019, companies established pre-2015 located in Ireland and tax resident in a separate jurisdiction could continue to operate under the rules set forth by the management test. However, in addition to barring new entrants, the new residency rules, by design, prevented MNCs from creating additional Double Irish structures. On and after 2020, all Irish affiliates had to be tax resident in Ireland.

Next, I turn to a discussion of the U.S. tax regime, important changes within my period of study, and the implications of these policies on incentives to shift profit into the United States.

2.3 The U.S. tax regime

The U.S. tax system experienced a significant restructuring with the passage of the TCJA over my study period. Before the TCJA, the United States operated under a quasi-worldwide tax system. Unlike under a pure worldwide system, which would tax foreign income once earned, the U.S. government taxed foreign earnings only upon repatriation to the United States. Between 2009 and 2017, repatriated income was subject to a 35 percent statutory tax rate. There was a strong incentive for companies to accumulate earnings and profits in lower tax jurisdictions and keep business activity abroad. After the passage of the TCJA, the United States moved towards, but not completely in the direction of, a territorial tax system. Below, I describe three major international tax

provisions introduced relevant to this study and their interfering effects on my dependent variable of interest, gross royalty payments reported in the United States.

Lowering the U.S. corporate tax rate

The TCJA lowered the U.S. statutory corporate tax rate from 35 to 21 percent. Holding all else constant, this would increase the incentive to shift profit back to the United States. However, the magnitude of profit shifted, in practice, hinges on a smaller tax rate differential since various credits reduce tax liability. For example, research and development credits provide large tax savings for IP-intensive firms.

The Global Intangible Low Tax Income regime

The Global Intangible Low Tax Income regime (GILTI) moved the United States into a hybrid international tax system, introducing components of both a worldwide and territorial tax system (Joint Committee on Taxation, 2019). GILTI serves as a form of minimum taxation on income derived from the use of intangible assets by U.S. headquartered affiliates. Thus, unlike a pure territorial system, the U.S. taxes the income to ensure a minimum tax is paid instead of relying on foreign jurisdictions to do so. However, unlike a worldwide system, U.S. domestic corporations do not incorporate foreign income into the U.S. tax base. Foreign tax credits (FTCs) partially offset GILTI liability. There is a 50 percent deduction from net tested income, generally making the statutory tax rate on GILTI 10.5 percent (21%*(1-50%)) through 2025. There is a carveout of 10 percent of tangible assets from taxable income, which is meant to approximate the fair market return.

The United States allows companies to use FTCs to offset some or all U.S. tax liability, making zero U.S. tax liability the lower bound. Additionally, FTCs are limited to 80 percent of foreign tax liability, so the credit can cover a company's entire GILTI tax liability in a foreign jurisdiction if the jurisdiction's statutory tax rate is up to 13.125 percent (10.5%/80%), assuming zero expense allocation. The addition of expense allocation lowers the FTC limitation, resulting in fewer allowable FTCs.

Since the GILTI FTC calculation operates on a blended, or global, basis, credits generated in high-tax jurisdictions can be used to offset tax liability on income earned in low-tax jurisdictions. For example, suppose an MNC earns income in Germany, a high-tax jurisdiction, and, after offsetting U.S. tax liability on German income, ends up in an excess credit position. Those excess credits can be used to offset U.S. tax liability in Bermuda, a zero-tax jurisdiction, even though income generated in Bermuda, a zero-tax jurisdiction, would generate no FTCs.

Holding all else constant, the introduction of GILTI will, relative to pre-TCJA, narrow the U.S. to foreign tax differential and thereby move profit, that would otherwise have

been indefinitely deferred, back to the United States.

One time transition tax and treatment of foreign income thereafter

The TCJA introduced a one-time transition tax on all profits earned by foreign affiliates before 2018. The rates were 15.5 percent for cash and other liquid assets and 8 percent for non-cash assets. As with the GILTI regime, moving forward, firms could offset the transition tax with FTCs. The transition tax inflates the values of net income and taxes paid in the United States for my entire sample, and this distortion is relatively worse for the treated group which consists of MNCs generating higher amounts of foreign income. However, by focusing on gross royalty payments to the United States, this study avoids incorporating the section 965 inclusion and deduction amounts.

CFC income repatriated on and after tax year 2018 is not subject to additional tax in the United States.

Foreign-derived intangible income deduction

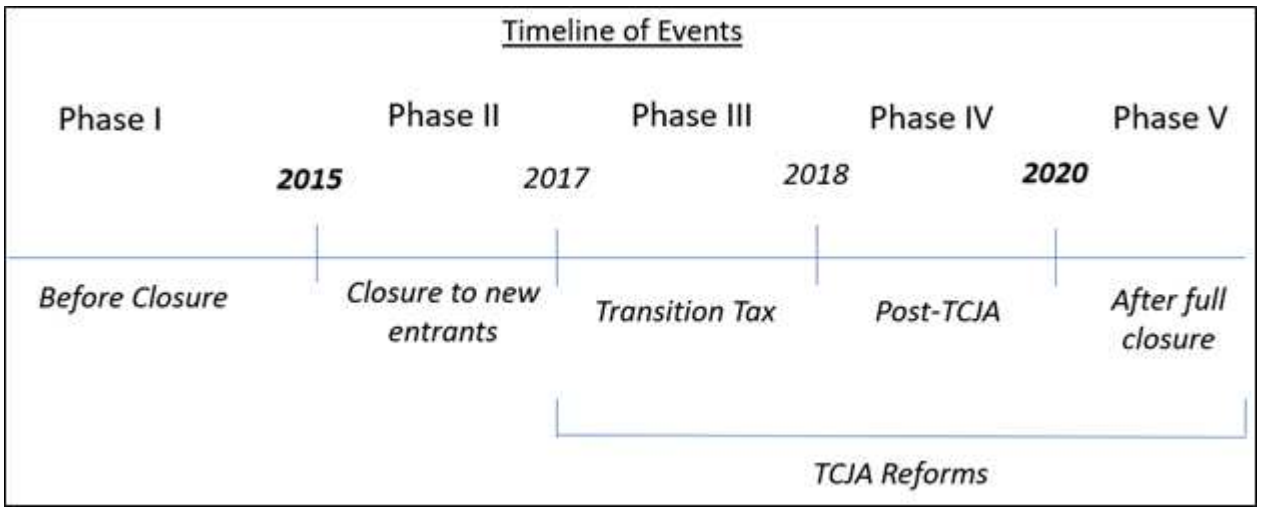
The foreign-derived intangible income deduction (FDII) provides a deduction for income derived from products originating in the United States and sold abroad, reducing the statutory tax rate on this income to 13.125 percent. I theorize that this provision had no significant effect in moving IP within the Double Irish arrangement back to the United States in 2018 and 2019 since MNCs could still achieve an effective tax rate close to zero percent by housing IP in low-tax affiliates. This is true even with the introduction of GILTI due to the blended FTC feature which means MNCs can use an excess credit position in one jurisdiction to offset the GILTI tax liability generated in Ireland. However, after the closure of the Double Irish arrangement in 2020, the FDII preferential tax rate may create strong incentives to shift IP back to the United States.

Profit shifting implications of TCJA reforms for Double Irish arrangement participants

I split the timeline of Double Irish phaseout into five distinct phases, each containing an important event that affects the tax planning calculus faced by an MNC partaking in the arrangement. The timeline is detailed in Diagram 2, and Figure 3 graphs the statutory tax rates over each phase considering two scenarios: if the MNC was (i) subject to tax within the Double Irish arrangement (Irish Co 1 in Diagram 1) and (ii) to shift royalty income to the United States. It is a useful abstraction to consider the strategy faced by an MNC operating in two countries, the U.S. and Ireland, with one affiliate in Ireland.[6]

[6]The tax rate on foreign income is calculated as the combined GILTI and foreign rate. This is the GILTI rate plus 20 percent of the foreign rate, or $10.5 + 0.2 * (t_f)$ where t_f is the statutory tax rate in the foreign jurisdiction. In this example, t_f represents the tax rate the MNC faces in Ireland.

Diagram 2: Timeline of events



Note: The event timeline is divided into five phases. Bolded text represents partial closure in 2015 and full closure in 2020. The diagram complements the depiction of tax rate differentials in Figure 3. Created using MS Office Powerpoint application.

In Phase I, the firm operates under a pre-TCJA tax system before partial closure. Figure 4 illustrates that effective tax rates for likely Double Irish users range from two to five percent, declining over time. The alternative statutory tax rate, should the MNC repatriate profit to the United States, is 35 percent.

In Phase II, Double Irish users rely on the same fact pattern as in Phase I, but the MNC now anticipates facing a higher Irish tax rate in five years. The statutory tax rate in Ireland is 12.5 percent. However, effective tax rates are particularly important to consider in the Irish context; generous benefits in the form of deductions and preferential tax rates result in ETRs far below the statutory rate (Cabral et al., 2021). For example, the introduction of the Knowledge Development Box (KDB) in 2016 lowered the effective rate on income derived from qualifying assets, such as patents and computer programs, to half the statutory tax rate (6.25 percent).

In Phase III, all MNCs pay a transition tax on accumulated foreign earnings and profits at a preferential rate. Since this is an unavoidable tax on foreign earnings indifferent to the location of profit, profit shifting incentives are unaffected.

In Phase IV, three major TCJA reforms work in concert to incentivize shifting profit back to the United States. These reforms significantly narrow the difference between the current tax rate faced by Double Irish users in Ireland versus the counterfactual rate should an MNC move royalty income back to the United States. First, the introduction of the GILTI regime theoretically raises the tax rate on foreign income, although by less than one would think given cross-crediting. Second, the statutory tax rate on foreign sales income drops from 21 to 13.125 percent due to the introduction of FDII. Finally, the corporate tax rate drops from 35 to 21 percent. GILTI, FDII, and the lower corporate

tax rate would incentivize MNCs to shift IP back to the United States. Assuming that MNCs would be subject to the lower FDII rate upon IP repatriation, the tax differential between the counterfactual tax rate should the MNC shift profit to the U.S. and the current tax rate faced by Double Irish users drops from 33 (35% - 2%) to 2.625 percent (13.125% - 10.5%).[7]

In Phase V, it is useful to imagine the "do-nothing" scenario. If a hypothetical treated MNC does not shift profit from Ireland in tax year 2020, this profit is subject to Irish tax as all affiliates in Ireland are tax-resident in Ireland by law. Irish tax varies depending on whether the MNC decides to locate IP in Ireland, subjecting royalty income to a lower tax rate of 6.25 percent under the KDB. Figure 3 depicts the current and counterfactual tax rates for two scenarios, one in which the MNC pays the KDB rate and the second in which the MNC pays the full Irish statutory tax rate of 12.5 percent. Both considerations narrow the tax rate differential relative to before full closure.

