SOLVAY BRUSSELS SCHOOL
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UNIVERSITÉ LIBRE DE BRUXELLES

FREEDOM TO RESEARCH

ESSAYS ON INTERNATIONAL TRADE AND CORPORATE TAX AVOIDANCE

Thesis presented by Baptiste SOUILLARD
in fulfillment of the requirements for the PhD degree in Economics and Management Sciences ("Docteur en Sciences Économiques et de Gestion")

Academic year 2021-2022

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Acknowledgments

When I came to Brussels in June 2017 to do my last internship, I did not plan to do a PhD. I did not intend to stay in Brussels either. In fact, the plan was to stay a few months and then find a job in Paris. But plans can change. It turns out that I am still here five years later. Overall, the PhD has been an incredible journey, but it would not have been the same without the constant and full support of my supervisor, committee, colleagues, friends, and family.

First, I would like to thank my advisor, Mathieu Parenti. Mathieu was the reason I came to ULB in the very first place, as he arranged this end-of-study internship. Thank you for introducing me to the field of corporate taxation – new to me when I arrived, giving me the chance to pursue a PhD, supporting my projects and ideas, and guiding me continuously throughout all these years. Having you as a PhD supervisor broadened my horizons in many regards. It notably allowed me to collaborate with public institutions and combine research with policy, which substantially sharpened my skills, fostered my professional development, and added meaning to my work. Thank you also for being so accessible and thoughtful. This truly made a difference.

Next, I would like to thank the members of the jury for their time and help in improving my dissertation. Gaëtan Nicodème played a key role in my PhD. His lectures on Tax Policy and Public Finance provided solid foundations and made me eager to delve into the topic. They familiarized me with the literature and helped me identify some gaps. It is no coincidence that the fourth chapter of my dissertation is an extension of the report I wrote as part of the course. I am grateful to Micael Castanheira for taking the time to read my articles, even though our research interests do not perfectly match. His feedback brought different but complementary perspectives. Moreover, and perhaps more importantly, his enthusiasm pushed me to keep going when doubts emerged. It gave me confidence and positivity when I needed it. I wish to thank Paola Conconi for her involvement

and effort in making my research better. Her course on International Trade taught methods essential to conducting my work. Her comments were precious, and our interactions were extremely insightful. I met Ronald B. Davies and Nadine Riedel only at a later stage. However, they have always been there. I can still picture myself writing the literature review for the PhD proposal while reading the analysis of Ron on transfer pricing techniques of French multinationals and that of Nadine on transfer pricing regulation. I thank both of them for their comments, suggestions, and encouragement. I would also like to thank Marjorie Gassner for agreeing to be the chair of the jury. Marjorie is one of the only professors in the H building, where the offices of PhD students are located. Needless to say, having her among us was a privilege. Being compared to Marouane Fellaini (obviously because of my hair) became routine, and teasing each other about sport and football – mostly the Belgian and French national teams, and of course RSC Anderlecht and Union Saint-Gilloise – brightened up my days. Thank you too for helping us with ULB procedures and your dedication to students and teaching. I take this opportunity to thank ECARES, faculty, and ULB professors/administrative teams – more specifically Anne-Marie, Nancy, and Pierre. The first time I came on campus, Nancy welcomed me and presented herself as, I quote, "the mother of all ECARES PhD students." I can attest to that. I am deeply indebted to her for her assistance and kindness, which made everything smoother.

I am also grateful to my colleagues in the H building. There is (too) much to say about the atmosphere in these corridors. In brief, what was supposed to be a workplace rapidly felt like home. I definitely have to praise Jean, Anousheh, and Guillaume for that. Jean was my mentor. He was already here when I arrived. French connection kicked in, I guess, and he naturally guided me through any academic-related matter. He helped me become a better researcher. In exchange, I helped him become a decent squash player. More seriously, merci pour tout Jean. I am happy to have met you along the way and now have you among my closest friends. What to say about Anousheh? Or, should I say, where do I start? Anousheh was everywhere, probably because she is one of the most social persons I know and we started the PhD at the same time. Having you around, Noush, was special. Cimer for your humor and (sometimes very bad) jokes. You enlivened the H life, and you enlivened mine as well. Thanks for the memories outside the H and your empathy. Guillaume and I shared the same office throughout all these years. Before meeting him, I expected a relatively cold guy since people were referring to him as "the sheriff." I was completely wrong. Thank you, Guillaume, for your unique helpfulness,

kindness, and patience. Thanks also for making the H a more inclusive and vibrant place. I especially enjoyed our morning debates about football, often initiated by Zinedine from the maintenance staff, whom I thank both for his friendliness and generosity.
Thank you Esteban, Gilles, Matthieu, and Salva for organizing many activities and always including me. I had no acquaintance in Brussels when I arrived, so your invitations meant a lot to me. I enjoyed our drinks at Gauguin and Tavernier as much as our weekly football games. Although most of you have already left the H, I am happy to stay in contact with you and see you at Joseph Marien, work, or elsewhere. Esteban, I will undoubtedly miss your "Salut les amis" every morning, stories at lunch, and indelible smile. Gilles is peculiar too, in his own (and in a good) way. He is arguably the only person who would stop at my door for fifteen seconds, look and smile at me without saying a single word, and then go away. Matthieu, I loved teasing you. You also enjoy teasing people around you, which made it even better. Thanks to you and Gilles for taking the initiative so many times. Salva, gracias for being sincere, considerate, caring, and humble. I really look forward to (re)having you as a colleague.
I also want to thank Coline, David, Elisabeth, Laura, Lisa, Valentine, and Valérie. Coline, thanks for your humor and honesty. David, I will surely miss your calmness and our conversations about sports. Elisabeth, thank you for being so respectful and delicate. Laura and Valentine, thanks for your enthusiasm and joviality. Lisa, thanks for your benevolence and kindness during all these years. Valérie, I was lucky enough to have your office (almost) next to mine. The laugh of Anousheh and Coline is quite singular, but yours is remarkable as well. Thanks for your humility and optimism, from which I have drawn some inspiration.
In the same vein, I would like to say a word about Andrzej, David, Domenico, Farah, Federico, Florine, Hierro, Ilaria, Marco, Marco, Oğuzhan, Roberto, Thomas, Vinka, and Umutcan. For the drinks, dinners, and parties, un immense merci. Life with you was much funnier. Andrezj, thanks for your generosity, solicitude, and easygoingness. As a matter of fact, I could use many adjectives along these lines to describe you. Thanks for the memories and our never-ending discussions on economics, food, wine, etc. Ilaria, dear, thanks for being cheerful all the time. Umut, you are the same, constantly smiling. You like complaining too; but when you do, at least you do it amusingly. Thanks for everything, in particular for your "very gud" food. David, Domenico, Farah, Federico, Florine, Hierro, Marco, Marco, Roberto, Thomas, and Vinka, thanks for being so lively and lovely. Oğuzhan, thank you for backing us up and asking Umut not to put Turkish music and mess with our playlists. Many of

us are relocating and I will miss you a lot, but I still hope that we will be able to organize big parties as we used to do. As one of us would say: why not?!
Other colleagues in the H became friends, some of whom graduated before me. It is for example the case for Angela, Beni, Lorenzo, Michael, and Stefan. Thanks, Angela, for your sympathy and your GoT debrief sessions. Tuesday mornings were quite creative and inspirational in this regard. Beni, naming himself "Beni the King," showed me that a PhD requires daily presence in the H building. Note the use of "H building" (instead of "office"). Legend says that he spent so much time in the corridors looking for coffee and people to chat with that he injured his knee pretty badly, to the point that he had to end his career as an 8th-division football player. Thanks for the reciprocal and permanent teasing. I enjoyed our long and deep discussions, always enriching and respectful, despite having contradictory views sometimes. Michael helped me in different ways. Michael and Jean used to knock at my door every day to make me take breaks. I declined their invitations for months. I progressively decided to accept, from time to time. It was a long process, but you should know that I now have my morning coffee break every single day! Lorenzo and Stefan, I had a lot of fun playing football with you on a weekly basis. I look forward to maintaining this tradition!
More globally, I would like to thank Afrae, Afrola, Alberto, Alexis, Amine, Avi, Bastien, Björn, Claudio, Clément, Elisa, Fabrizio, Giampaolo, Guida, Ignacio, Kevin, Laetitia, Lena, Maria, Mariia, Morgane, Moritz, Natacha, Nicolas, Riccardo, Sarah, Stefano, Thomas, Tillman, Tom, and Tommaso for all the moments we shared in the H building, on the futsal pitch, in bars, or elsewhere.

There are other persons that I met at conferences and seminars. Camille, thanks for being so friendly and such a good listener. I am glad I met you in Vienna. I also wish to thank Carlos, Daniele, Elena, and Enxhi. I am grateful to my co-authors Bruno, Farid, Julien, Samuel, and Sébastien. I would particularly like to thank Bruno and Julien. Bruno supervised me during my consultancy work at the United Nations. His guidance allowed me to better approach business taxation and tax dodging from a policy angle and think about these issues through the lens of an international organization. Julien invited me to Montréal in February 2020. The five-month stay unfortunately turned out to be a three-week visit due to the pandemic and I did not have the chance to spend much time in Canada. Still, it was enough to experience its cold winter with snowstorms and -25°C. I will not forget that. Julien, you warmly welcomed me and remained available when I had to work remotely from my Airbnb and then from Europe. I especially appreciated the way

you provided me with constructive feedback and suggestions. Un tout grand merci !

There is a whole world outside of academia without which I would not have been able to pursue this path. I want to thank my old friends Aben, Armand, Benjamin, Bernie, Dylan, Julien, Kevin, Mai, Maxime, Noémie, and William. Aben, Bernie, Kevin, and William, thanks for encouraging me in everything I do, some of you since first grade. Armand and Benjamin, thanks for making me smile at all times (including "chiro" episodes). Mai, thank you for your unconditional support and understanding. We first met at Paris Sorbonne during the bachelor's degree, then both started a PhD in Belgium, and will soon be colleagues. That's quite something! Dylan, Julien, and Maxime, thank you (among other things) for the sport and game sessions with the Quiz team. Noémie, I am indebted to you for your kindness, caring, and dedication.

Last but not least, I would like to thank Ana and my lovely family. I am extremely grateful to them for all the love and comfort they gave me.
Ana, obrigado pela tua presença constante. Também quero te agradecer pelo apoio incansável. Having you by my side made everything easier and more pleasant. Thanks, also, for regularly reminding me that life does not revolve around academia, PhD, and work.
I will never forget the support of Thierry and Catherine, my uncle and aunt, and Robert and Chantal, my godparents, with whom I would ideally spend happy lazy Sundays sprinkled with good food and good wine.
This thesis is dedicated to my parents and brothers. The adventure actually started more than 25 years ago. You inculcated me with an important principle at the earliest age: "where there is a will, there is a way." Well, the way has never been easy. As a kid, I wanted to be the best – both at school and on the tennis court – just to catch your attention and make you proud. I then entered high school and university. These years were harder. The fact that I was the first to study there did not make them any easier. As a real first-gen student I had to catch up – which I never really did – and it was difficult for me to express my doubts and concerns. That said, you made many sacrifices to offer me the opportunity to study in the best conditions. I will never be able to thank you enough for that. You also taught me a work ethic based on determination and discipline that goes beyond academic skills. I hope that this thesis honors these principles. I also hope that it will make you proud, not of *me*, this time, but of *yourselves*. – Cette thèse est dédiée à mes parents et à mes frères. L'aventure a en réalité commencé il y a plus de 25 ans.

Vous m'avez inculqué un principe essentiel dès le plus jeune âge : "là où il y a une volonté, il y a un chemin." Tout compte fait, ce chemin n'a jamais été facile. Au départ, je voulais être le plus performant – tant à l'école que sur le court de tennis – juste pour attirer votre attention et vous rendre fiers. Je suis ensuite rentré au lycée, puis à l'université. Cette période a été plus intense, et être le premier à étudier au lycée et à l'université ne l'a pas rendue plus facile. Je devais combler mon "retard" – ce que je n'ai pas totalement réussi à faire –, et communiquer mes doutes et préoccupations n'était pas simple. Ceci dit, vous avez fait de nombreux sacrifices pour m'offrir la possibilité d'étudier dans les meilleures conditions. Je ne pourrai jamais vous remercier assez pour cela. Vous m'avez également transmis une éthique de travail qui repose sur la détermination et la discipline et qui dépasse le savoir académique. J'espère que cette thèse honore ces principes. J'espère aussi qu'elle vous rendra fiers, non pas de *moi*, cette fois-ci, mais de *vous-mêmes*.