Theoretically, the narrowing tax rate differential between Ireland and the United States would redirect a portion of royalty payments within the Double Irish back to the United States. Prior to full closure, Figure 3 demonstrates the introduction of GILTI and a lower U.S. corporate tax rate dramatically lowered the tax rate differential between the United States and Ireland. Disentangling the effects of TCJA from Double Irish reforms is a major contribution of this paper. However, the above exercise, although helpful, ignores two realities in favor of simplification. First, Double Irish users are very large firms that operate in multiple jurisdictions, including several low-tax jurisdictions, so it is possible that MNCs re-orient to take advantage of other tax planning strategies. Second, jurisdictional-specific deductions can lower taxable income, resulting in a narrower tax base. Lastly, these companies face policy uncertainty and incentives brought on by the GILTI regime to keep profit abroad. Therefore, the effects of full closure on tax planning decisions are ambiguous and an empirical question.

3 A Review of the Literature on BEPS Tools and Profit-Shifting

The core concept driving literature on individual and corporate behavior in the presence of tax rate differentials is that changes in the tax rate affect the cost of capital, and, in turn, affect companies' investment decisions. Corporations and individuals will make investment decisions in the present based on the future discounted value of expected post-tax income. Hines and Rice (1994) build on this concept in the context of a corporation's decisions on where to locate profit in the face of varying jurisdictional tax rates.

[7]Any income shifted to the United States derived from foreign operations would not qualify for the FDII rate. Thus, in practice, the tax rate differential post-TCJA is higher.

The authors build from the assumption that a firm prefers the interest rate and tax rate bundle that maximizes after-tax return on a given investment. Therefore, firms primarily concerned about after-tax profit maximization will often optimally locate profits in low-tax jurisdictions, even in cases where the foreign interest rate is lower than the domestic interest rate if they receive higher after-tax returns abroad. The authors also note that, although profit is physically located abroad, companies can re-invest in U.S. capital markets without repatriating profits pre-TCJA. Using after-tax profit maximization as the objective function, the authors derive the following model to predict the amount of after-tax profit in a given location:

$$\log \pi_i = Const + \beta_1 \tau_i + \beta_2 \tau_i^2 + \beta_3 \log GDP_i + e$$

Where, for jurisdiction i, π is after-tax profits, τ is the tax rate, GDP is the gross domestic product, and e is the error term.

The early results in Hines and Rice (1994) suggest what more recent literature have noted as a hierarchy of behavioral responses, whereby the earnings of MNCs in high-income, high-tax jurisdictions are responsive to tax rates, but the location of real economic activity is relatively insensitive to tax rate differentials. Clausing (2016) utilizes survey data from the Bureau of Economic Analysis to present stylized facts on the major jurisdictions where U.S. MNCs book employment and assets versus report gross income in. The author finds Ireland is the second largest jurisdiction in terms of gross income and direct investment earnings in 2012. However, U.S. MNCs concentrate real activity in a largely different set of jurisdictions with higher tax rates.

The large amounts of profit and comparative lack of business activity in low-tax jurisdictions can be explained by the non-linear elasticities estimated by Dowd et al. (2017) – a concept later built-upon using a quadratic functional form by Garcia-Bernardo and Janský (2022). The authors are the first to use Form 5471 data to study the correlation between effective tax rates and reported pre-tax profit. They find that a tax rate change from 30 to 20 percent leads to a 0.7 percent increase in reported income. However, changes in tax rates in the lower half of the ETR distribution generate much larger profit shifting responses. A decrease in tax rates from 5 to 4 percent is estimated to increase reported income in a jurisdiction by 4.7 percent. The heterogeneous profit shifting behavior of MNCs in low- versus high-tax jurisdictions suggests that highly mobile profits constitute a large portion of total profit in low-tax countries.

Specifically, royalty payments derived from the use of IP are sensitive to tax rate changes due to favorable treatment under tax law and regulations. IP-intensive firms book large fractions of total profit in low-tax jurisdictions (Seabrooke & Wigan, 2014; Jones & Temouri, 2016; Grubert & Mutti, 2009) note two key elements of U.S. law that benefit IP: First, tax authorities find it difficult to enforce the arms-length standard on

transfer pricing positions companies take regarding IP transactions. Thus, companies can form CSAs which result in future income streams that disproportionately flow into low-tax jurisdictions, even if the IP is developed in another jurisdiction, as is the case with the Double Irish. The authors observe the location of IP and the formation of CSAs from 1996 to 2002. Much has changed since 2002, with the creation and rise of many major IP-intensive U.S. MNCs since. However, the authors demonstrate a notable rise in IP-based profit shifting in this early period. Compensation for technical and management services, used as a proxy for the formation of CSAs, increased by 108 percent over the 6-year period. Since 2002, Ireland has become a major investment hub for U.S. software and pharmaceutical companies, attracting large amounts of profit through numerous tax benefits. Stewart (2018) studies the resulting effective tax rates in Ireland using public accounting data. The author calculates ETRs in Ireland for 31 U.S. IP-intensive firms with substantial operations in Ireland from 2006 to 2015 and finds that MNCs with large Irish presence pay little foreign tax.

My paper most closely aligns with a short article, Coffey (2021). Coffey observes aggregated outbound royalty payments from Ireland between 2012 and 2020 in the Eurostat data. The author finds constant outbound royalty payments to the Netherlands and other offshore financial centers from Ireland through 2019. There is a large drop in royalty payments to these locations in 2020. In addition to a dip in royalty payments to the Netherlands and offshore financial centers, there is a rise in outbound royalty payments from Ireland to the United States of roughly $44 billion, from $8 billion in 2019 to $52 billion in 2020. I apply rigorous econometric techniques using administrative tax data to build upon and extend the suggestive evidence Coffey (2021) presents. My paper refines these findings in several ways: First, Coffey's findings are generalized to all royalty payments, without narrowing to companies that likely used the Double Irish arrangement. Second, as Coffey notes, attributing the rise in royalty payments to Double Irish closure is complicated by the introduction of the TCJA and changes in OECD IP transfer pricing guidelines. I use a control group to disentangle confounding events. Third, the use of U.S. tax data provides a relevant estimate of the amount of royalty payments reported to U.S. tax authorities. Lastly, this study places my own estimate of the change in royalty payments to the United States within the context of the amount of profit funneled into the Double Irish arrangement.

A careful analysis by Clausing (2020) demonstrates the predicted effects of the TCJA, estimating that the introduction of GILTI will reduce profit in low-tax jurisdictions by 12 to 16 percent. The author estimates that the U.S. tax base will increase by $15-$30 billion each year, underscoring the importance of disentangling incentives brought on by the TCJA legislation from the effects of Double Irish closure. Important to my study as well, Clausing distinguishes between the short-run and steady-state response, noting that current profit shifting arrangements are sticky so we should not expect an immediate

jump in profits reported in the United States. These observations are qualitatively evident in the complexity of the Double Irish, which is difficult to undo, particularly when repositioning cost-sharing arrangements. The same temporal distinctions should apply to the response of MNCs to Double Irish closure, and the amounts presented in this paper should be taken to represent the short-run, not steady-state, response.

4 Description of Data Sources

I use three corporate tax return datasets from the Internal Revenue Service's Statistics of Income (SOI) group to define my treated and control groups, create consolidated values for the purpose of matching, and estimate gross royalty payments redirected to the United States from abroad. I outline each relevant form and the line item below.

Form 1120: U.S. Corporation Income Return

Nearly all U.S. corporations file IRS Form 1120, including traditional corporations and passthrough entities. I use the SOI sample from 2011 through 2020. I pull several variables on Form 1120 to quantify my companies' domestic operations. My dependent variable of interest is gross royalty payments reported by the U.S. domestic corporations of the MNC group on line 7. To estimate the size of domestic operations, I use gross receipts and sales (line 1a), taxable income (line 30), and tangible capital.[8]

Form 5471: Information Return of U.S. Persons with respect to Certain Foreign Corporations

Any U.S. domestic corporation or partnership that had control of a CFC during the foreign corporation's accounting period must file IRS Form 5471. The dataset includes all CFCs that are greater than 50 percent owned by a U.S. domestic corporation in the SOI Form 1120 sample.[9] I use the SOI Form 5471 sample to identify my treated group, observe the movement of royalties, and estimate the magnitude of foreign operations. The country of incorporation information allows me to tally the number of low-tax jurisdictions each MNC operates in. I estimate the size of the MNCs in my sample along three dimensions, using variables found on Schedule C and Schedule M. I calculate net income before unusual items (line 19 of Schedule C) less related party dividends[10], gross receipts and

[8]Tangible capital is the sum of accumulated depreciation on line 10b, accumulated depletion on line 11b, and land on line 12.

[9]Per Regulation sections 1.6038-2(b) and (c), control entails (i) more than 50% of the total combined voting power of all classes of stock of the foreign corporation entitled to vote, or (ii) more than 50% of the total value of shares of all classes of stock of the foreign corporation.

[10]Per Blouin and Robinson (2022), I take out related party dividends received from Schedule M (lines 10b to 10f).

sales (line 1a of Schedule C), and tangible capital.[11]

Form 8858: Information Return of U.S. Persons with Respect to Foreign Disregarded Entities (FDE) and Foreign Branches (FB)

Any U.S. corporation that directly or indirectly is a tax owner of an FDE must file IRS Form 8858. SOI conducts this study every four years, and the latest datasets are for tax years 2012 and 2016. The FDE Information Returns Study includes all Form 5471 filings attached to U.S. parent corporation income tax returns in the SOI corporate sample. I use the information on the country of incorporation and tax owner to construct my treated group by identifying MNCs that indirectly own one or more DEs in Ireland through a tax owner incorporated in Ireland. A tax owner of a DE is the CFC that is treated as owning the assets and liabilities of the DE for purposes of U.S. income tax law.

5 Study Design

In this section, I turn to describe my methodology, starting with how I identify my treated group using the datasets described in section 4. Then, I lay out my first-stage propensity score matching equation used to identify a comparable control group and my difference-in-differences design. Finally, I introduce a strategy to estimate the size of the Double Irish arrangement based on logical deductions derived from the structure presented in Diagram 1.

5.1 Details on constructing the treated and control groups

I construct my treated group in 2014, the last tax year before closure to new entrants, because any new MNCs meeting my identification criteria after 2014 could not take advantage of the Double Irish. Below, I highlight two key details of the Double Irish structure that determine my choice of likely treated MNCs.

Criterion 1 (C1) is that there exists a DE incorporated in Ireland. I am limited to using 2012 and 2016 DE data, which creates a snapshot of the DE population within a radius of tax year 2014. I cannot directly observe the sample in my year of interest. Consequently, I take a piecewise approach. First, I use the Form 8858 SOI file to identify DEs incorporated in Ireland in tax year 2012. Next, I add in MNCs with Irish DEs in the 2016 file with creation dates in 2012, 2013, or 2014.[12] I intentionally exclude MNC

[11] Tangible capital is the sum of building and other depreciable assets less depreciation (line 8b), depletable assets less depletion (line 9b), and land net of amortization (line 10).

[12] A small percentage (roughly 1%) of dates are erroneously inputted. I correct these errors in two steps: If the DE files in a previous year and inputs a year no larger than 2016, I take the earliest of these plausible years. If all filings for a given DE contain date errors, I assume the creation date is the earliest year in which I observe the DE filing. These assumptions do not affect the composition of my treated

groups that set up their first Irish DE on or after 2015, since these companies could not have benefited from the old residency rules. I assume these DEs are present through tax year 2014 even if they are not present in the 2016 data since it is possible a subset of MNCs reacted to partial closure by shutting down operations in Ireland. Thereby, I avoid biasing my results by excluding DEs based on their non-existence in the 2016 data.

Criterion 2 (C2) is that the DE is tax owned by an Irish CFC. To identify this linkage, I merge the DEs in the Form 8858 SOI sample by tax owner to their CFCs in the Form 5471 SOI sample. By linking based on the DEs' tax owners, I account for complex chains of ownership whereby, for example, there exists an intermediary DE between the Irish DE and the Irish tax owner. I also exclude any 2012 and 2016 DEs that do not link to a tax owner in the 2014 Form 5471 data.

The primary concern is that selection into the Double Irish arrangement is most certainly not random, and, evidently, the treated group contains larger, more profitable MNCs that may respond differently to tax rate changes than my sample at large. Table 1 demonstrates the average of several key consolidated variables with progressive criterion-based restrictions. The treated group has, on average, roughly 8 times the consolidated revenue, 16 times the consolidated profit, 7 times the consolidated tangible assets, and 4 times the low-tax jurisdiction presence of the whole Corporate SOI sample. Simply taking the complement of the set of treated observations as my control group will place downward pressure on average gross royalties, and I may overestimate the average treatment effect. Thus, my control group, as is, contains many incomparable MNCs.

Further, a large window of my post-event period takes place after the passage of the TCJA. Since my treated group has more profit abroad, there are two primary concerns regarding the legislation: the introduction of FDII and GILTI, as laid out in detail in Section 2, theoretically creates an incentive to shift profit back to the United States. If my treated group has more foreign income, a greater magnitude of royalties could shift back in 2018 onwards relative to my control group. Thus, I may falsely attribute repatriation from the introduction of the TCJA reforms to MNCs shifting royalty payments back to the United States ahead of full closure. In addition to concerns over confounding legislative reforms, the best comparison group would consist of similarly sized firms that are prone to profit shifting such that any differences between the two groups would be attributed to the Double Irish structure itself.

I address these concerns by restricting the control group. I propensity score match two untreated MNCs to each treated MNC on log consolidated revenue, log tangible capital, log foreign net income, and the number of low-tax affiliates.

group.

5.2 Propensity score matching (PSM) and difference-in-differences equations

As evident in Table 1, treated companies have more tangible assets, revenues, low-tax presence, and net income than the whole 2014 Corporate Study sample, suggesting there are meaningful differences in the propensity of untreated companies to profit-shift. Although a difference-in-differences design allows for large yet parallel differences in the two groups over time, it is difficult to control for the known and unknown events in my post-period, 2015-2020, that may differentially affect MNCs of disparate sizes and shifting behaviors. An obvious confounding event is the TCJA. An additional major confounding event is the introduction of updated OECD transfer pricing guidelines in 2017. The updated rules state that payments made to affiliates that own the rights to an intangible asset must be in proportion to the functions performed, assets used, and risks assumed by said affiliate as well as the contributions made by other members of the MNC group (OECD, 2017). An affiliate should not receive payments derived from the exploitation of IP for the sole purpose of owning the asset if it does not perform any of the relevant functions. These transfer pricing guidelines would theoretically affect MNCs with higher propensities to profit shift. To approximate profit shifting tendencies, I incorporate into my model a variable for the number of low-tax jurisdictions in which an MNC operates.

I match the propensity score of each treated MNC to the two nearest propensity scores in the untreated sample without replacement. In other words, I carry out a one-to-two nearest neighbor match without replacement. Several studies have noted that propensity score matching is preferable to including the covariates in an OLS regression for two reasons: first, the nonparametric characteristic allows greater flexibility in the covariates I include in the model. Second, the observed differences between the two groups in an OLS design are confounded by differences in treatment (Amoah et al., 2020; Bilicka, 2019; Rosenbaum & Rubin, 1983). For example, if the treated and control group have very different distributions of revenue, and this difference correlates with domestic gross royalties reported, it is difficult to disentangle the effects of differential revenue distributions from the outcome of interest, which is the interaction of being treated and the post-reform period. Propensity score matching better adjusts for similar distribution of covariates as it does not rely on an underlying functional form. The logit model, laid out in Eqn. (1), outputs the probability of being assigned to the treated group conditional on a set of covariates in 2014, the last year in the pre-reform period. There are two main assumptions when carrying out a matching technique as the first stage to a difference-in-differences model: first, this technique assumes that unobservable characteristics between my two groups do not affect the probability of treatment. Second, I am matching to pick out extreme observations within the control group, which assumes that the means of my covariates do not trend towards the mean of the unmatched sample over time. Simply put,

my choice of control MNCs cannot be, on average, one-hit-wonders in 2014. I cannot test my first assumption directly, although I ensure that my results are robust to alternate specifications of Eqn. (1). I test for the second assumption of stable means by graphing the covariates of the matched control and treated group over time.

My first-stage equation is specified as such:

$$Y_i = \beta_1 rev_i + \beta_2 tancap_i + \beta_3 lwtx_i + \beta_4 frgnprft_i + \epsilon_i \tag{1}$$

In Eqn. (1), Y is an indicator that takes the value of 1 if a multinational group is likely treated by the closure of the Double Irish arrangement in 2014 and 0 otherwise. The covariates rev, $tancap$, $lwtx$, and $frgnprft$ represent consolidated revenue, consolidated total tangible capital, the number of low-tax jurisdictions in which an MNC exhibits presence, and foreign unrelated profit respectively. I designate jurisdictions as low-tax using the list Tørsløv et al. (2022) identifies.[13] All variables vary across multinational groups (i). Using Eqn. (1), I estimate the propensity score, $\hat{Y}$, for each control and treated observation present in the 2014 SOI sample. Each treated observation is then matched to the two control observations with the closest propensity score without replacement. Thus, my treated and control group in 2014 contain 134 and 268 observations respectively.

Next, using the matched control and treated groups, I estimate the average treatment effect of partial and full closure using a difference-in-differences design specified by the following Ordinary Least Squares model:

$$Y_i = \beta_1 treated_{it} + \beta_2 post_{it} + \beta_3 (treated_i \times post_t) + \beta_4 dtancap_{it} + \epsilon_{it} \tag{2}$$

In Eqn. 2, the dependent variable, Y, is the gross royalties in the United States as reported on Form 1120 which capture the total gross royalty amounts reported by domestic corporations of the MNC. The covariates *treated* and *post* indicate the treated group and post-reform period respectively. I consider two specifications for the post-reform period. Regression 1 specifies tax years 2015 through 2020, or after partial closure, as post-reform. Regression 2 specifies tax year 2020, or after full closure, as post-reform. I include domestic tangible capital, *dtancap*, in my regression to control for growth in real activity within the United States.

5.3 Measuring profit within the Double Irish arrangement

I produce my estimate of the amount of profit funneled through the Double Irish arrangement by aggregating the net income before tax reported on Form 5471 Schedule C of the

[13] Antigua & Barbuda, Bahamas, Barbados, Belgium, Belize, Bermuda, British Virgin Islands, Cayman Islands, Cooks Island, Cyprus, Gibraltar, Grenada, Hong Kong, Isle of Man, Luxembourg, Puerto Rico, Malta, Netherlands, Panama, Singapore, St. Kitts, St. Vincent, Switzerland, and Turks & Caicos

Irish tax owner (Irish Co 1 in Diagram 1), hereafter referred to as "the tax owner." In specifying the upper bound estimate, I exclude related party dividends received by the tax owner from other foreign CFCs or partnerships, following a correction suggested by Blouin and Robinson (2022) to avoid misallocating previously taxed income. However, Schedule M of Form 5471 contains high misreporting rates and ambiguous instructions likely contribute to this. With regards to related party dividends, companies may include previously taxed income earned in earlier tax years, inflating the actual flow of related CFC income in a given year. I provide a range to account for this uncertainty. Additionally, I approximate the value of Double Irish profits in odd years given that the Form 5471 SOI study is produced for even tax years only. To do so, I use the midpoint of the two closest even years. For example, the Double Irish estimate in tax year 2015 is the midpoint of the change in profit between tax years 2014 and 2016.

To substantiate my approach, I check that the effective tax rate on income reported by the tax owner is very low-taxed. Figure 4 shows the effective tax rates on the net income reported by Double Irish tax owners hovers between 2 and 5 percent between 2008 and 2018, which is well below the Irish statutory tax rate of 12 percent. This fact both validates my identification strategy and demonstrates that income associated with the arrangement is reported within the tax owner's income statement for accounting purposes.

Interestingly, Double Irish users report income in the form of revenues, not gross royalty payments received, as one would expect. From an accounting perspective, I conclude that the royalty payments from high-tax European and Middle Eastern jurisdictions to the tax owner are characterized as revenues.[14] This phenomenon helps explain the enigma policymakers face regarding the misalignment of revenue from real activity in the data. This has garnered more attention under the OECD BEPS project, and the Pillar One progress report released in July 2022 recognizes the need to reallocate revenue reported to the location of real activity via alternate allocation metrics.[15]

6 Results

6.1 Propensity score matching

Table 2 compares the means, standard deviation, minimum, and maximum values for log tangible capital, log revenues, log foreign income, and the number of tax havens for my treated, whole untreated, and matched untreated samples. I refer to my matched un-

[14] I explore whether the Form 1120 data contains the same characterization of royalty payments as revenues and find revenues are stable through tax year 2020. Thus, the reporting of royalty payments as revenue appears unique to the Form 5471 data in my study.

[15] See OECD (2022), the latest Pillar One Progress report from July 2022, page 64 on Reliable Methods

treated observations as the control group. Before matching, there are large and significant differences between MNCs that did not use the Double Irish arrangement and those that did. Matching mechanically narrows the difference in means of the covariates between my treated and untreated groups. My control group, i.e., my matched group, has statistically insignificant levels of log foreign income, log tangible capital, log revenues, and low-tax jurisdiction presence compared to my treated group. Thus, matching successfully balances the characteristics of Double Irish and non-Double Irish users on all matching variables.

The standardized bias column in Table 2 shows that matching on one control MNC reduces bias of log tangible capital by 5 percent and log revenues by 3 percent more than matching on two control MNCs. However, I prefer matching on two controls to minimize bias in log net income which, as aforementioned, strongly interacts with the TCJA legislation. My results are robust to matching on one control firm.