General introduction

"Income tax returns are the most imaginative fiction being written today."
Herman Wouk

This decade has been marked by numerous tax scandals: the Offshore Leaks in 2013, the LuxLeaks in 2014, the SwissLeaks in 2015, the Panama Papers in 2016, the Paradise Papers in 2017, the FinCEN Files in 2020, the Pandora Papers in 2021, etc. They raised awareness about the aggressive strategies adopted by companies to avoid corporate income taxes. They also had special resonance due to increasing income inequalities, persistent budget deficits in high-income countries, and the COVID-19 pandemic. A group of firms is particularly accused of large-scale tax avoidance: multinational enterprises (MNEs). Apple, Deutsche Bank, Facebook, FedEx, IKEA, Nike, and PepsiCo, to mention only a few, all appear in recent data leaks. With the help of banks and accounting companies, they exploit legal technicalities and set up complex structures to reduce their tax liability. They artificially shift a substantial amount of profits from high- to low-tax countries, and especially to tax havens, where corporate income tax rates are very low and opacity provides unique opportunities for tax dodging.

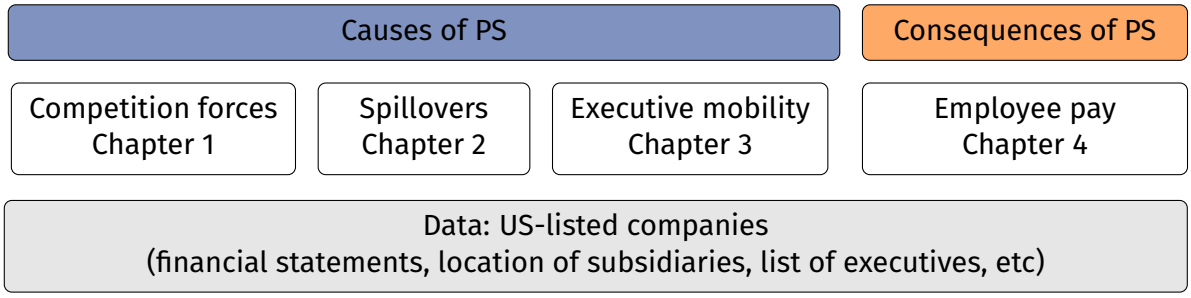
Many questions have emerged in the wake of these scandals. How much profits are transferred to tax havens for tax purposes? The question is natural, but the answer is not trivial. Quantifying profit shifting is highly challenging in essence because it is unobserved. To come up with an estimate, we need to calculate the amount of profits that would have been declared in tax havens in absence of profit shifting, which is not as simple as it seems. What encourages companies to engage in profit shifting? Tax rate differentials certainly play a role. Profits tend to be disproportionately high in jurisdictions with near-zero tax rates. However, tax rates are insufficient to explain why some tax havens attract more profits than others. They are also insufficient to grasp why some high-tax countries are more

affected by profit shifting than others. What are the consequences, notably in terms of income inequalities? It is often admitted that profit shifting aggravates income inequalities in the media, public, and political spheres.[1] Yet, there is to date little statistical evidence on this topic.

My dissertation tackles some of these questions. It consists of four solo-authored chapters, whose approach combines methods from economics and statistics with insights from accounting, international business, and management. The objective is twofold: better understand the determinants of profit shifting and shed light on its distributional consequences (see figure I.1).

Before coming to the core of the dissertation, I summarize the existing research on profit shifting. The general introduction not only sets the stage for the ensuing chapters but also concisely explains how my work contributes to the literature. The first section describes how MNEs usually proceed to park profits in offshore financial centers (OFCs),[2] while the second section reviews (global) estimations of profit shifting. The third and fourth sections outline the determinants and consequences of tax avoidance and profit shifting hitherto uncovered.

Figure I.1 – Structure of the dissertation



Notes: "PS" stands for profit shifting.

1. See this European Parliament headline: https://www.europarl.europa.eu/news/en/headlines/economy/20191213STO69020/corporate-taxes-meps-want-to-tackle-tax-avoidance-by-big-companies, this Oxfam article: https://www.oxfam.org/en/inequality-and-poverty-hidden-costs-tax-dodging, and this column: https://inequality.org/research/6-facts-corporate-tax-avoidance/.

2. "Offshore financial centers" and "tax havens" are used interchangeably throughout the dissertation.

It is useful to mention at this point that profit shifting is one of several tax avoidance strategies. Accelerated depreciation is another. The *corporate tax avoidance* literature is thus more comprehensive than the *profit shifting* literature. Moreover, the difference between tax *avoidance* and tax *evasion* needs to be clarified. While tax evasion is informal and illegal, tax avoidance is legal or at least falls in a legal gray area. Tax avoidance consists in taking advantage of ambiguities of the tax code and then requires legal expertise. This distinction is crucial because firms evading income taxes and firms avoiding income taxes are very different. Small and medium-sized enterprises (SMEs) are more prone to turn to informality (e.g., Dabla-Norris, Gradstein, and Inchauste, 2008; De Paula and Scheinkman, 2011; Galiani and Weinschelbaum, 2012). On the opposite, large firms are more inclined to avoid taxes. As we will see throughout this dissertation, a narrow circle of firms more specifically engage in profit shifting: the most performing MNEs.

1 How do multinationals shift profits across borders?

MNEs employ a variety of techniques to move profits between jurisdictions for tax saving purposes (Dharmapala, 2014; Riedel, 2018; Beer, de Mooij, and Liu, 2020). The literature traditionally highlights three approaches: the optimization of transfer prices, the use of intra-firm loans, and the strategic management of intellectual property (IP) rights. Albeit distinct at first sight, they boil down to manipulating the price of some transactions between affiliates. They enable MNEs to inflate reported profits in tax-friendly jurisdictions and diminish reported profits in high-tax countries. Overall, the reallocation of profits leads to a decrease in MNEs' average effective tax rates (ETRs).

1.1 Transfer (mis)pricing

Intra-firm trade accounts for a significant part of international trade transactions (Lanz and Miroudot, 2011). The prices at which intra-firm transactions occur are regulated in most countries and should be in line with the so-called arm's length principle. According to this principle, the amount charged by one party to another must be equal to the price that would have been set between two unrelated parties in a comparable transaction.[3] This ensures that transfer prices are based

3. The techniques used by experts to derive this benchmark price can be divided into two groups. The first group encompasses traditional transaction methods: the comparable uncontrolled price method, the cost plus method, and the resale price method. The second group encompasses trans-

on market values. Still, there is room for MNEs to deviate from arm's length prices and distort transfer prices to their advantage, even in presence of transfer pricing rules and guidelines.[4] The idea is simple: slightly raise the price charged by affiliates in low-tax countries to those in high-tax countries, or slightly deflate the price set by related parties in high-tax countries to those in low-tax countries. In this manner, part of the profit originally made in high-tax countries is now recorded in low-tax countries.

An extensive body of literature documents this tax dodging scheme. In two seminal papers, Swenson (2001) and Clausing (2003) exploit product-level data and attest that US intra-firm trade prices and countries' tax rates are strongly correlated in a way that is consistent with tax-motivated incentives. More recently, Cristea and Nguyen (2016), Davies, Martin, Parenti, and Toubal (2018b), Liu, Schmidt-Eisenlohr, and Guo (2020), and Hebous and Johannesen (2021) reach concordant results with Danish, French, UK, and German firm-level data. Perhaps more interestingly, Davies et al. (2018b) find that profit shifting is granular, i.e., concerns a handful of firms and low-tax jurisdictions. As we will see in this dissertation, the pattern is largely corroborated in the profit shifting literature. Income shifting is for the "happy few" superstar firms. Despite being few in number, they represent a high share of total profits and have the financial resources to undertake such activities (Krautheim and Schmidt-Eisenlohr, 2011; Langenmayr, 2015; Jones, Temouri, and Cobham, 2018; Bilicka, Devereux, and Guceri, 2020). Furthermore, tax havens absorb the lion's share of shifted profits and the response of profit shifting to tax rates is highly non-linear. Dowd, Landefeld, and Moore (2017) and Garcia-Bernardo and Janskỳ (2022) show that inward profit shifting essentially involves jurisdictions with tax rates close to zero.

1.2 Debt shifting and intra-firm loans

A second option used by MNEs for aggressive international tax planning consists in taking advantage of the tax deductibility of interests. When a firm takes out a loan and pays interest on that loan, interest payments are tax deductible. It means

actional profit methods: the transactional net margin method and the profit split method. This list is not exhaustive. These methods are not covered here for clarity and because the dissertation does not focus on this particular profit shifting channel.

4. It might be difficult to know what would be the price in a third-party comparable transaction, precisely when there is no comparable transaction involving independent companies. This case often appears for intangible assets and services.

that the firm can claim interest payments on a tax return in order to reduce its taxable income. All firms benefit from the tax deductibility of interest payments. Nonetheless, MNEs have an opportunity that domestic enterprises cannot seize. They can strategically manage debt across all the jurisdictions where they operate and adjust their capital structure to maximize tax savings. More specifically, they can shift debt from low-tax countries to high-tax countries to capitalize on the high deduction of interest payments in high-tax countries, without increasing the overall debt of the group and potentially accentuating the risk of bankruptcy.

Evidence in the profit shifting literature points in this direction. Egger, Eggert, Keuschnigg, and Winner (2010a) find that, among European firms, foreign-owned firms display a higher debt ratio than domestic firms. This gap increases with the corporate tax rate of the host country. Buettner and Wamser (2013) notice that (i) German MNEs with affiliates implanted in low-tax countries use internal debt to a larger extent and (ii) internal debt grows with the spread between the tax rate of the host country and the lowest tax rate among all affiliates. Fuest, Hebous, and Riedel (2011) use German firm-level data as well with an emphasis on developing countries, and Desai, Foley, and Hines (2004) and Huizinga, Laeven, and Nicodème (2008) provide evidence along the same lines with US and European firm-level data, respectively.

1.3 Intangible assets and property rights

An alternative way for MNEs to lighten their tax burden is to strategically manage the location of IP rights. Research and development (R&D) is carried out in a particular country, but property rights are then transferred to a low-tax country. In the same spirit of debt shifting, profits made by affiliates in high-tax countries are shifted toward tax-friendly jurisdictions through royalty payments and license fees, which are tax deductible too. Intangible assets offer a unique opportunity for international tax planning because of their mobility and because it is difficult to establish an arm's length price for IP-related transactions.

An influential paper in this strand of research is the one of Grubert (2003). With US firm-level data, he reveals that profits of affiliates with R&D-intensive parents are more responsive to local tax rates than other affiliates. Importantly, he also reveals that R&D-intensive companies are more likely to locate subsidiaries in low- *and* high-tax jurisdictions, thereby suggesting that profit shifting tempers the disadvan-

tage caused by a high corporate tax rate. Profit shifting lowers the ETR truly faced by MNEs and wanes ETR differentials across locations.[5] This mechanism nurtures numerous discussions about the economic efficiency of capital allocation under profit shifting (Casella and Souillard, 2022). Dischinger and Riedel (2011) find that corporate tax rates exert a negative effect on IP assets. Within European MNEs, intangible assets are significantly higher in affiliates where corporate tax rates are relatively low. Karkinsky and Riedel (2012) complement these findings on European MNEs focusing on patents. They observe that applications to the European Patent Office are more likely to be made by affiliates implanted in low-tax countries. Griffith, Miller, and O'Connell (2014) draw similar conclusions with similar data.

1.4 Other methods

The three aforementioned profit shifting techniques are neither exhaustive nor exclusive. Other methods include treaty shopping (Hong, 2018) and corporate inversions (Desai and Hines, 2002). In reality, all these methods are often combined to create complex corporate structures and a series of transactions between affiliates.[6] The so-called double Irish with a Dutch sandwich, famous in the media and largely implemented by Google and its parent Alphabet, involves a strategic location of IP, tax treaties, and loopholes regarding the definition of tax residency. In the same vein, sales shifting associates transfer mispricing and intangible assets (see the online appendix of Laffitte and Toubal (2021) with an illustration based on Apple).