Figure 5 demonstrates that the mean of my control sample is consistently above the mean of the whole untreated sample between 2008 and 2018, ensuring that the control group does not trend towards the mean of the whole untreated sample when moving away from the matching year 2014.

6.2 Estimated gross royalties shifted to the United States after Double Irish closure

I use the comparable control group to estimate the amount of royalty income that returns to the United States after partial closure using Eqn. 2. Figure 6 graphs average domestic gross royalties from 2011 to 2020 for my treated and control group. Three trends stand out in this graph: first, we can see there is likely no statistically significant difference in reported domestic royalty payments between the treated and control group through 2019 compared to pre-2015, before partial closure. Second, between 2017 and 2018 the introduction of the TCJA is accompanied by a small decrease in gross royalties for my treated group averaging $20 million and a small increase for my control group averaging $90 million. However, these changes are not statistically significant. Third, the treated group diverges from the control group after full closure in 2020. Between 2019 and 2020, the control group increases gross royalties reported by roughly $10 million on average. In contrast, the Double Irish MNCs experience a much higher uptick in royalties of $650 million on average. Figure 7 graphs the aggregate royalty payments reported in the United States for both groups over time. After the closure of the Double Irish arrangement, between 2019 and 2020, the treated group increased reported royalty payments in the United States by $59 billion.

Table 3 and Table 4 lay out several regression specifications using Eqn. 2. The coefficient on the interaction between *treated* and *post* estimates the average effect of Double

Irish closure on the treated group. I present two sets of post results: the first set of regressions, Regression 1a and 1b, take tax years 2015 through 2020 as the post-reform period. During this period, my treated group anticipates full closure. Regression 1b adds domestic tangible capital to account for real increases in activity within my treated group. In Regression 1a and 1b, the effect of partial closure can be taken as the effect of anticipatory and real tax rate increases on profit shifted to the United States. The interaction term is insignificant, indicating that the treated companies, on average, did not send royalty payments back to the United States after partial closure.

Regressions 2a through 2b estimate the average treatment effect of full closure. My preferred specification is Regression 2b, which includes domestic tangible capital to explain variations in gross royalties reported due to changes in real domestic business activity. The coefficient on the interaction term states that, on average, Double Irish users shift $609 million in royalty payments to the United States after full closure. The estimate is statistically significant at the one-percent level.

However, I demonstrate that the story is more nuanced, and these large shifts in profit after full closure are driven by outliers. Regression 3 reduces the variance in my sample by taking the log of my continuous variables, gross royalties and tangible capital. A log specification reduces the power of outliers on the estimated coefficients. The average treatment effect of full closure is statistically insignificant. Thus, although, on aggregate, roughly $59 billion in gross royalties return to the United States compared to 2019, the increase in profit is driven by few MNCs. In the next subsection, I provide the first estimates of the size of the Double Irish structure. In doing so, I underscore the importance of my treated group to the profit shifting phenomenon, suggest a lower bound on the magnitude of IP-based profit shifting over the past decade, and contextualize the $59 billion in royalty payments that come back to the United States within the total amount of profit funneled through the Double Irish.

6.3 Estimated profit funneled through Double Irish arrangement

I estimate that $1.2 to $1.4 trillion of profit moved through the Double Irish arrangement for my treated group alone between 1998 and 2018. Over this period, profit within the Double Irish grew steadily for my treated group due to both new entrants and increased use of existing arrangements as depicted in Figure 8. Within the first year of the TCJA (2018) alone, which is not imputed using the midpoint method described in Section 5.3, the arrangement facilitated the movement of $156 to $190 billion in profit to low-tax jurisdictions. Putting this estimate in the context of the profit shifting literature, Tørsløv et al. (2022) estimate $154 billion in U.S. tax base lost in 2015. Using my estimate for the magnitude of profit within the Double Irish in 2015, which includes the full set of

existing users at the time, the authors' estimate implies that 62 to 76 percent of this loss in tax base is attributable to the Double Irish arrangement.[16]

I avoid imputing my estimate beyond 2018, although it is likely that MNCs continued to utilize the arrangement based on their inaction in shifting profit back to the United States through 2019 and the continued rise in profits after the introduction of GILTI and FDII. However, it is possible that companies started to change their tax structures, and the advent of the TCJA may have rearranged profit shifting incentives for companies in deficit credit positions in the longer run. I conclude that MNCs repatriated 31 to 38 percent of the 2018 Double Irish profit levels to the United States in 2020. Roughly 62 to 69 percent of profit within the arrangement remains abroad, and this is a generous lower bound given the likelihood of Double Irish profit growth after 2018.

7 Conclusions

My estimates on the magnitude of profit funneled through the Double Irish and royalty payments shifted back to the United States help elucidate the nature of IP-based profit shifting and the effectiveness of policy aimed at addressing it. Double Irish users waited until full closure to redirect royalty payments to the United States, meaning multinationals are largely unreactive to expected tax rate changes over the five-year transition period. There is a surprising lack of graduality in responses ahead of full closure demonstrated by the fact the treated group maintains statistically insignificant levels of royalty payments pre- versus post-partial closure. The change in U.S. gross royalty payments between 2019 and 2020 of $59 billion is large in magnitude and significantly higher than royalty payments reported by non-Double Irish users in the same year. Yet, the redirected payments make up 31 to 38 percent of the 2018 profit levels within the arrangement and are driven by few MNCs. Significant amounts of profit remain abroad, which suggests two non-competing concepts: cost-sharing arrangements are likely "sticky", meaning that renegotiating new IP ownership structures takes time. However, users had a five-year window to recalibrate. Thus, the presence of 62 to 69 percent of the profit previously attached to the Double Irish abroad may, second, signal continuing incentives to maintain current CSA structures. These incentives are likely complex, and I hope to explore the behavior of foreign affiliates of Double Irish MNCs further using Country-by-Country datasets.

Theoretically, there are many reasons to think multinationals chose the "do-nothing" scenario whereby profit remains in Ireland. In addition to the cost of reorganizing IP

[16]My extreme lower bound surpasses Blouin and Robinson (2022) where the authors estimate $33 billion in U.S. tax base lost in 2012 (Double Irish is 5 times larger). My lower bound falls within larger calculations in the literature such as Cobham and Janský (2017)'s estimate of $660 billion in U.S. gross profit lost in 2012 (Double Irish makes up 25 percent) and Clausing (2016)'s estimate of $257 to $370 billion in tax base lost in 2012 (Double Irish makes up 44 to 64 percent).

ownership rights, Irish law continues to provide favorable tax rates for IP-intensive firms. The introduction of the KDB in 2016, after partial closure, incentivizes U.S. MNCs to keep IP in Ireland and to shift research and development costs to their Irish subsidiaries. Irish affiliates would benefit from a 6.25 percent tax rate on royalty payments and licensing fees generated from qualifying assets.[17] Additionally, future research could explore incentives brought on by the TCJA to maintain profit abroad. Among these are the political uncertainty of the preferential FDII rate, the advantages of maintaining profit in other high-tax jurisdictions over the United States to accumulate FTCs, and approaching TCJA sunset clauses. In the Irish context, the deduction of specified interest expense from GILTI may enable MNCs in Ireland to continue taking advantage of other generous interest expense deductions to achieve low ETRs.

Importantly, my study design ensures that the increase in U.S. royalty payments is due to closure, disentangling confounding events such as the TCJA and changes in transfer pricing guidelines. These results will be particularly informative to studies that continue to explore the effects of the TCJA on profit shifting, highlighting that some of the profit leaving low-tax jurisdictions in 2020 is not attributable to the legislation alone. Although the narrower post-TCJA tax rate differential between low-tax jurisdictions and the United States likely incentivized companies to bring profit back upon full closure, my study emphasizes that Double Irish closure catalyzed the shift.

Within the literature, my estimates of both the size of the Double Irish and the profit that shifts back after full closure underscore that models, on average, likely understate the amount of profit that would shift back to the United States under tax harmonization. This is perhaps primarily due to the concentration of shifted profit within complex IP-based structures enabled by facets unique to U.S. tax law. These structures, as I have detailed, rely on establishing CSAs to uniquely shift profit away from the U.S. parent and shield transactions from generating subpart F income using hybrid entities enabled by CTB regulations. Figure 9 graphs profits within the Double Irish as a percent of the U.S. corporate tax base between 2006 and 2018. By 2017, profit within the Double Irish arrangement made up 14 to 17 percent of the U.S. tax base.[18] Although I study one of the most aggressively used BEPS tools by U.S. multinationals, I find that the magnitude of the estimated Double Irish profits suggests that more conservative estimates may understate profit shifted out of the United States. This possibility opens the door to a more comprehensive study measuring profits within multiple tax planning strategies employed by U.S. multinationals.

My study highlights the importance of case-based analyses given the heterogeneity in

[17] See Knowledge Development Box (KDB) (revenue.ie) for more information.

[18] The tax base in 2018 is larger than in previous years due to the one-time transition tax, which is difficult to disentangle within the tax data, so I use the tax base value from 2017 instead.

tax planning behavior across industries, affiliate locations, and headquartered jurisdictions. As one of the first studies to observe the use of tax planning arrangements by U.S. MNCs at the affiliate level, I provide evidence of the historical importance of the Double Irish. In doing so, I demonstrate relatively few U.S. MNCs disproportionately contribute to corporate tax base erosion. These companies maintained existing structures through the 5-year grace period and, in fact, continued to funnel profit into the Double Irish at an increasing rate between 2015 and 2019. Although the Double Irish is closed, the paper emphasizes that past, and current, profit shifting is driven by attributes of U.S. law. CTB regulations no longer benefit my treated group through the Double Irish, but difficulties in enforcing arms-length standards when transfer pricing IP continue to facilitate the movement of profits abroad.

References

Amoah, J., Stuart, E. A., Cosgrove, S. E., Harris, A. D., Han, J. H., Lautenbach, E., & Tamma, P. D. (2020). Comparing propensity score methods versus traditional regression analysis for the evaluation of observational data. *Clinical Infectious Diseases*, *71*(9), 497-505.

Bajgar, M., Berlingieri, G., Calligaris, S., Criscuolo, C., & Timmis, J. (2020). Coverage and representativeness of orbis data. *OECD Science, Technology, and Industry Working Paper*.

Beer, S., de Mooij, R., Hebous, S., Keen, M., & Liu, L. (2020). Exploring residual profit allocation. *IMF Working Paper*.

Bilicka, K. (2019). Uk tax returns of foreign multinationals to matched domestic firms. *The American Economics Review*, *109*(8), 2921-2953.

Blouin, J., & Robinson, L. (2022). Accounting for the profits of multinational enterprises: Double counting and misattribution of foreign affiliate income. *Working Paper*.

Cabral, A. C. G., Appelt, S., & Hanappi, T. (2021). Corporate effective tax rates for R&D: The case of expenditure-based R&D tax incentives. *OECD Taxation Working Paper*.