1.5 Relative importance of each channel

What is the most important mechanism at play? As mentioned above, the techniques are often intersecting, making it difficult to unravel their respective contri-

5. For the ease of exposition, consider a two-country world with a high-tax country c, whose ETR is equal to ETR_c, and a tax haven h, levying no corporate taxes. Suppose that $\lambda_c > 0$ is the share of profits shifted by an MNE from c to h and that profit shifting is free. The ETR really paid by the MNE on the income generated in c is $\lambda_c ETR_c$, not ETR_c. The mitigating impact of profit shifting on tax rate differentials can be generalized in a multi-country set-up under the hypothesis that high-tax countries are more exposed to profit shifting, which is empirically observed. See figure I.2 and Casella and Souillard (2022).

6. The literature is surprisingly silent about the substitutability/complementarity of profit shifting methods. Case studies show that these techniques are often intertwined, perhaps suggesting that profit shifting methods are complementary. It is, however, not straightforward. Saunders-Scott (2015) for instance demonstrate that transfer mispricing and debt shifting are substitutes (see also Dudar, Nicolay, and Nusser, 2016).

bution. Nonetheless, it is commonly accepted that debt shifting is a minor channel relative to transfer mispricing and licensing (e.g., Egger, Eggert, and Winner, 2010b; Merz and Overesch, 2016). The meta-analysis carried out by Heckemeyer and Overesch (2017) stands as a reference in the literature and confirms this hierarchy. The authors estimate a tax semi-elasticity of (pre-tax) profits equal to -0.8. In addition, the tax semi-elasticity of (pre-tax) profits imputable to non-financial shifting techniques in the likes of transfer mispricing and licensing is about -0.64. Their computations thus indicate that transfer mispricing and licensing are dominant. In a more recent survey, Beer et al. (2020) expand the exercise performed by Heckemeyer and Overesch (2017) and bear out this finding.

1.6 Contribution

My dissertation does not directly add to this stream of research, but chapters 1, 2, and 4 still resonate with earlier work on the role of intangible assets. Chapter 1 explores the effect of competition on corporate tax avoidance. Among other things, the results validate that (i) MNEs with subsidiaries in OFCs and intensive in intangible assets pay fewer income taxes than comparable corporations absent from OFCs, and (ii) competition fosters profit shifting indirectly through intangible assets. Indeed, it does not seem that MNEs widen their network of subsidiaries in OFCs in response to a competition shock. What happens is that MNEs invest in intangibles to limit losses in sales and profits through competitive differentiation (Bloom, Draca, and Van Reenen, 2016; Gutiérrez and Philippon, 2017; Hombert and Matray, 2018). At the same time, these assets spur the income shifting of MNEs already present in OFCs.

Chapter 2 unveils the existence of intra-industry spillovers of profit shifting and tax haven foreign direct investments (FDIs). An event study shows that a company is more likely to own subsidiaries in a given tax haven if another company operating in the same sector also does. In line with our expectations, the diffusion of profit shifting knowledge is most striking in sectors known to be intensive in intangibles and for the most aggressive tax havens.

Chapter 4 looks at the consequences of profit shifting on employee pay and income inequalities. The analysis proves that firm presence in OFCs is not innocuous and significantly worsens income inequalities between top executives and the rest of employees. Again, the inequality-deepening impact of firm entry into tax havens is

more pronounced among intangible-intensive firms. In a sense, chapters 1, 2, and 4 reaffirm that intangible assets facilitate and fuel the profit shifting activities of MNEs.

2 How big is profit shifting?

Estimating the volume of profits artificially registered in tax havens is challenging for at least two reasons. First, profit shifting is unobservable. Second, it requires a holistic approach taking into account all the possible techniques used by profit shifting MNEs. No consensus emerges on its magnitude beyond the fact that it is quite sizable. Up-to-date estimates suggest that between $300 billion and $1 trillion are recorded in OFCs as a result of profit shifting. This section reviews the classical quantification methods and their applications. Attention is paid to worldwide estimates. Studies performed on a smaller scale (e.g., MNEs from/in a specific country or region) are not discussed for the sake of brevity.

2.1 Three methodologies

Approaches used to gauge the extent of the phenomenon fall into three categories: tax semi-elasticity approaches, profit misalignment approaches, and domestic/MNEs comparison approaches (Cobham, Garcia-Bernardo, Janskỳ, and Palansky, 2021; Casella and Souillard, 2022). A useful starting point for further insight is that profits generated by MNEs in country c (Π_c^G) can be either reported in c (Π_c^R) or shifted (Π_c^S):[7]

$$\Pi_c^G = \Pi_c^R + \Pi_c^S$$

$\Pi_c^S > 0$ in case of outward profit shifting and $\Pi_c^S < 0$ in case of inward profit shifting. Information on Π_c^R is available in many databases (e.g., national accounts). The two remaining terms, by contrast, are unknown. The objective is to proxy Π_c^G and then pin down Π_c^S.

Tax semi-elasticity The tax semi-elasticity approach is standard in the corporate tax avoidance literature (e.g., Hines and Rice, 1994; Huizinga and Laeven, 2008; Dowd et al., 2017). Profits reported by MNEs are regressed on corporate tax rates

7. Unless stated otherwise, profits in this section refer to *pre-tax* profits.

after controlling for MNEs' activities. The econometric model is:

$$ln\left(\Pi_c^R\right) = \alpha + \beta t_c + \gamma X_c + \epsilon_c$$

t_c is the tax rate in country c. X_c is a vector of covariates generally including labor, capital, and other country-specific determinants of MNEs' profits such as income per capita. ϵ_c is the error term.

The concept is the following. Tax rate differentials eventually affect the location decisions of MNEs (Lawless, McCoy, Morgenroth, and O" Toole, 2018; Davies, Siedschlag, and Studnicka, 2021). Nonetheless, conditional on these location choices, reported profits should not depend on tax rate differentials. Take two countries c and c' alike in all respects but with different tax rates t_c and t'_c. It is assumed that differences in MNEs' reported profits between c and c' are entirely attributable to profit shifting. The key variable is β, i.e., the tax semi-elasticity of reported profits. It indicates the percentage change in reported profits induced by a one percentage point increase in the tax rate. We expect profit shifting to be more intense in high-tax countries all other things being equal, i.e., a negative value for β. The meta-study of Heckemeyer and Overesch (2017) concludes that $\beta \approx$ -0.8. Armed with β, one can calculate a counterfactual variable supposed to reflect the profits that would have been reported in absence of tax rate differentials and profit shifting, which corresponds to Π_c^G. The subtraction with Π_c^R finally yields Π_c^S.

The principle is simple, but many debates pertain to the right-hand side variables. They should not be affected by profit shifting. Hence, inserting gross domestic product (GDP) per capita might be controversial since profit shifting biases GDPs and diverse macroeconomic aggregates (Bricongne, Delpeuch, and Forero, 2021; Guvenen, Mataloni, Rassier, and Ruhl, 2022). The very definition of the variables also raises questions. Selecting tax rate data is for example not easy (Bradbury, Hanappi, and Moore, 2018; Casella and Souillard, 2022). Various studies make use of statutory tax rates (STRs), i.e., tax rates stipulated by law. However, some argue that ETRs give a more accurate picture of corporate taxation and are thus more relevant. Unlike STRs, ETRs absorb deductions, exemptions, and other tax breaks introduced by governments to reduce the tax burden. There is no unanimity on the ETR that should be preferred either. Some scholars claim that backward-looking ETRs are better than forward-looking ETRs, and vice versa (Devereux and Griffith,

2002, 2003; Egger, Loretz, Pfaffermayr, and Winner, 2009).[8] On another note, recent discussions concern the functional form itself. The equation above presumes a linear tax semi-elasticity of reported profits. Yet, new studies reveal that profits are extremely concentrated in tax havens with near-zero tax rates (Dowd et al., 2017; Garcia-Bernardo and Janskỳ, 2022). They support a non-linear semi-elasticity of profits to tax rates and call for quadratic or logarithmic forms. Last but not least, another caveat is that profit shifting is assumed to be utterly driven by tax rate differentials. Other characteristics such as financial secrecy are ignored.

Misalignment The misalignment method has recently been promoted by Cobham and Janskỳ (2019) and Garcia-Bernardo and Janskỳ (2022) among others. It can be seen as a simplification of the tax semi-elasticity approach because Π_c^G this time is computed without any econometric model. The method relies on the assumption that (real) profits of MNEs are determined and reflected by several observable factors that can be used to allocate worldwide profits to each jurisdiction.

To illustrate this, pick three apportionment factors as in Garcia-Bernardo and Janskỳ (2022): L_c, the numbers of workers employed by MNEs in country c, W_c, wages paid by MNEs in country c, and R_c, unrelated party revenues of MNEs in country c. Assume that (i) profit shifting costs are negligible, (ii) at the worldwide level, profits generated and reported by MNEs coincide, i.e., $\sum_c \Pi_c^R = \sum_c \Pi_c^G$, (iii) the share of MNEs' profits created in c, s_c, is given by the relative size of c as measured by MNEs' workers, wages, and revenues, and (iv) all three factors are unaffected by profit shifting. Then, formally:

$$\Pi_c^G = s_c \sum_k \Pi_k^R = \left(l \frac{L_c}{\sum_k L_k} + w \frac{W_c}{\sum_k W_k} + (1 - l - w) \frac{R_c}{\sum_k R_k} \right) \sum_k \Pi_k^R$$

l and w represent the weights of workers and wages in the apportionment formula. Garcia-Bernardo and Janskỳ (2022) set $l = w = 0.25$. Alternative combinations could include tangible assets, sales, etc. The intuition is that profit shifting disconnects economic activities and profits, but the latter hail from countries that account for

8. Both types of ETRs aim at measuring tax liability, but they are conceptually different. On the one hand, forward-looking ETRs are model-based, consider a hypothetical investment project, and include all taxes due over the lifetime of this investment. They are usually recommended to examine the effect of tax rates on investment decisions. On the other hand, backward-looking ETRs do not require assumptions about future interest and inflation rates. They are based on tax payment and profit data, and thus observed (ratio of corporate income taxes paid in the jurisdiction over the amount of profits reported in this jurisdiction).

a large share of global workforce and unrelated party revenues.

Again, the misalignment method has both advantages and drawbacks. The primary advantage resides in its transparency. Furthermore, no transformation is necessary to guarantee that profit shifting flows cancel out, i.e., $\sum_k \Pi_k^S = 0$. Nevertheless, the oversimplification of the procedure comes at a cost. It seems reasonable to posit that factors like tangible capital are somewhat immobile and unaffected by profit shifting. It is less clear for wages. As we will see in chapter 4, profit shifting exerts an impact on wages. Perhaps more crucially, mismatches between profits and economic activities can originate from multiple sources besides profit shifting. Technology differentials across countries are for instance not fully captured in the formula above.

Above-normal profitability The third approach used in the literature to quantify profit shifting has been popularized by Tørsløv, Wier, and Zucman (2021). It slightly differs from the two previous approaches. Instead of analyzing activities and profits reported by MNEs *between* jurisdictions, the method scrutinizes the profitability of different classes of firms *within* jurisdictions. Tørsløv et al. (2021) notice that profits-to-wage ratios Π_c^R/W_c are systematically higher for foreign firms than for local firms in tax havens, while the opposite occurs in non-haven countries. Moreover, local firms in tax havens are as profitable as local firms in non-havens. On this basis, Tørsløv et al. (2021) consider that local and foreign corporations would have the same profitability in absence of profit shifting and that the profitability of local firms in tax havens is unaltered by profit shifting. Equalizing in each tax haven the profitability of foreign firms to its benchmark level thus delivers a macro-level estimate of profit shifting.

As the misalignment approach, the above-normal profitability methodology does not require econometric models and stands out for its clarity. Another major advantage is that profit shifting estimates are by construction corrected for differences in productivity and technology across countries. However, it might be complicated to find a comparison group of domestic companies for every country, in particular for low-income and developing countries. More importantly, an old and rich line of inquiry in international trade demonstrates that domestic companies and MNEs are different with respect to productivity. MNEs are inherently more productive than their peers (e.g., Helpman, Melitz, and Yeaple, 2004). Therefore, the central assumption that domestic companies and MNEs are equally profitable is

dubious.

2.2 Macroeconomic estimates

Several studies build on these methodologies to provide a global picture of profit shifting. The most prominent evaluations are certainly those conducted by OCDE (2015), Clausing (2016), Crivelli, De Mooij, and Keen (2016), Johansson, Skeie, Sorbe, and Menon (2017), and Cobham and Janskỳ (2018) (elasticity-type approach), Cobham and Janskỳ (2019) and Garcia-Bernardo and Janskỳ (2022) (misalignment method), and Tørsløv et al. (2021) (above-normal profitability technique).[9] They estimate that the amount of profits shifted to OFCs for tax purposes lies between $300 billion and $1 trillion. No consensus has thus been reached regarding the magnitude of profit shifting.

No consensus has been reached on the greatest losers of profit shifting either. It is quite clear and unsurprising that developed economies lose more profits than developing economies in absolute terms. Indeed, they encompass the overwhelming majority of economic activities. In relative terms however, Tørsløv et al. (2021) and Garcia-Bernardo and Janskỳ (2022) find contradictory results despite having comparable worldwide estimates. Tørsløv et al. (2021) state that high-income countries see a much larger share of their profits moved to tax havens (especially the European Union and the US), whereas Garcia-Bernardo and Janskỳ (2022) state that developing countries are substantially more exposed to profit shifting. I refer the reader to Bradbury et al. (2018) and Garcia-Bernardo and Janskỳ (2022) for further comparisons and discussions.

3 What causes profit shifting?

Disparities in tax rates across jurisdictions play a pivotal role in profit shifting. There would be little rationale for (tax-motivated) income shifting in a world where tax rates are homogeneous. All the same, profit shifting is not only about tax rate differentials. The tax environment as a whole and a battery of other factors play a role alongside tax rates. They give us a better grasp of why some countries are

9. Two supplementary studies are regularly cited: Bolwijn, Casella, and Rigo (2018) and Janskỳ and Palanskỳ (2019). They develop and follow another strategy, not discussed here for reasons of concision. They examine the relationship between the share of FDIs from tax havens and the rate of return on FDIs. They find slightly lower estimates.

more touched by tax avoidance and profit shifting than others with similar tax rates. They also explain why some industries and firms are more inclined to engage in this type of activity while sharing the same tax environment. This section starts with a brief state-of-the-art summary of the related literature. I focus on the influence of the tax environment first and then address other well-known determinants of profit shifting.[10] I close the section by outlining the novelty of my dissertation.

3.1 The tax environment

The impact of the tax environment on profit shifting is maybe best visualized through the lens of the workhorse model of profit shifting (Hines and Rice, 1994). For simplicity, consider a two-country world composed of a high-tax country c, with tax rate t_c, and a tax haven h, with tax rate $t_h < t_c$. Assume that an MNE generates a profit Π_c^G in c. The corporation can eventually shift some profits to h but doing so is not free. The cost incurred by the MNE to transfer income toward the tax haven logically increases with the amount of profits shifted Π_c^S and decreases with the amount of profits generated in c Π_c^G. The idea is that it is easier to shift \$1 million for a company making \$100 million of profits than for another corporation making \$10 million of profits. More formally, assume that profit shifting costs are given by:[11]

$$\frac{\left(\Pi_c^S\right)^2}{2k\Pi_c^G}$$

Under reasonable conditions, the share of profits shifted from the high-tax country to the tax haven Π_c^S/Π_c^G is equal to:

$$k(t_c - t_h)$$

This model stresses the importance of corporate income tax rates t_c and t_h. It says

10. See Alm (2019), Wang, Xu, Sun, and Cullinan (2020), and Beer et al. (2020) for more exhaustive lists on the determinants of tax compliance, tax avoidance, and profit shifting.

11. Two comments are in order. (i) Profit shifting costs are sometimes seen as the cost of activities undertaken to *hide* the misreporting of profits (Weichenrieder, 2009) or the expected *penalty* that the MNE would have to pay to the public authorities if the latter detect the profit shifting activities (Nielsen, Raimondos-Møller, and Schjelderup, 2010). This interpretation is common in the transfer pricing literature and directly resonates with the tax evasion literature. It is maybe less adequate for other profit shifting techniques insofar as they are not necessarily illegal. (ii) Profit shifting MNEs may entail fixed costs. This point is discussed later on. That said, notice that fixed costs would influence the extensive margin of firm-level profit shifting (whether or not to shift profits) but not the intensive margin (conditional on shifting profits, how much profits the MNE would shift).

that high-tax countries should experience more outward profit shifting and that profits should be principally directed toward low-tax jurisdictions. This prediction has a strong empirical basis, and figure I.2 illustrates this. To produce the two graphs, I borrow data from the database assembled by Tørsløv et al. (2021). The database is available on `missingprofits.world` and unique insofar as it is to date the only database that provides profit shifting data at the bilateral level. The authors calculate the share of profits that are generated in each non-haven country [12] and shifted to eight tax havens: Belgium, Cyprus, Ireland, Luxembourg, Malta, the Netherlands, Switzerland, and a composite of 34 tax havens. [13] The first graph exhibits a positive correlation between non-haven countries' ETRs and outward profit shifting. A one percentage point increase in a non-haven country's ETR is associated with a 0.12 percentage point hike in the (total) outward profit shifting share. Moreover, profit shifting is negatively related to ETRs in tax havens. The average share of profits shifted from a non-haven country to a tax haven goes up by 0.03 percentage point if the ETR of this tax haven falls by 1 percentage point. Similar figures can be obtained by using the bilateral profit shifting shares more directly and regressing them on both ETRs or by using the (country-level) profit shifting shares and ETRs derived by Garcia-Bernardo and Janskỳ (2022). [14]

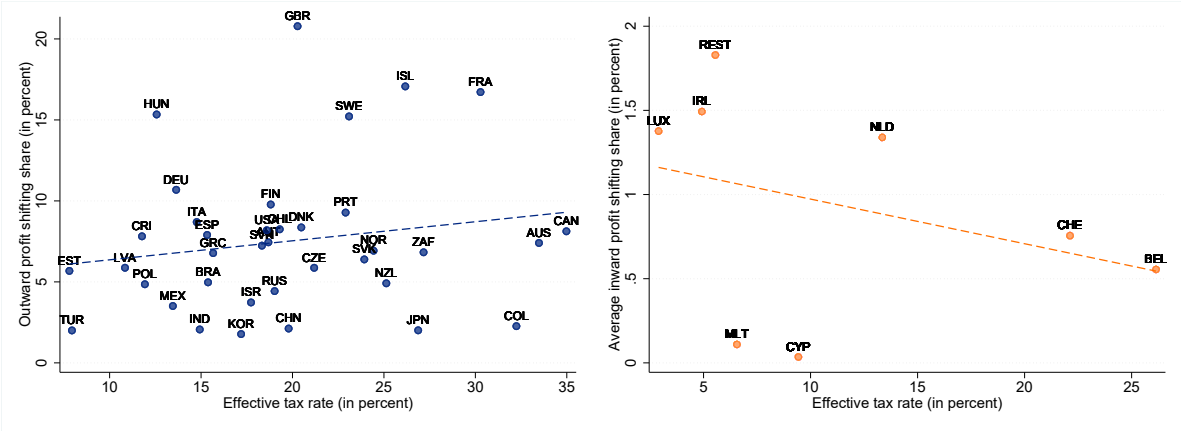
Interestingly, the conceptual framework also stresses the importance of another variable: k. In theory, k might embed a number of things. It is supposed to comprise all variables affecting profit shifting costs and inducing variation in profit shifting shares for a given set of tax rates. A natural candidate for k is tax regulation and anti profit shifting legislation. Lately, a package of reforms has been adopted to curtail aggressive tax planning. Transfer pricing regulations (TPRs), thin-capitalization rules (TCRs), and controlled-foreign-company rules (CFCRs) are probably the most popular of them. TPRs impose documentation requirements

12. 37 non-havens are included. They comprise most of OECD economies and the main developing countries, namely: Australia, Austria, Brazil, Canada, Chile, China, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Israel, Italy, Japan, Korea, Latvia, Mexico, New Zealand, Norway, Poland, Portugal, Russia, Slovakia, Slovenia, South Africa, Spain, Sweden, Turkey, United Kingdom, and United States.

13. The list is: Andorra, Anguilla, Antigua and Barbuda, Aruba, Bahamas, Bahrain, Barbados, Belize, Bermuda, Bonaire, British Virgin Islands, Cayman Islands, Curacao, Grenada, Guernsey, Gibraltar, Hong Kong, Isle of Man, Jersey, Lebanon, Liechtenstein, Macau, Marshall Islands, Mauritius, Monaco, Panama, Puerto Rico, Seychelles, Singapore, St. Kitts and Nevis, St. Lucia, St. Maarten, St. Vincent and the Grenadines, and Turks and Caicos Islands.

14. Interestingly, the two series are based on different data sources. Tørsløv et al. (2021) mostly leverage national account data while Garcia-Bernardo and Janskỳ (2022) exploit Country-by-Country Reporting data. See Casella and Souillard (2022) for a discussion.

Figure I.2 – Profit shifting and ETRs



Notes: The first graph depicts the share of profits generated in non-haven countries and shifted to tax havens on the *y*-axis, and the ETR of each corresponding non-haven country on the *x*-axis. The second graph depicts the average share of profits generated in non-haven countries and shifted to each tax haven on the *y*-axis, and the ETR of each corresponding tax haven on the *x*-axis. The dashed lines represent linear fit curves. The data are from 2017 and Tørsløv et al. (2021). The tax haven classification also follows Tørsløv et al. (2021). "Rest" is a composite of 34 OFCs. Profit shifting shares are calculated with tables C4 and U1, while ETRs are from table U1 (source: `missingprofits.world`).

for transactions between related parties. Evidence corroborates that they globally fulfill their purpose (Lohse and Riedel, 2013; Beer and Loeprick, 2015; Marques and Pinho, 2016; Rathke, Rezende, and Watrin, 2021). However, Rathke et al. (2021) conclude that TPRs do not totally inhibit transfer mispricing and that MNEs still have the opportunity to manipulate transfer prices. TCRs more specifically target debt shifting. Once the debt-to-equity ratio exceeds a certain threshold, TCRs deny the tax deductibility of interests. Note that excessive deduction on interest payments is sometimes defined based on interest expenses over income ("earning stripping rules"). CFCRs, for their part, make the income of a subsidiary taxable in the country of the parent if the tax rate paid in the subsidiary country is too low. There is compelling evidence on the effectiveness of TCRs and other rules aimed at disallowing the tax deductibility of interest (Overesch and Wamser, 2010; Buettner, Overesch, Schreiber, and Wamser, 2012; Wamser, 2014; Merlo, Riedel, and Wamser, 2020) and on the power of CFCRs (Buettner and Wamser, 2013; Egger and Wamser, 2015; Haufler, Mardan, and Schindler, 2018; Clifford, 2019); but again, they do not entirely deter profit shifting. Reiter, Langenmayr, and Holtmann (2021) point out that TCRs and CFCRs rarely apply to banks, notwithstanding the large scope of

their profit shifting activities.

From a more global perspective, *k* could possibly include tax treaties (Hong, 2018; Nakamoto, Rouhban, and Ikeda, 2020), transparency (Schjelderup, 2016; Janskỳ, Meinzer, and Palanskỳ, 2021; Overesch and Wolff, 2021), geographical distance and cultural ties with tax havens (Haberly and Wójcik, 2015; Ogle, 2020; Laffitte, Martin, Parenti, Souillard, and Toubal, 2021; Casella and Souillard, 2022), as well as corruption and quality of institutions (Bilicka and Seidel, 2020; Johannesen, Tørsløv, and Wier, 2020; Al-Hadi, Taylor, and Richardson, 2021).

3.2 Other determinants

The tax environment casts light on the geography of profit shifting. Yet, it alone provides an incomplete picture. Other factors intervene, be they at the industry level or the firm level.

Industry-level determinants Sectors do not equally engage in profit shifting. On the contrary, Beer and Loeprick (2015) and Barrios and d'Andria (2020) uncover substantial sectoral differences in profit shifting. They observe that sectors intensive in intangible assets are remarkably more prone to profit shifting. Two arguments can be put forward according to the authors. First, intangibles are highly mobile. Second, companies operating in such sectors produce more differentiated goods. It thus becomes harder for tax authorities to find relevant comparisons and enforce arm's length pricing rules. In the same manner and for related reasons, banks and MNEs in services are regularly ranked among the largest profit shifters (Gumpert, Hines, and Schnitzer, 2016; Jones and Temouri, 2016; Merz and Overesch, 2016).