Clausing, K. A. (2016). The effect of profit shifting on the corporate tax base in the united states and beyond. *National Tax Journal*, *65*(40), 905-934.

Clausing, K. A. (2020). Profit shifting before and after the tax cuts and jobs act. *National Tax Journal*, *73*(4), 1233-1266.

Cobham, A., & Janský, P. (2017). Measuring misalignment: The location of us multinationals' economic activity versus the location of their profits. *Development Policy Review*, *37*, 91-110.

Cobham, A., & Loretz, S. (2014). International distribution of the corporate tax base: Implications of different apportionment factors under unitary taxation. *ICTD Working Paper*(27).

Coffey, S. (2021). The changing nature of outbound royalties from ireland and their impact on the taxation of the profits of us multinationals. *Working Paper*.

Congressional Budget Office. (2023). Trends in corporate economic profits and tax payments, 1998 to 2017.

Darby, J. B., & Lemaster, K. (2007). Double irish more than double the tax savings. *Practical US/International Tax Strategies*, *11*(9), 1-16.

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

Dowd, T., Landefeld, P., & Moore, A. (2017). Profit shifting of u.s. multinationals. *Journal of Public Economics*, *148*, 1-13.

Garcia-Bernardo, J., & Janský, P. (2022). Profit shifting of multinational corporations

worldwide. *International Centre for Tax and Development Working Paper*(119).

Grubert, H., & Mutti, J. (2009). International trade in services and intangibles in the era of globalization. In M. Reinsdorf & M. J. Slaughter (Eds.), (p. 111-137). Chicago: University of Chicago Press.

Guvenen, F., Jr., R. J. M., Rassier, D. G., & Ruhl, K. J. (2022). Offshore profit shifting and aggregate measurement: Balance of payments, foreign investment, productivity, and the labor share. *American Economic Review*, *112*(6), 1848-1884.

Heckemeyer, J. H., & Overesch, M. (2017). Multinationals' profit response to tax differentials. *The Canadian Journal of Economics*, *50*(4), 965-994.

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

Joint Committee on Taxation. (2019). Overview of the taxation of global intangible low-taxed income and foreign-derived intangible income: Sections 250 and 951a. *The Quarterly Journal of Economics*.

Jones, C., & Temouri, Y. (2016). The determinants of tax haven FDI. *Journal of World Business*, *51*, 237-250.

OECD. (2017). OECD transfer pricing guidelines for multinational enterprises and tax administrations 2017. *OECD Transfer Pricing Guidelines*.

OECD. (2022). Progress report on amount a of pillar one. *OECD/G20 Base Erosion and Profit Shifting Project*.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for casual effects. *Biometrika*, *70*(1), 41-55.

Seabrooke, L., & Wigan, D. (2014). Global wealth chains in the international political economy. *Review of International Political Economy*, *21*(1), 257-263.

Stewart, J. (2018). MNE tax strategies and ireland. *Critical Perspectives on International Business*, *14*(4), 338-361.

Tørsløv, T., Wier, L. S., & Zucman, G. (2022). The missing profits of nations. *Review of Economic Studies. (forthcoming)*.

Zucman, G. (2014). Taxing across borders: Tracking personal wealth and corporate profits. *Journal of Economic Perspectives*, *28*(4), 121-148.

Table 1: **Change in sample size and average financial variables with treated restrictions in tax year 2014 (billions $)**

	SOI 2014 Form 5471 Sample (Base)[a]	Base ∩ C1	Base ∩ C1 ∩ C2
MNC Count	8,939	503	134
Average consolidated revenues	2.3	15.2	18.9
Average consolidated tangible assets	0.5	3.1	3.3
Average consolidated unrelated profit	0.2	1.9	3.1
Average number of low-tax jurisdictions[b]	1	4	4

Note: C1 and C2 map to the identification strategy criterion 1: there exists a DE incorporated in Ireland and criterion 2: the DE is tax owned by an Irish CFC.
[a]Restricted to U.S. corporate Form 5471 filers that file a corresponding Form 1120 form.
[b]A low-tax jurisdiction is counted once if an MNC has at least one affiliate incorporated in the jurisdiction. The following jurisdictions are classified as low-tax jurisdictions: Antigua & Barbuda, Bahamas, Barbados, Belgium, Belize, Bermuda, British Virgin Islands, Cayman Islands, Cooks Island, Cyprus, Gibraltar, Grenada, Hong Kong, Isle of Man, Luxembourg, Puerto Rico, Malta, Netherlands, Panama, Singapore, St. Kitts, St. Vincent, Switzerland, and Turks & Caicos.

Table 2: **Summary statistics on propensity score matching**

	Treated Group Mean	Untreated Group Mean	Differences in Means	Differences in Standard Deviation	Standardized Difference	Standardized Bias Reduction
Whole Sample (Treated: 134, Control: 8,805)						
Log of Tangible Capital	19.27	15.98	3.29	-1.81	87.15	
Log of Revenues	21.46	17.96	3.50	-2.34	91.00	
Log of Income Foreign Derived	14.79	8.95	5.84	0.74	74.40	
Number of Tax Havens (Rounded)	4	1	3	2	94.87	
Nearest Neighbor Match: 1 Match without replacement (Treated: 134, Control: 134)						
Log of Tangible Capital	19.27	19.51	-0.24	-0.02	-8.57	110%
Log of Revenues	21.46	21.46	0.00	0.04	0.05	100%
Log of Income Foreign Derived	14.79	14.43	0.35	0.74	4.49	94%
Number of Tax Havens (Rounded)	4	4	0	0	0.00	100%
Nearest Neighbor Match: 2 Matches without replacement (Treated: 134, Control: 268)						
Log of Tangible Capital	19.27	19.40	-0.13	-0.24	-4.65	105%
Log of Revenues	21.46	21.40	0.07	0.01	2.76	97%
Log of Income Foreign Derived	14.79	14.62	0.16	0.97	2.11	97%
Number of Tax Havens (Rounded)	4	4	0	0	0.00	100%
Nearest Neighbor Match: 3 Matches without replacement (Treated: 134, Control: 402)						
Log of Tangible Capital	19.27	19.34	-0.08	-0.11	-2.68	103%
Log of Revenues	21.46	21.28	0.18	0.02	7.36	92%
Log of Income Foreign Derived	14.79	14.48	0.31	0.92	3.99	95%
Number of Tax Havens (Rounded)	4	4	0	0	0.00	100%
Nearest Neighbor Match: 4 Matches without replacement (Treated: 134, Control: 536)						
Log of Tangible Capital	19.27	19.24	0.03	-0.12	1.01	99%
Log of Revenues	21.46	21.23	0.23	0.09	9.39	90%
Log of Income Foreign Derived	14.79	14.51	0.27	1.10	3.54	95%
Number of Tax Havens (Rounded)	4	4	0	0	0.00	100%

Table 3: **Gross royalties reported in the United States**

	Regression Specifications			
	Regression 1a	Regression 1b	Regression 2a	Regression 2b
Treated (millions $)	305***	339***	262***	303***
	(78)	(75)	(53)	(51)
Post (millions $)	52	22	52	-3
	(60)	(57)	(110)	(105)
Treated X Post (millions $)	**12**	**24**	**613*** **	**609*** **
	(103)	**(99)**	**(186)**	**(179)**
Tangible capital (10^{-6})		30***		30***
		(2)		(2)
Constant (millions $)	168***	65	194***	79***
	(45)	(44)	(31)	(30)
Observations	3,536	3,536	3,536	3,536
Adjusted R-squared	0.011	0.088	0.016	0.092

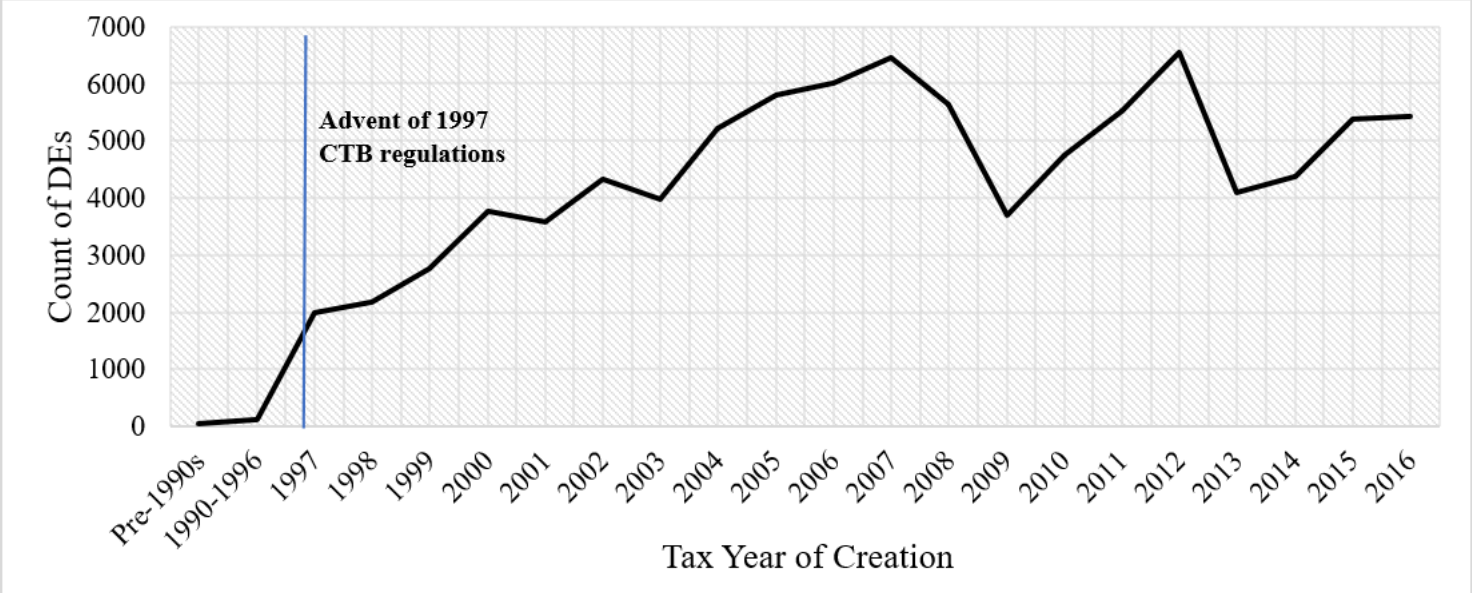
Note: Results use the propensity score matched untreated observations as a control group. Regression 1ab specifies post-reform equal to 2015-2020 (pre-reform 2011-2014). Regression 2ab specifies post-reform equal to 2020 (pre-reform 2011-2019). The variable of interest is the interaction term in bold. The convention *, **, and *** refers to 10, 5, and 1 percent significance levels respectively.