At the industry level, interactions between firms could shape profit shifting schemes too. The tax avoidance literature points in this direction. For instance, industry competition has long been seen as a potential driver of tax avoidance, although its effect is theoretically ambiguous and unclear. While Marrelli and Martina (1988) claim that competition should temper corporate tax avoidance, Goerke and Runkel (2011) suggest that competition should foster corporate tax avoidance. Two empirical studies conducted by Cai and Liu (2009) and Gokalp, Lee, and Peng (2017) clarify this relationship. They conclude that competition stimulates corporate tax evasion/avoidance and thereby support the prediction of Goerke and Runkel (2011).

Another reason why interactions might matter for profit shifting is that they could contribute to the diffusion of profit shifting knowledge. Again, the tax avoidance literature provides evidence along these lines. Prior research uncovers multiple channels whereby tax planning knowledge disseminates across firms. Lim, Shevlin, Wang, and Xu (2018) show that companies connected to other low-tax firms through auditors have lower ETRs. Cen, Maydew, Zhang, and Zuo (2017), Gallemore, Gipper, and Maydew (2019), and Barrios and Gallemore (2021) unveil similar mechanisms and emphasize the role played by supply chains, bank ties, and employee mobility. Note that, in this case, interactions do not necessarily have to take place between peers. They might as well involve companies operating in distinct sectors.

Firm-level determinants Profit shifting is not only heterogeneous across countries and industries, but it is also highly heterogeneous across firms. Not all firms engage in tax avoidance and profit shifting. In fact, a fistful of firms are able to undertake such activities, just like few firms engage in export activities or become multinational. Standard international trade theories predict that the least productive firms cannot initiate any internationalization process because they do not have the financial resources to do so. Typically in these models, export and FDI activities boost profits but require the payment of a fixed cost that only the most productive companies can find profitable to pay. It leads to a ranking of firms. The least productive firms neither export nor become multinational, medium-productive firms export, and top performing firms are multinational (Helpman et al., 2004). In a way, profit shifting extends this classification and adds another layer. Profit shifting necessitates sizable fixed costs on top of variable costs (Krautheim and Schmidt-Eisenlohr, 2011; Langenmayr, 2015; Bilicka et al., 2020). Profit shifting corporations hire legal experts, whose knowledge is rare and valuable (Jones et al., 2018). Official reports indicate that Caterpillar paid PricewaterhouseCoopers $55 million to elaborate its tax dodging schemes (US Senate Permanent Subcommittee on Investigations, 2014). Then, only the most performing MNEs adopt very aggressive tax planning strategies. They form a narrow circle of superstar corporations that, albeit low in number, represent a significant amount of worldwide economic activities. Gumpert et al. (2016) confirm this pattern.

Academic research underlines the importance of various factors in addition to firm size and productivity. The accounting literature is notably rich when it comes to documenting the firm-level determinants of corporate tax avoidance and profit

shifting. Business strategy (Higgins, Omer, and Phillips, 2015; Hsu, Moore, and Neubaum, 2018), compensation plans (Rego and Wilson, 2012; Gaertner, 2014), corporate governance (Lanis and Richardson, 2011; Armstrong, Blouin, Jagolinzer, and Larcker, 2015; Kovermann and Velte, 2019), ownership structure (Chen, Chen, Cheng, and Shevlin, 2010; McGuire, Wang, and Wilson, 2014; Khan, Srinivasan, and Tan, 2016; Richardson, Wang, and Zhang, 2016), and political activities (Kim and Zhang, 2016; Ajili and Khlif, 2020) have for example all been linked with tax avoidance and profit shifting. A nascent substream of the literature goes further and delves into the role played by executives and board members. Dyreng, Hanlon, and Maydew (2010) are the first to show, in a systematic way, that executives per se are key to understanding corporate tax avoidance. Subsequent papers draw on these findings, extend the approach, and shed more light on senior managers' characteristics driving corporate tax aggressiveness. They reveal that conservatism (Christensen, Dhaliwal, Boivie, and Graffin, 2015), financial expertise (Taylor and Richardson, 2014), gender (Lanis and Richardson, 2011), military experience (Law and Mills, 2017), native language (Na and Yan, 2021), narcissism (Olsen and Stekelberg, 2016), overconfidence (Hsieh, Wang, and Demirkan, 2018), and political orientation (Kim and Zhang, 2016; Shen, Gao, Bu, Yan, and Chen, 2019) of top managers might influence corporate tax avoidance.

3.3 Contribution

My thesis consolidates this literature. It shows that a small number of MNEs carry out profit shifting activities. Those involved in OFCs are ordinarily larger, more productive, and more intangible-intensive than the rest of MNEs.

More importantly, my thesis supplements the aforementioned results and globally underscores the role of interactions between firms. Chapter 1 argues that competition exacerbates profit shifting. This finding echoes and concurs with Cai and Liu (2009), Goerke and Runkel (2011), and Gokalp et al. (2017). However, the accent is on profit shifting and the effect is indirect. Competition pressures do not push MNEs to enlarge their network of subsidiaries in OFCs. Rather, they prompt MNEs to invest in intangible assets to differentiate and mitigate losses in revenues, but these intangible assets also fuel the profit shifting activities of MNEs implanted in OFCs in the first place.

Chapter 2 uncovers the existence of intra-industry spillovers of profit shifting. It

shows that an MNE is more likely to establish subsidiaries in a given tax haven if another firm operating in the same sector has already penetrated this tax haven. The paper is the first to focus on profit shifting, tax haven FDIs, and within-industry interactions. In terms of technicalities, the study uses richer and more disaggregated data than the previous ones. This feature is worth noting because it allows for a stronger statistical exercise besides highlighting very particular tax avoidance schemes.

Chapter 3 scrutinizes these spillovers further and exploits finer data to this end. It identifies executive mobility as one mechanism whereby profit shifting strategies propagate across firms. C-level executives acquire and build OFC-specific expertise while working for profit shifting MNEs. When joining a new firm, they even tend to replicate the profit shifting schemes of the MNEs they worked for. The knowledge is extremely valuable in the labor market, and companies hire executives used to oversee tax dodging practices precisely for tax saving purposes. This conclusion enriches the one of Barrios and Gallemore (2021) and generalizes some anecdotal evidence. [15]

4 What about the consequences?

The literature tackling the impact of corporate income taxation is dense and advanced. The literature on the effect of profit shifting is, on the contrary, much more scarce (Jacob, 2022). I recapitulate the findings reached by this strand of work. Next, I explain to what extent my research partly fills this void. My research also illustrates why profit shifting is not merely a decrease in corporate taxes and why, as a consequence, the existing literature on the incidence of corporate taxation is imperfect to fully fathom the impact of profit shifting.

4.1 From micro-level effects...

Profit shifting lessens the tax liability of MNEs. Given the abundant literature on the harmful effect of corporate taxes on the cost of capital and investment,

15. The case of Wal-Mart is quite famous. David Bullington, Wal-Mart's vice president for tax policy between 1994 and 2010, said that he felt pressured to decrease Wal-Mart's effective tax rate after Thomas Schoewe was appointed chief financial officer in 2000. According to him, Thomas Schoewe was familiar with "some very sophisticated and aggressive tax planning" and "rode herd on [them] all the time that [they] have the world's highest tax rate of any major company" (Drucker, 2007).

it is natural to conjecture that profit shifting bolsters MNEs' investments and innovation. The topic has still received little attention to this date, but evidence provided by Overesch (2009) and Buettner, Overesch, and Wamser (2018) validates this hypothesis. Looking at inbound investments in Germany, Overesch (2009) finds that investments of foreign MNEs in Germany increase with the tax differential between Germany and the parent country. The result is reminiscent of profit shifting. Foreign-owned MNEs with subsidiaries in Germany, a relatively high-tax country, have the opportunity to shift part of the profits made in Germany to the parent company. The tax saving opportunity confers a competitive advantage that lowers the cost of capital and spurs investments. In a sense, profit shifting decorrelates corporate taxes and investments. The statement applies to FDIs too. [16] By reducing the ETR ultimately paid by MNEs on the income generated by their affiliates, profit shifting compresses ETR differentials across countries (Casella and Souillard, 2022). The possibility to shift profits toward tax-friendly jurisdictions thus neutralizes the fiscal disadvantage of high-tax countries. The conclusion drawn by Buettner et al. (2018) lends credence to this view. They analyze how FDIs respond to tax rate differentials and observe that the implementation of TCRs reinforces the detrimental impact of corporate taxes on countries' attractiveness. [17] These mechanisms open up many intriguing discussions about investment and economic efficiency. They highlight a bright side of profit shifting that is not intuitive at first sight. They also hint that eliminating profit shifting could make location choices of MNEs more responsive to tax-related factors and entail more inefficiencies.

A series of papers explore the impact of profit shifting on other firm-level outcomes. For instance, Desai and Dharmapala (2009), Blaufus, Möhlmann, and Schwäbe (2019), and Hasan, Lobo, and Qiu (2021) show that profit shifting boosts firm value in some cases, whereas Kim, Li, and Zhang (2011) and Cao, Feng, Lu, and Shan (2021) show that it might increase stock price crash risk and stock return volatility. Perhaps more closely related to my dissertation, Krautheim and Schmidt-Eisenlohr (2016) question the impact of profit shifting on the wages paid by MNEs. They predict a negative effect of profit shifting on wages which surprisingly contrasts with what the literature in public economics and corporate taxation would normally

16. See Feld and Heckemeyer (2011) and Davies et al. (2021) for discussions on the effect of corporate taxes on FDIs.

17. See also Todtenhaupt and Voget (2021) and Prettl and von Hagen (2022) for similar discussions with transfer pricing and CFC rules, in the context of mergers and acquisitions. See Li, Ma, and Shevlin (2021) for anti profit shifting rules and corporate innovation.

posit. In standard models, the effect of corporate taxation on wages is studied through the lens of a collective bargaining framework. Firms hire workers to produce goods. The economic activity creates a surplus that is redistributed between the firm and its workers. The allocation of the surplus is achieved by a bargaining process. In the plain-vanilla version of the model, the wage agreed upon w hinges on three elements: the size of the surplus per worker S, the relative bargaining power of workers κ, and their outside options $\bar{w}$, i.e., what workers would get if they unilaterally withdraw from the negotiations. Formally (see chapter 4 for a more thorough description of the stylized model):

$$w = \bar{w} + \kappa S$$

According to Krautheim and Schmidt-Eisenlohr (2016), there are two opposite forces at play. First, in line with the corporate taxation literature, profit shifting increases the surplus S. This channel should improve wages all other things being equal. Second, profit shifting weakens the relative bargaining power of workers κ. Profits are relocated to OFCs and workers do not have perfect information about the surplus. Hence, workers accept to retain a lower share of the surplus not to put the firm at risk and to avoid a situation in which no production takes place. This channel counterbalances the first one. In total, the size of the pie increases, but the proportion of the pie that workers receive decreases. The overall effect depends on the magnitude of both mechanisms, and the second one dominates in the theoretical framework developed by Krautheim and Schmidt-Eisenlohr (2016).

4.2 ... to macroeconomic implications

Profit shifting of MNEs has not only micro-level consequences but also macro-level repercussions. At the industry level, a recent study performed by Martin, Parenti, and Toubal (2022) indicates that profit shifting alters competition. The competitive edge that it gives to the largest MNEs strengthens industry concentration. At the country level, the impact of profit shifting goes far beyond corporate income tax revenues. Shevlin, Shivakumar, and Urcan (2019) find that profit shifting and more generally tax planning fosters GDP and economic growth despite undermining tax revenues. They state that companies conduct more growth-oriented investments than public authorities. Therefore, lowering the corporate tax burden is a useful tool for stimulating macroeconomic growth. In addition, new contributions suggest that profit shifting biases multiple aggregate statistics. Guvenen et al. (2022) show

that outward profit shifting in the US mechanically inflates trade deficits, returns on FDIs, and labor shares, while driving down GDPs and productivity growth. Bricongne et al. (2021) find similar results in the case of France. The mismeasurement problem induced by profit shifting activities of MNEs has crucial implications given the importance of these metrics in the design and monitoring of governments' policies.

4.3 Contribution

The dissertation particularly resonates with the theoretical paper written by Krautheim and Schmidt-Eisenlohr (2016), according to which profit shifting deteriorates wages. Chapter 4 tests the empirical validity of this prediction and extends the model to delve into income inequalities. It reveals that profit shifting is indeed associated with lower wages for non-executive employees, i.e., the bulk of employees. The traditional literature on the incidence of corporate taxation is thus insufficient to rationalize the impact of profit shifting on wages and needs to be revisited. Importantly, the effect is not homogeneous across occupations. Although profit shifting depresses wages of non-executive employees, it raises the compensation of top executives such as chief executive officers (CEOs) and chief financial officers (CFOs). This discrepancy stems from the fact that the adverse effect of profit shifting on wages put forward by Krautheim and Schmidt-Eisenlohr (2016) is less plausible for executives, as they are those in charge of companies' business, financial, and tax operations.

1

The indirect effect of import competition on corporate tax avoidance

Solo-authored paper [*]

The role of competition in corporate tax avoidance is theoretically unclear in the literature. The present paper clarifies this role with an empirical study and a focus on import competition. The analysis shows that competition fosters corporate tax avoidance. Consistent with profit shifting behavior, it also shows that the positive effect of competition on corporate tax avoidance is driven by multinational enterprises already implanted in tax havens. Competitive pressures prompt these companies to invest in intangible assets to limit losses in sales and profits through differentiation. At the same time, intangibles facilitate tax-motivated income transfers toward offshore financial centers. The findings shed light on the determinants of corporate tax avoidance and profit shifting. More generally, they help understand the decline in the average effective tax rate of US-listed firms, the ongoing backlash against large corporations and globalization, and the recent calls for reform of the international tax system.

*. This chapter received the 2021 Award for Best Research Work on Investment and Development from the United Nations (UNCTAD) and the Academy of International Business (AIB). I would like to thank Micael Castanheira, Paola Conconi, Alexander Copestake, Ronald B. Davies, Jean Lacroix, Sébastien Laffitte, Glenn Magerman, Julien Martin, Maximilian Mayer, Mai Nguyen, Gaëtan Nicodème, Francesco Pappadà, Mathieu Parenti, Nadine Riedel, Farid Toubal, Gonzague Vannoorenberghe, Daniele Verdini, and three anonymous referees for valuable comments and suggestions. I would also like to thank Lorenzo Trimarchi for his help with the data and participants at various conferences, seminars, and workshops for insightful discussions. Funding from the F.R.S.-FNRS is gratefully acknowledged.

1 Introduction

Aggressive tax planning has become a salient concern due to repeated tax scandals, persistent budget deficits, and rising income inequalities. A specific group of enterprises is regularly accused of large-scale tax avoidance: multinational enterprises (MNEs). It is now well known that MNEs shift part of their profits to tax-friendly jurisdictions to lessen their tax burden (Dharmapala, 2014; Riedel, 2018; Beer et al., 2020). The phenomenon is remarkable. Up-to-date estimations suggest that between $300 billion and $1 trillion are artificially booked by MNEs in tax havens, where corporate income tax rates are near zero (Bolwijn et al., 2018; Tørsløv et al., 2021; Garcia-Bernardo and Janskỳ, 2022). In this context, identifying the factors influencing profit shifting and corporate tax avoidance is of foremost interest to both researchers and policymakers.

The present paper explores the determinants of corporate tax avoidance and more particularly examines the role played by competition. This role is unclear in the literature. Existing theories posit that corporate tax avoidance could either increase or decrease as competition toughens (Marrelli and Martina, 1988; Goerke and Runkel, 2011). I revisit this topic with an empirical analysis and demonstrate that competition spurs corporate tax avoidance. Furthermore, the effect is indirect and essentially driven by MNEs already implanted in tax havens. MNEs do not widen their network of subsidiaries in offshore financial centers (OFCs)[2] in response to a competition shock. They invest in intangible assets to better cope with competitive pressures and minimize losses in sales and profits. At the same time, these assets fuel the profit shifting activities of MNEs established in OFCs.

To come to these conclusions, I exploit the rise of exports from China and scan the financial statements of US-listed firms. A strand of economic research pioneered by Autor, Dorn, and Hanson (2013) documents the repercussions of the surge in Chinese exports initiated in the 1990s. The so-called China shock was a sizable import competition shock. The penetration ratio of US imports from China in manufacturing increased sixfold within only 15 years, with notable disparities across sectors. Besides its magnitude, this episode makes it possible to use a quasi-natural experiment. The US granting Permanent Normal Trade Relations (PNTR) status to China in 2000 generated exogenous variations in Chinese import competition and allows a causal interpretation of the results. In parallel, a

2. "Tax havens" and "offshore financial centers" are used interchangeably throughout the paper.

stream of research in accounting attempts to measure corporate tax avoidance. Quantifying corporate tax avoidance is challenging because it is unobserved. To this end, scholars usually resort to balance sheets, income statements, and cash flows (Hanlon and Heitzman, 2010).[3] Building on this literature, I construct four indicators of tax aggressiveness for US-listed manufacturing firms between 1990 and 2005. I scrutinize the evolution of (i) the ratio of income taxes to pre-tax income, (ii) the ratio of current income taxes to pre-tax income, (iii) the ratio of cash income taxes paid to pre-tax income, and (iv) the ratio of cash income taxes paid to operating cash flows. Lower values are associated with higher tax avoidance, and these variables are standard not only in accounting but also in economics and finance (e.g., Dyreng, Hanlon, Maydew, and Thornock, 2017; Suárez Serrato, 2019). Moreover, they encompass conforming, non-conforming, permanent, and temporary strategies. They thus reflect multiple tax avoidance techniques.

The analysis starts with three stylized facts. First, Chinese import competition and corporate tax avoidance exhibit a positive correlation. While the penetration ratio of US imports from China continuously increased between 1990 and 2005, the indicators of corporate tax avoidance fell in the meantime. Second, the China shock accentuated the sales slump of domestic firms and slowed the rise in sales of MNEs. Third, sales, pre-tax income, and effective tax rates are positively correlated. It implies that a positive correlation between changes in Chinese import competition and changes in corporate tax avoidance variables could in fact be spurious.

These observations naturally raise the following question: Did Chinese import competition really drive corporate tax avoidance upward? I first regress each of the four tax avoidance variables on the penetration ratio of US imports from China in the output market. The regressions are run with ordinary least squares (OLS), and a set of control variables neutralizes the effect of confounding factors. A 1 percentage point increase in the penetration ratio of US imports from China is associated with a decrease of about 0.2 percentage point in each of the four tax avoidance variables. The baseline results are highly robust. They are corroborated by several econometric models and hold with more recent data. The tax avoidance proxy developed by Henry and Sansing (2018) also gives consistent results. It preserves the advantages of effective tax rates while remedying their main

3. See also Frank, Lynch, and Rego (2009), Henry and Sansing (2018), Badertscher, Katz, Rego, and Wilson (2019), and De Simone, Nickerson, Seidman, and Stomberg (2020).

weaknesses. On the same note, leveraging imports from China of eight other high-income countries as an instrument to better capture the supply-driven changes in Chinese import competition and replicating the analysis with Mexican import competition yield comparable results. Importantly, integrating the US conferral of PNTR status on China in October 2000 in a difference-in-differences (DiD) setting delivers the same conclusions. The motive for this approach is threefold. (i) The granting considerably invigorated China's exports to the US by removing tariff rate uncertainty. According to Handley and Limão (2017), this event is responsible for a third of the boom in China's exports to the US between 2000 and 2005. (ii) All manufacturing sectors were not equally exposed to trade policy uncertainty prior to the shock. Trade policy uncertainty mostly depended on sector-specific policy decisions made seventy years earlier, in 1930, so the treatment is plausibly exogenous (Pierce and Schott, 2016). (iii) Throughout the decade preceding the shock, tariff rate uncertainty was relatively stable and tax avoidance evolved independently from policy uncertainty. Hence, the results cannot be imputable to pre-existing trends.

Next, I proceed in two steps to clarify the mechanism. The first step separates MNEs and domestic firms to test for heterogeneous effects. MNEs have opportunities that domestic companies cannot seize. Through various techniques, they can move profits from affiliates based in high-tax countries to others in low- or no-tax jurisdictions. We thus expect stronger effects for MNEs, especially for MNEs having subsidiaries in tax havens. The results show no significant impact of import competition on tax avoidance among domestic firms. The fact that the effect is statistically significant solely for MNEs and more pronounced for those physically established in OFCs is reminiscent of profit shifting. The second step investigates how MNEs intensified their tax avoidance practices in response to the China shock. Particular attention is paid to intangible assets. On the one hand, previous studies find that intra-firm royalty payments are massively used for profit shifting purposes (Heckemeyer and Overesch, 2017; Beer et al., 2020). MNEs transfer intellectual property rights to no- or low-tax countries to deflate (inflate) the profits registered in high(low)-tax countries and thereby reduce their average effective tax rate. On the other hand, Bloom et al. (2016), Gutiérrez and Philippon (2017), and Hombert and Matray (2018) conclude that the China shock increased innovation, technical change, product differentiation, and investments in intangibles by industry leaders. Drawing on these papers, I check whether import competition fosters tax aggressiveness indirectly through intangible assets,

and I provide strong evidence to support this hypothesis. (i) The effect of Chinese import competition on tax avoidance becomes statistically insignificant when intangible assets are controlled for, hinting that the China shock had no direct impact on tax avoidance conditional on intangibles. (ii) Intangible assets reduce the corporate income taxes paid by MNEs based in tax havens. The pattern does not apply to other companies with similar fundamentals and confirms the use of intangibles as a tool to shift profits across borders. (iii) The China shock made MNEs invest in intangible assets, and these investments were again more remarkable for MNEs involved in OFCs. This is in line with the aforementioned papers and the view that MNEs undertaking profit shifting activities are the most performing companies. (iv) Finally, sales of firms that were intensive in intangibles suffered from the China shock to a lesser extent; and MNEs operating in the most import-competitive sectors did not expand their network of subsidiaries in OFCs, despite a sharp increase in US-listed firms' operations in tax havens during the 2000s (Souillard, 2022b). All in all, the results indicate that the rise in tax avoidance is an indirect effect of import competition. The China shock pushed MNEs to invest in intangible assets in order to escape competition, and these assets facilitated their income shifting activities.

The findings have three policy implications. They cast light on the decline in the average effective tax rate of US-listed firms (Dyreng et al., 2017). Back-of-the-envelope computations show that the average effective tax rate in 2005 could have been 1.5 percentage point higher in absence of the China shock. More generally, this paper underscores a controversial side of globalization. Globalization stimulates innovation in leading firms close to the technological frontier. Yet, the present paper argues that competitive pressures can indirectly accentuate their tax avoidance. It is worth noting that tax avoidance practices did not seem pivotal for firm survival since they thrived exclusively among the most performing companies, namely MNEs. The findings could then partly explain the current backlash against globalization and large corporations (Helpman, 2017; Ravallion, 2018; Rodrik, 2018; Walter, 2021). Lastly, they emphasize that import competition and corporate taxes are closely connected. The current international tax system was designed long before the recent globalization, i.e., when economic activities were carried out differently. This inadequacy engenders loopholes, mismatches between tax systems, and other opportunities to aggressively save taxes. From this perspective, the paper reaffirms the need to better articulate fiscal and trade policies.

Related literature The paper lies at the intersection of two separate lines of research. A flourishing literature studies the causes and methods of corporate tax avoidance. In particular, compelling evidence shows that MNEs transfer part of their profits to low-tax countries by distorting transfer prices (Swenson, 2001; Clausing, 2003; Cristea and Nguyen, 2016; Davies et al., 2018b), strategically locating intellectual property rights (Dischinger and Riedel, 2011; Karkinsky and Riedel, 2012; Griffith et al., 2014; Alstadsæter, Barrios, Nicodème, Skonieczna, and Vezzani, 2018), and by means of intra-firm loans and interest payments (Egger et al., 2010a; Buettner and Wamser, 2013), treaty shopping (Hong, 2018), and corporate inversions (Desai and Hines, 2002). I refer the reader to Dharmapala (2014), Riedel (2018), and Beer et al. (2020) for surveys on profit shifting and Alm (2019) and Wang et al. (2020) for reviews on the determinants of corporate tax avoidance. The present paper adds to this literature in two different ways. First, it offers greater insight into the impact of competition on corporate tax avoidance. The latter is in theory ambiguous. Marrelli and Martina (1988) predict a negative effect. According to the authors, competition should moderate tax avoidance in a world where agents have decreasing absolute risk aversion. Goerke and Runkel (2011) claim otherwise. The amount of taxes avoided by each firm is constant. But because sales and profits wane when competition toughens, tax avoidance increases in relative terms. Cai and Liu (2009) and Gokalp et al. (2017) empirically look at the effect of competition on tax evasion/avoidance and reach conclusions in favor of Goerke and Runkel (2011). The present paper focuses on profit shifting[4] and uncovers a novel mechanism. It differs from Goerke and Runkel (2011) in the sense that the China shock did not stir up the tax avoidance practices of domestic companies, for which profits dropped over the period. Here, the effect is indirect and passes through MNEs' intangibles. Second, the paper complements the findings of Martin et al. (2022). They find that tax avoidance creates a competitive edge that amplifies industry concentration. The relationship between competition and corporate tax avoidance is thus two-way.