Table 4: Log gross royalties reported in the United States

Treated	1.12***
	(0.18)
Post	-0.07***
	(0.37)
Treated X Post	**0.15**
	(0.63)
Log Tangible capital	0.85***
	(0.02)
Constant	-5.06***
	(0.31)
Observations	3,536
Adjusted R-squared	0.27

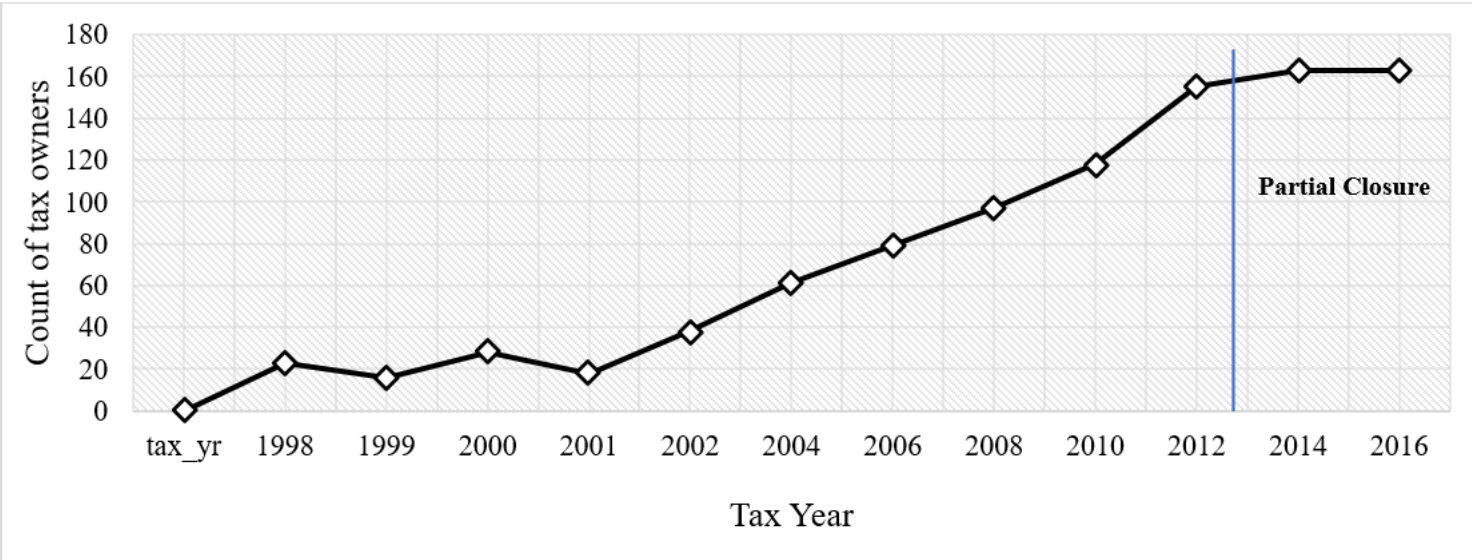
Note: Results use the propensity score matched untreated observations as a control group. Post-reform equals 2020 (pre-reform 2011-2019). The variable of interest is the interaction term in bold. The convention *, **, and *** refers to 10, 5, and 1 percent significance levels respectively.

Figure 1: **Growth of Irish disregarded entities from 1950 through 2016**



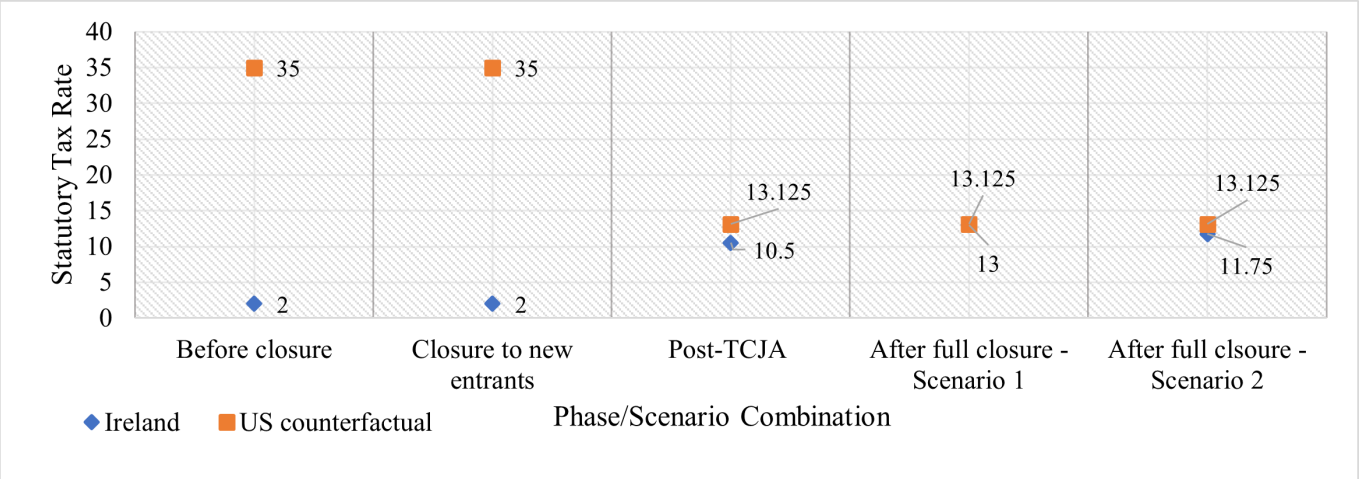
Note: This panel of DEs is pieced together using 2006, 2008, 2012, and 2016 SOI Form 8858 data vintages. DEs that were inactive during at least one of these tax years are not captured. Specifically, if a DE was formed and dissolved in an odd-numbered year, for which there is no dataset (an unlikely scenario) or dissolved before 2006, it will not be captured in this
panel

Figure 2: **Count of Double Irish entities (identified in 2014) over time**



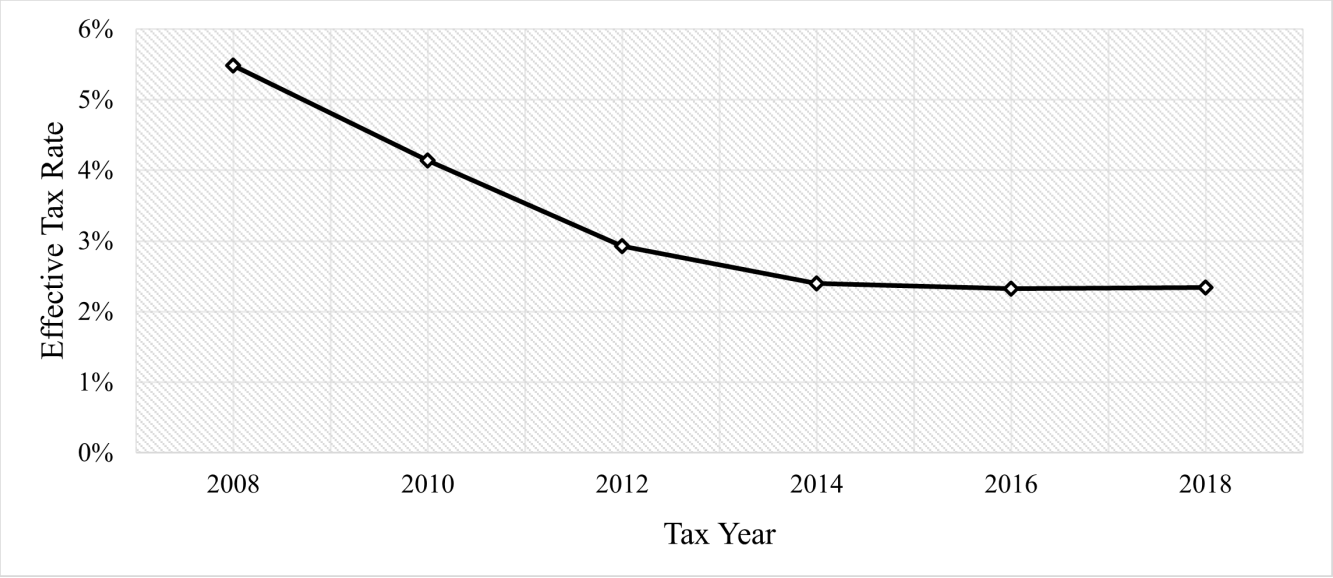
Note: Tax owners within the Double Irish arrangement ("treated tax owners") are identified in 2014. I graph the number of treated tax owners that file Form 5471 each tax year. Data is only available for the tax years that contain diamond markers

Figure 3: **Statutory tax differentials over event study phases**



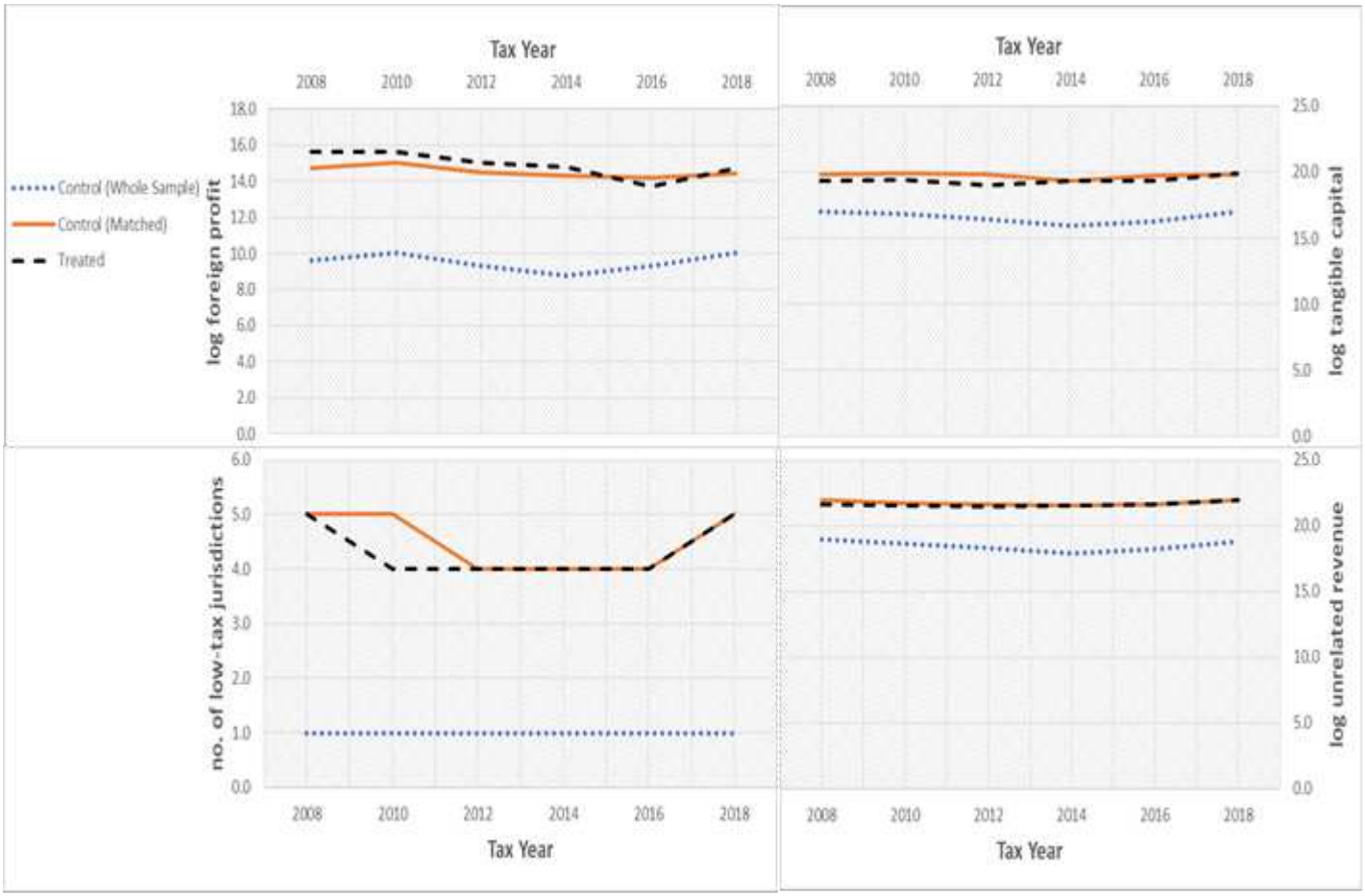
Note: The orange squares refer to the counterfactual U.S. statutory tax rate should the MNC shift royalty income to the United States. The blue diamonds refer to the Irish statutory tax rate on royalty income within the Double Irish arrangement. Scenario 1 is if the MNC in Ireland is subject to the Irish statutory rate of 12.5 percent upon full closure. Scenario 2 is if the MNC in Ireland is subject to the KDB rate of 6.25 percent.