Another range of papers investigate the consequences of the China shock. They

4. Tax *evasion* and tax *avoidance* are not equivalent. Tax evasion is undoubtedly informal and illegal, whereas tax avoidance is legal or falls in a grey area between legality and illegality. Unlike tax evasion, tax avoidance requires deep knowledge of the tax code and financial resources. The distinction is thus crucial because firms evading taxes and those avoiding taxes are very different. Small and medium-sized enterprises are more prone to engage in tax evasion, and large firms are more likely to turn to tax avoidance. More specifically, only the largest and most performing MNEs are able to undertake profit shifting activities (e.g., Langenmayr, 2015; Gumpert et al., 2016; Jones et al., 2018).

reveal labor market effects (Autor et al., 2013; Mion and Zhu, 2013; Utar and Ruiz, 2013; Utar, 2014; Acemoglu, Autor, Dorn, Hanson, and Price, 2016; Pierce and Schott, 2016) and repercussions on firm product scope, factor reallocation (Iacovone, Rauch, and Winters, 2013; Chakraborty and Henry, 2019), innovation (Bloom et al., 2016; Hombert and Matray, 2018), productivity (Chen and Steinwender, 2021), and prices (Bai and Stumpner, 2019; Amiti, Dai, Feenstra, and Romalis, 2020). In this regard, my results on investments in intangibles resonate and concur with those of Bloom et al. (2016), Gutiérrez and Philippon (2017), and Hombert and Matray (2018). They highlight one of the downsides of the China shock and trade-induced competition at the same time. Although import competition encourages firms to innovate and move up the quality ladder, it also indirectly exacerbates MNEs' profit shifting practices.

The article is decomposed into six sections. Section 2 introduces the data and section 3 lays out three stylized facts on import competition and corporate tax avoidance. Section 4 then outlines the econometric strategy and baseline results. Section 5 discusses the profit shifting channel and the role of intangible assets. Section 6 briefly concludes.

2 Data

To conduct the analysis, I assemble an unbalanced panel dataset of publicly listed manufacturing firms headquartered in the US operating between 1990 and 2005. This section describes the data sources, the main variables, and the final sample.

2.1 Sources and main variables

The dataset comprises both firm- and industry-level data. Firm-level data originate from Compustat North America, and industry-level data are obtained from the NBER-CES Manufacturing Industry Database and Schott (2008).

Firm-level data Compustat North America gives rich information on consolidated balance sheets (assets, liabilities, and equity), income statements (revenues, costs, and expenses), and cash flows of publicly held companies in North America since 1950. Despite representing a small share of all firms, publicly listed firms account for an important share of total employment, sales, and pre-tax profits (Asker,

Farre-Mensa, and Ljungqvist, 2014). They are the largest and the most productive companies, and therefore the most likely to engage in multinational activities and aggressive tax planning (e.g., Helpman et al., 2004; Langenmayr, 2015; Gumpert et al., 2016; Jones et al., 2018).

The information is used to construct four firm-year-specific indicators of corporate tax avoidance: (i) the ratio of income taxes to pre-tax income, i.e., the effective tax rate (*ETR*), (ii) the ratio of current income taxes to pre-tax income (*ETR*2), (iii) the ratio of cash income taxes paid to pre-tax income (*CASHETR*), and (iv) the ratio of cash income taxes paid to operating cash flows (*CFM*). Exact formulas with Compustat codes are attached in Appendix table 1.A1. Lower *ETR*, *ETR*2, *CASHETR*, and *CFM* values are associated with higher tax avoidance. The rationale for using cash income taxes in addition to tax expenses is that accounting rules (e.g., Generally Accepted Accounting Principles and International Financial Reporting Standards) generally differ from tax rules. That is why cash income taxes do not always align with income tax expenses. Note that information on taxes paid is a crucial advantage of Compustat over Orbis, another database extensively used in the tax avoidance literature where only accounting effective tax rates can be computed. Operating cash flows, for their part, depict firms' economic activities. They can be compared to accounting earnings to determine whether earnings are manipulated for tax purposes.

The four proxies have three key advantages. First, they have an intuitive interpretation. *ETR* is the simplest and will be the preferred variable in the rest of the paper. Second, they are the most popular in accounting, economics, and finance (e.g., Donohoe, 2015; Cen et al., 2017; Dyreng et al., 2017; Blaufus et al., 2019; Suárez Serrato, 2019; Wang et al., 2020). [5] Lastly, they cover conforming, non-conforming, permanent, and temporary tax avoidance strategies, [6] thereby giving an overall snapshot of corporate tax avoidance. Table 1.1 confirms this complementarity and shows

5. Book-tax differences and unrecognized tax benefits are sometimes used as alternatives. US firms are required to report unrecognized tax benefits as of 2006. In addition, although firms with negative profits are routinely excluded in the accounting literature, potentially biasing the results, this is not the case here as long as the tax avoidance indicator lies between 0 and 1. Hence, 75 percent of loss-making firms remain in the baseline sample. For more discussions on the measurement of corporate tax avoidance, see Hanlon (2003), Lev and Nissim (2004), Dyreng, Hanlon, and Maydew (2008), Dyreng et al. (2010), Hanlon and Heitzman (2010), Guenther (2014), Henry and Sansing (2018), Badertscher et al. (2019), De Simone et al. (2020), and Wang et al. (2020).

6. Non-conforming tax avoidance refers to strategies affecting taxable income but not financial income. Conforming tax avoidance impacts taxable *and* financial income. Then, *ETR* (for example) cannot capture conforming tax avoidance by construction.

Table 1.1 – Correlation between tax avoidance variables

	ETR	*ETR2*	*CASHETR*	*CFM*
ETR	1.00			
ETR2	0.53	1.00		
CASHETR	0.26	0.41	1.00	
CFM	0.20	0.27	0.64	1.00

Notes: This table reports the average within-firm correlation coefficients between the four tax avoidance variables defined in section 2. For a firm-year observation to be included in the computation of a correlation coefficient, the two tax avoidance variables must lie in the [0,1] interval. See section 2 for more details.

that the metrics simultaneously absorb a mix of common and uncommon features of corporate tax avoidance. One caveat is that the metrics can fluctuate regardless of tax dodging strategies. To mitigate this and precisely identify the effect of import competition on aggressive tax planning, factors determining tax liability like tax loss carryforward will be controlled for in the econometric exercise. Other concerns have been raised in the recent accounting literature regarding the power of tax avoidance indicators based on effective tax rates. It should be noted, however, that using the newly popular proxy of Henry and Sansing (2018) gives coherent results. [7]

Industry-level data I supplement these data with industry data at the 4-digit 1987 SIC level from the NBER-CES Manufacturing Industry Database and Schott (2008). The NBER-CES Manufacturing Industry Database contains industry-level annual output, employment, payroll and other input costs, investment, capital stock, total factor productivity, and prices in the US from 1958 to 2018. The database built by Schott (2008) provides annual US trade flows from 1972 to 2005. Combined, they allow for the calculation of the penetration ratio of US imports from China *IMP*, i.e., the ratio of US imports from China to US domestic demand, for each industry *j* and year *t*: [8]

$$IMP_{jt} = \frac{Imports_{jt}^{China,US}}{Shipments_{jt}^{US} + Imports_{jt}^{World,US} - Exports_{jt}^{US,World}}$$

7. Appendix figure 1.A10 reproduces the key results and ascertains the findings.

8. A caveat is that the value of US imports from China might be undervalued due to tariff evasion at the US customs. According to Ferrantino, Liu, and Wang (2012), the under-reporting was not always statistically significant and, if anything, did not exceed 5 percent.

$Imports_{jt}^{China,US}$ symbolizes US imports from China in industry j and year t, $Imports_{jt}^{World,US}$ symbolizes total US imports in industry j and year t, $Exports_{jt}^{US,World}$ symbolizes total US exports in industry j and year t, and $Shipments_{jt}^{US}$ symbolizes US production in industry j and year t. The ratio varies over time and across industries, even among similar products. In 2005, for instance, the penetration ratio of Chinese imports of hardwood veneer and plywood products (SIC 2435) was 12 percent, i.e., about twice the average, while the ratio for softwood veneer and plywood products (SIC 2436) was 40 times smaller. Owing to data limitations, multi-sector firms principally operating in the same industry j are considered to be equally exposed to Chinese import competition, i.e., $IMP_{ijt} = IMP_{jt} = IMP_{it}$ for all firm i mainly active in sector j in year t.

2.2 Sample

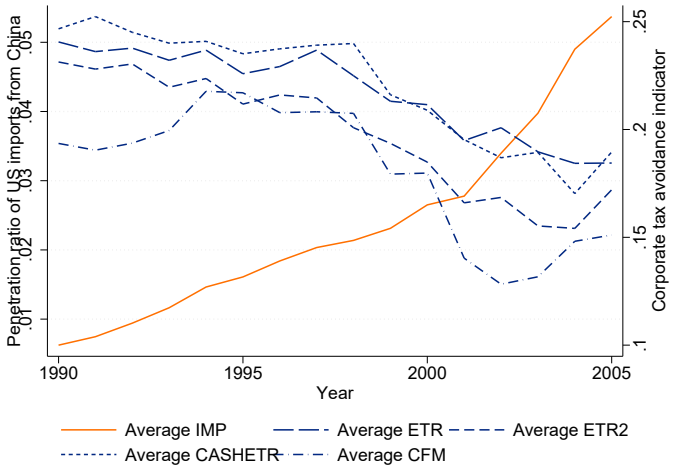
Only a subsample of the dataset described above is used for the study. I remove companies whose headquarters are not located in the US for comparability and exclude observations before 1990. The 1990s mark the onset of the Chinese export boom. The share of Chinese exports in total world exports grew from 0.6 percent to 1.1 percent between 1970 and 1990 and then rose rapidly to 8.5 percent in 2010 (see Appendix figure 1.A1). In section 4, we will also see that the 1990-2005 period is ideal to exploit the US granting PNTR status to China in 2000 as a quasi-natural experiment. I finally restrict the sample to manufacturing firms since manufacturing products represented the lion's share of Chinese exports during that period, and there is substantial variation in *IMP* across manufacturing sectors.[9] In total, the benchmark subsample consists of an unbalanced panel of 51,791 firm-year observations, with 5,739 firms operating in 218 industries between 1990 and 2005, 1,087 of which operated over the entire time span.

3 First evidence on import competition and corporate tax avoidance

The dataset uncovers three facts: (i) Chinese import competition and corporate tax avoidance are positively correlated, (ii) the China shock reinforced the decline in sales of domestic firms and tempered the increase in sales of MNEs, and (iii) effective tax rates, sales, and pre-tax income move in the same direction.

9. The second argument justifies the non-use of services as a comparison group.

Figure 1.1 – Import competition and corporate tax avoidance: macro-level evidence



Notes: This figure plots the average penetration ratio of US imports from China (*IMP*, left *y*-axis) and the mean value of each of the four corporate tax avoidance variables (*ETR*, *ETR*2, *CASHETR*, and *CFM*, right *y*-axis) between 1990 and 2005. For the latter, lower values are associated with higher tax avoidance and firm-year observations are set as missing if the tax avoidance variable lies outside the [0,1] interval. See sections 2 and 3 for more details.

Stylized fact 1: The rise in Chinese import competition was accompanied by an increase in corporate tax avoidance.