Figure 4: **3-year moving average ETRs of Double Irish tax owners identified in 2014**



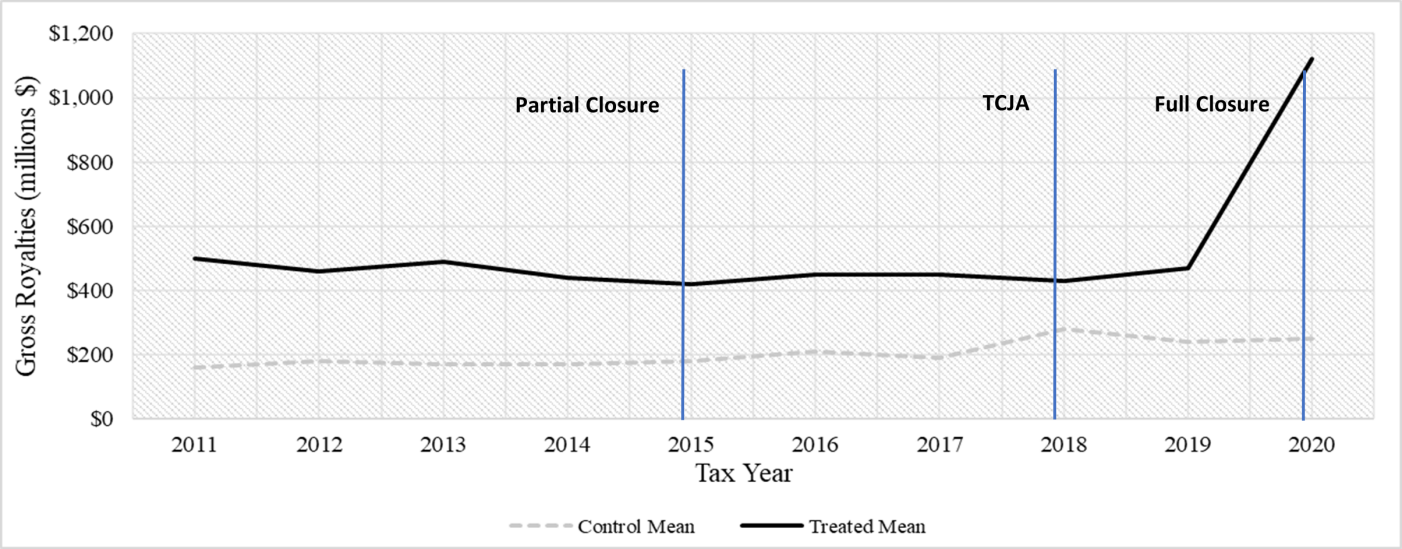
Note: For each tax year, t, effective tax rates are a moving 3-year average of tax years t, t-1, and t-2.

Figure 5: **Before versus after propensity score matching results**



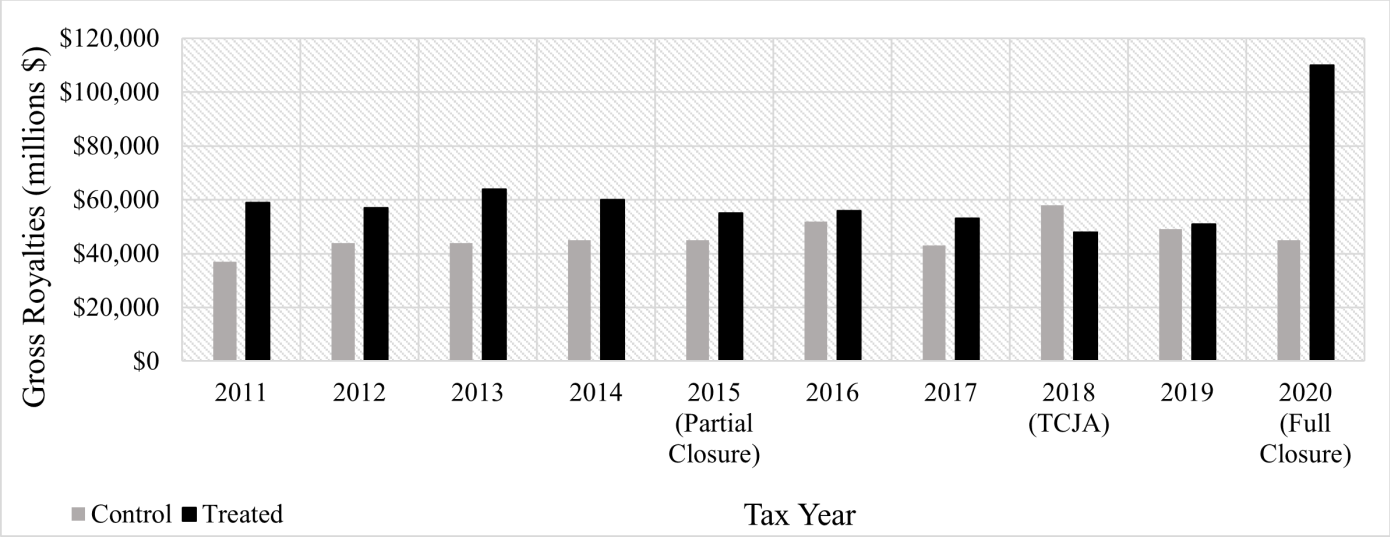
Note: Control (Whole Sample) refers to the set of MNCs in the Form 5471 SOI panel that do not have a Double Irish structure in TY 2014. Control (Matched) refers to the subset of MNCs in Control (Whole Sample) that are matched to a treated MNC in TY 2014. Treated refers to the set of MNCs that have a Double Irish structure in place during TY 2014.

Figure 6: **Average domestic gross royalty payments reported**



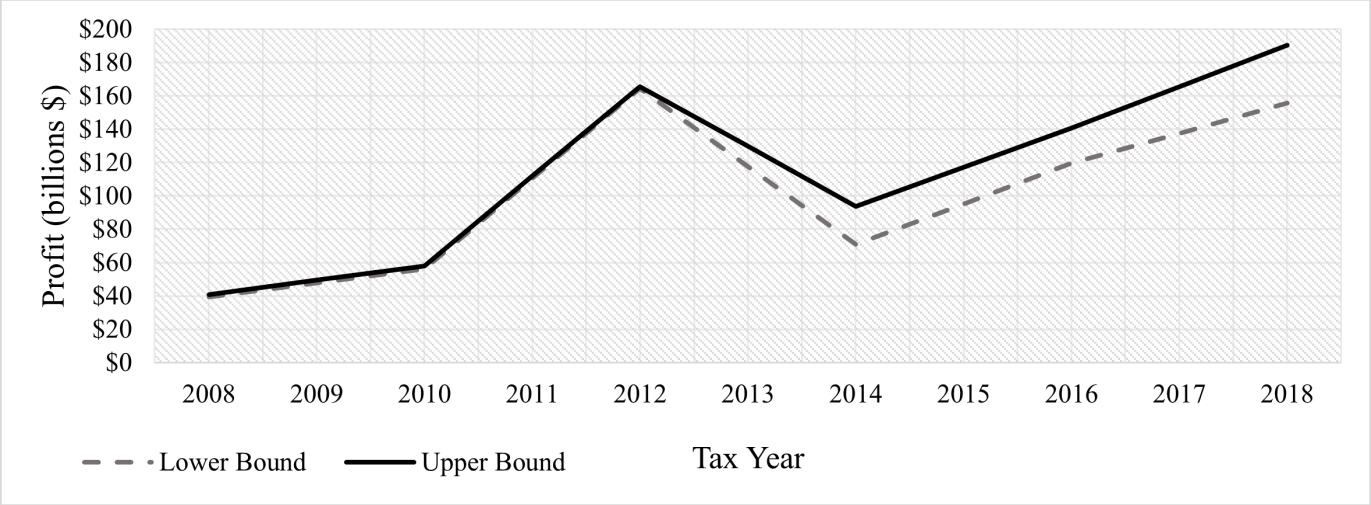
Note: Results use the propensity score matched untreated observations as the control group.

Figure 7: **Total domestic gross royalty payments reported**



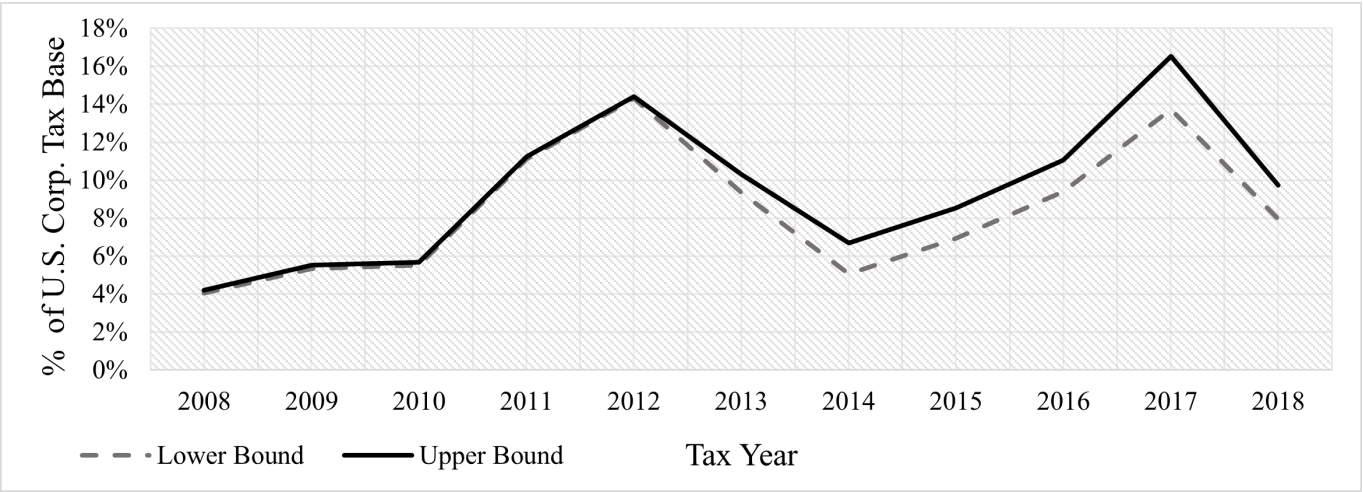
Note: Results use the propensity score matched untreated observations as the control group.

Figure 8: **Estimates of profit in Double Irish arrangement for treated group tax owners (identified in 2014) over time**



Note: The non-cumulative estimate uses identified treated MNCs in 2014 and follows the tax owners from 1998 through 2018. The year-by-year estimates are displayed starting in 2008 given this is the first year in which CFCs were required to report related party dividends as a separate line item. The lower bound is net income less related party dividends. The upper bound is net income.

Figure 9: **Estimates of Double Irish profits as a percent of the U.S. corporate tax base**



Note: The denominator aggregates weighted taxable income (line 30) in the Form 1120 SOI sample for each tax year. The lower bound is net income less related party dividends in the numerator. The upper bound is net income in the numerator.

Appendix

Thoughts on double counting and the misallocation of income

Estimates on the magnitude of profit in low-tax jurisdictions vary significantly between datasets and methodologies which are driven by assumptions used to allocate and aggregate income at the jurisdictional level. The accounting standards used in international tax data can be quite opaque, so it is important to foster discussion in this space. Researchers should keep in mind the primary concern when studying profit shifting is not where the income is located for accounting purposes, but, rather, where that income is taxed.

Many researchers (Clausing, 2016; Guvenen et al., 2022; Cobham & Janský, 2017; Zucman, 2014) utilize two Bureau of Economic Analysis (BEA) datasets to study the location of profit at the jurisdiction by year level. The direct investment income series reports net income proportional to the direct investor's ownership interest in their lower-tier affiliates. The net income (NI) series reports profit aggregated at the jurisdictional level for all 10% or more owned affiliates of U.S. MNCs. Unlike the Form 5471 data, this series has a clear accounting standard, the equity method, and includes a separate line item for equity income.

Blouin and Robinson (2022) note that both series suffer from double-counting issues when dealing with tiered ownership structures. Specifically, there are concerns that the financial statements of higher-tier affiliates aggregate all or some of the net income and taxes of their lower-tier affiliates, depending on the method of accounting. The authors propose an adjusted net income series that excludes equity income from net income. They also note that double counting on Form 5471 can be eliminated by excluding related party dividends received from foreign CFCs from net income. I include this adjustment when calculating the size of the Double Irish.

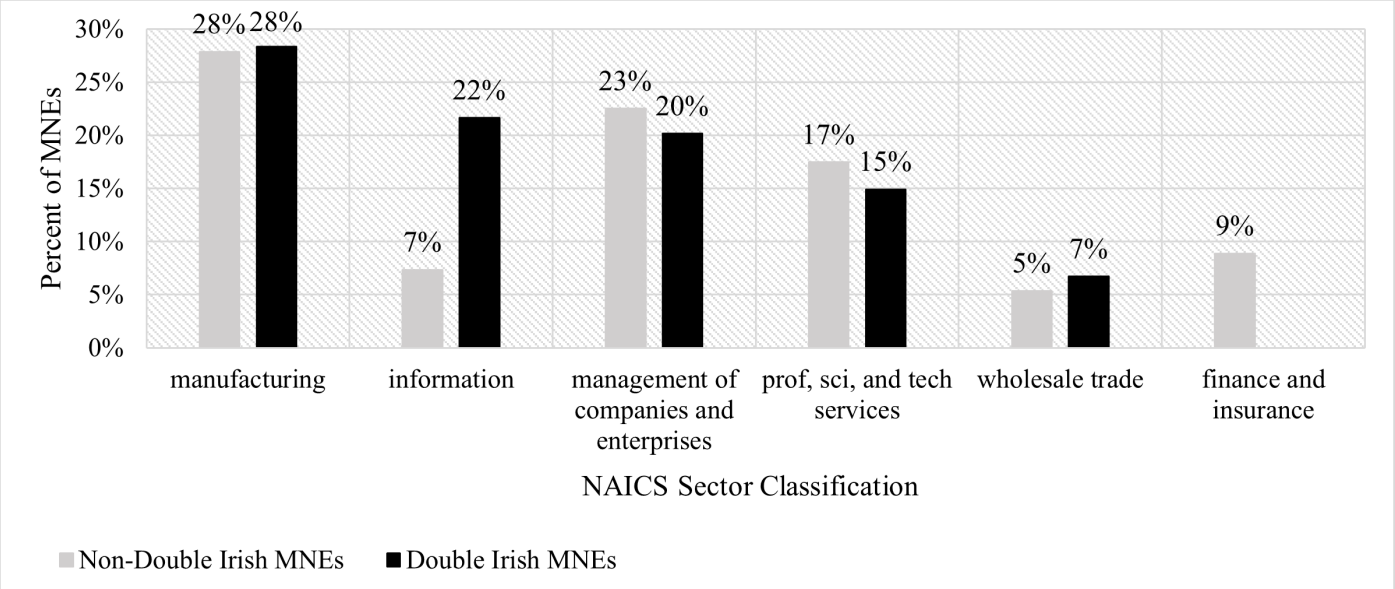
The BEA adjusted NI series is puzzling, although I have no singular explanation for what appears to be an overcorrection in 2016 Irish net income. The adjusted series, when compared to the SOI Form 5471 data, reports significantly less profit in low-tax jurisdictions. Blouin and Robinson note this discrepancy is "likely related to a known problem with disregarded entities created via the check-the-box regulations." Specifically, the authors take issue with the aggregation of income earned by a DE located in a different jurisdiction from its tax owner within the tax owner. Based on Blouin and Robinson's analysis, it is likely that income is double counted in the unadjusted net income series. However, there is a myriad of evidence that U.S. companies utilize hybrid entities to shift profit between countries. For the purposes of studying tax-motivated behavior, it is important to attribute the profit of disregarded entities to where they are taxed as is done in the Form 5471 data. For example, a transfer of royalty payments from a DE in

Country A to a CFC in Country B could be deductible from taxable income in Country A. The royalty payments would be taxed by Country B.

The accounting complications created by check-the-box (CTB) structures do not arise in the case of a same-country DE as is the case with the Double Irish structure. Within the Double Irish, there is no attribution of different country DE income to Ireland. Yet, my estimate for the amount of profit reported by Double Irish tax owners in 2016, which excluded related party dividends, is $120 billion dollars. This is still $43 billion higher than the BEA adjusted NI series. Therefore, it is possible that the discrepancies between the two datasets cannot simply be attributed to CTB regulations.

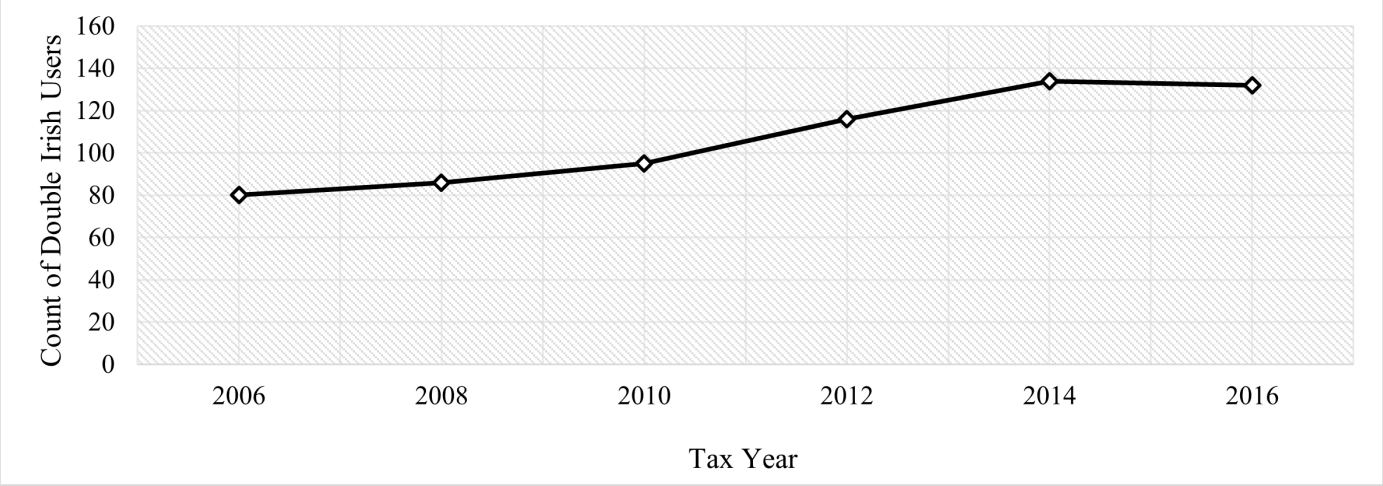
There are other important differences, such as different definitions of net income and income tax for book versus tax purposes and, importantly, the incentives MNCs face when reporting income for book versus tax purposes. Therefore, the underestimation in the adjusted BEA series compared to the SOI data for Ireland raises questions on the exclusion of all equity income from the NI series and merits further study.

Figure A1: Sectoral Breakdown of Treated vs. non-Double Irish MNCs in Ireland



Note: Non-Double Irish MNCs are defined as corporations that operate in Ireland but do not have a Double Irish structure in 2014. Sectoral breakdowns utilize the 2-digit NAICS code of the parent company. Values for "Finance and Insurance" are suppressed for Double Irish MNCs. Double Irish users are more likely than other U.S. corporations based in Ireland to operate in the information sector, which includes companies specializing in software. Double Irish users are less likely to operate in the finance and insurance sector.

Figure A2: Approximate number of Double Irish users in a given tax year



Note: Double Irish users in years lacking Form 8858 data (2010 and 2014) are identified as laid out in Section 5.1. After partial closure, the number of estimated MNCs using the Double Irish drops from 134 to 132.