Figure 1.1 plots the average penetration ratio of US imports from China and the mean value of the four tax avoidance variables between 1990 and 2005. For interpretability and as is customary in the field, firm-year observations are set as missing if the tax aggressiveness variable lies outside the $[0, 1]$ interval. The competition variable continuously increased throughout the period. On the contrary, the indicators of corporate tax avoidance fell, in line with Dyreng et al. (2017). In Appendix table 1.A2, the correlation is found to be statistically significant at the 1 percent level with just 16 data points. A 1 percentage point increase in the average import penetration ratio is associated with a 1.36 percentage point decrease in the average *ETR*, a 1.79 percentage point decrease in the average *ETR*2, a 1.47 percentage point decrease in the average *CASHETR*, and a 1.40 percentage point decrease in the average *CFM*. The correlation persists at the industry level as outlined in Appendix table 1.A3. It should be noted that the four metrics of tax avoidance appear relatively low (compared to US statutory tax rates) and

somewhat volatile. This is because some firms have very low effective tax rates (see Appendix figures 1.A2 and 1.A3). Appendix table 1.A4 shows that the negative correlation still holds when this downward bias is corrected, and I will tackle the volatility issue later in the econometric analysis.

Stylized fact 2: Chinese import competition curtailed sales growth. In particular, it deepened the sales slump of domestic firms and dampened the sales increase of MNEs.

Appendix figure 1.A4 brings sales into the picture and reveals that they remarkably doubled during this time, notwithstanding growing Chinese import competition. Nonetheless, the increase in total sales was fueled primarily by the increase in MNEs' sales. Domestic firms' sales, by contrast, dwindled by 22 percent.[10] Appendix table 1.A5 proves that the China shock aggravated the contraction of domestic firms' sales and slowed the rise of MNEs' sales. Sales are regressed on *IMP*, an MNE dummy, and a set of firm and year fixed effects. The coefficient associated with *IMP*, negative, reflects the China shock's harmful impact on sales.[11] The same applies to pre-tax income (see Appendix table 1.A5). The negative correlation is clear in Appendix figure 1.A5. The graph exhibits the distribution of the growth rate of domestic firms' sales at the sector level. Sectors are divided into three groups of equivalent size based on exposure to the rising Chinese import competition. Growth rates are concentrated around -50 percent for the third tercile, composed of the sectors most exposed to rising Chinese import competition (transportation equipment, industrial machinery and equipment, electronic and other electric equipment). The distribution is flatter and shifts to the right for the second tercile. It shifts even further for the first tercile.

Stylized fact 3: Effective tax rates and sales/pre-tax income are positively correlated.

Appendix figure 1.A6 examines the relationship between effective tax rates and sales/pre-tax income. The *y*-axis represents the effective tax rate, and the *x*-axis represents either sales (left, in logarithm) or pre-tax income (right, in logarithm). The figure depicts a positive correlation in both cases and barely changes if sales

10. These figures correspond to *aggregate* sales. They are qualitatively the same for *average* sales.

11. The negative impact holds for both domestic and multinational enterprises. When allowing for heterogeneous effects, *IMP* becomes significant at the 10 percent level and the interaction term $IMP \times MNE$ appears negative (although statistically insignificant at standard levels).

and pre-tax income are expressed in levels. The slope of the linear fit curve in the first graph indicates that a 10 percentage point increase in sales translates into a 0.37 percentage point increase in the effective tax rate. The slope in the second graph indicates that a 10 percentage point increase in pre-tax income translates into a 0.10 percentage point increase in the effective tax rate. This pattern means that the negative correlation between effective tax rates and Chinese import competition is potentially attributable to the losses in sales induced by the China shock. In the ensuing sections, I will rule out the mechanical effect of import competition on tax avoidance variables passing through sales and pre-tax income by integrating these two variables into the vector of covariates. Interestingly, we will see that Chinese import competition only decreased the effective tax rate of MNEs, for which sales thrived.

4 Causal effect of import competition on corporate tax avoidance

This section goes beyond correlations and provides robust evidence of a positive and causal effect of import competition on corporate tax avoidance. I start with OLS estimates. Next, I address sensitivity and endogeneity concerns.

4.1 Baseline estimates

I assess the effect of import competition on corporate tax avoidance with the following model:

$$CTA_{ijt} = \beta IMP_{jt} + \delta X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \tag{1.1}$$

CTA_{ijt} is the tax avoidance variable for firm i mainly operating in industry j in year t.[12] IMP_{jt} gauges Chinese import competition in sector j and year t. X_{ijt} is a vector of firm-year controls. It includes firms' characteristics related to tax liability and avoidance in the literature: sales, pre-tax income, assets, tax loss carryforward, profitability, leverage, market power, inventories, market-to-book ratio, and multinational operations.[13] Controls are coupled with firm fixed effects μ_i and year dummies ν_t.

12. j is constant in the Compustat Historical Segments.
13. Including sales, profits, and assets in absolute terms or logarithm does not alter the results.

X_{ijt}, μ_i, and ν_t encompass a wide array of confounding factors. For example, ν_t neutralizes global trends in US tax rates and tax avoidance as well as macroeconomic shocks. μ_i accounts for persistent differences in CTA_{ijt} across industries and firms. Among other things, the presence of sales and profits in X_{ijt} adjusts for firm size and purges the potential effect of policies targeted toward the firms which were the most affected by the China shock. The firm-year MNE dummy embedded in X_{ijt} absorbs to some extent differences in tax rates between the US and the other countries where MNEs are located. Note that because the variable is year-specific, it broadly captures changes in CTA_{ijt} ascribable to a reshuffling of US MNEs' activities across borders and the effect of the check-the-box regulations enacted in 1997, accused by specialists of having facilitated MNEs' tax avoidance through hybrid entities.

Table 1.2 displays the results of equation (1.1) for the four tax aggressiveness variables, with and without covariates. For the sake of clarity, I focus on the coefficient of interest β and solely report $\hat{\beta}$ in the regression tables. Consistent with the primary evidence presented in section 3, $\hat{\beta}$ is negative and statistically significant. The coefficients remain significant when controls are introduced so the correlation is not spurious. They range from -0.18 to -0.26 with controls. All other things being equal, a 1 percentage point hike in the penetration ratio of US imports from China is associated with a 0.20 percentage point reduction in *ETR*, a 0.18 percentage point reduction in *ETR*2, a 0.18 percentage point reduction in *CASHETR*, and a 0.26 percentage point reduction in *CFM*. In untabulated results, a composite index PCA_{ijt} is constructed with a principal component analysis. The synthetic tax avoidance variable is then transformed to lie between 0 and 1 via a min-max normalization. Replacing CTA_{ijt} by PCA_{ijt} in equation (1.1) gives $\hat{\beta}$ = -0.25, with a standard error equal to 0.04.

4.2 Robustness

Appendix table 1.A6 gauges the robustness of the results. Panel A shows that deleting outliers does not affect the findings. I start by winsorizing the right-hand-side variables at the 2.5 and 97.5 percentiles to guarantee that the estimates are not driven by extreme values of the independent variables (panel A1), and I eliminate firm-year data points with negative profits as is occasionally done in the accounting literature (panel A2). Next, firms not operating over the entire time

Table 1.2 – Effect of import competition on corporate tax avoidance: baseline results

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	ETR_{ijt}		$ETR2_{ijt}$		$CASHETR_{ijt}$		CFM_{ijt}	
IMP_{jt}	-0.21^{a}	-0.20^{a}	-0.29^{a}	-0.18^{b}	-0.36^{a}	-0.18^{a}	-0.54^{a}	-0.26^{a}
	(0.03)	(0.03)	(0.08)	(0.07)	(0.07)	(0.04)	(0.09)	(0.06)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Firm FEs	No	Yes	No	Yes	No	Yes	No	Yes
Year FEs	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.00	0.20	0.00	0.21	0.00	0.13	0.00	0.12
No. of obs.	27,607	23,097	26,477	22,286	18,995	16,688	19,581	16,584

Notes: This table reports the results of equation (1.1) obtained with OLS. The four dependent variables (*ETR*, *ETR2*, *CASHETR*, and *CFM*) measure corporate tax avoidance at the firm-year level. Lower values are associated with higher tax avoidance. *IMP* is the penetration ratio of US imports from China at the industry-year level. In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

span (panel A3) and firms involved in a merger and acquisition operation (panel A4) are excluded to leave any compositional effect aside. [14] In all four cases, the results coincide with table 1.2 in terms of both magnitude and statistical significance.

Panel B verifies that the addition of covariates does not alter the results. One caveat is that *IMP* could pick up not only Chinese import competition but more broadly ongoing industry trends in globalization. To isolate the impact of import competition, equation (1.1) is augmented with six industry-year specific variables in panel B1: US exports to China, US total exports (from Schott, 2008), Chinese import tariffs (from Pierce and Schott, 2016), the penetration ratio of US imports from other foreign countries (from Schott, 2008), the intensity of Chinese import competition in the input market, and the average statutory tax rate faced by US-listed companies. The intensity of Chinese import competition in the input market for sector j and year t is given by $\sum_k \lambda_{kj} IMP_{kt}^{2-digit} / \sum_k \lambda_{kj}$. $\lambda_{kj} / \sum_k \lambda_{kj}$ is the share of inputs from sector k used in the production of goods in sector j. The λ shares are calculated using input-output tables at the 1987 SIC 2-digit level for

14. Firms first appear in Compustat two or three years before the initial public offering. Exits are of different types: merger and acquisition (M&A), bankruptcy, liquidation, reverse acquisition, leveraged buyout, etc. M&A transactions are the major cause of exits, and how Compustat treats the survivor depends on the method of acquisition.

1992 from the Bureau of Economic Analysis (BEA). The statutory tax rate faced by US-listed companies is given by $\sum_c SUBS_{ict} STR_{ct} / \sum_c SUBS_{ict}$. $SUBS_{ict}$ denotes the number of subsidiaries disclosed by firm i in country c and year t (from Exhibit 21 files, described in the next section) and STR_{ct} denotes the statutory tax rate in country c and year t (from the Tax Foundation). In panel B2, I rerun the regression with three more industry-year variables measuring sales of affiliates of US MNEs in China, the share of intra-firm exports to China, and the share of intra-firm imports from China. They come from the US Direct Investment Abroad (USDIA) database of the BEA and the Related Party Trade (RPT) database of the Census Bureau. The equation is estimated separately from panel B1 because the data are only available from 2000 onward. Similarly, I extend the set of dummies in panels B3, B4, and B5. Year dummies are replaced with state-year and state-year-MNE status dummies in panels B3 and B4. These regressions better take into account corporate tax reforms implemented in the US state of incorporation over the study period. Panel B5 introduces a set of 2-digit SIC industry-year dummies into equation (1.1). Again, the coefficients in panel B match those obtained in table 1.2.

In panel C, alternative specifications yield the same results. The exercise performed in panel C1 replicates equation (1.1) at the SIC 3-digit level. The number of observations in table 1.2 is small compared to the total number of firm-year observations in the dataset (51,791). This drop stems from two things. First, it is impossible to construct *ETR* and *ETR*2 for 10 percent of firm-year observations and *CASHETR* and *CFM* for 20 percent of firm-year observations, and firm-year observations with a dependent variable lying outside the [0,1] interval are dropped for interpretability (around 15 percent of the restricted sample). Second, some firms report a SIC 3-digit code instead of a 4-digit code and do not appear in table 1.2. In panel C1, these missing values are imputed with the penetration ratio of US imports from China at the 3-digit level. The coefficients tend toward zero because the competition variable is less precise, but they remain statistically significant overall. In panel C2, the 1990-2005 period is split into four four-year subperiods. Equation (1.1) is estimated with long-run tax avoidance variables (sum of the numerator across years divided by the sum of the denominator across the same years) and four-year averages of the independent variables. The reason, as mentioned in section 3, is that tax avoidance variables are volatile. There is no consensus in the literature on the use of annual or multi-year tax avoidance variables. On the one hand, Dyreng et al. (2008) recommend computing long-run values to smooth transient shocks. On the other hand, these long-run values

abstract from temporary strategies, and around 70 percent of managers surveyed by Hoopes, Mescall, and Pittman (2012) report being able to change tax positions within one year (see also De Simone et al., 2020). Nevertheless, I find evidence of a positive effect of import competition on corporate tax avoidance with either approach. The results are also robust to using sixteen-year differences (panel C3).

Lastly, panel D carries out a falsification test and tackles external validity. In panel D1, I assign each firm to a random industry j' and substitute IMP_{ijt} with $IMP_{ij't}$ to give confidence that equation (1.1) truly estimates the effect of import competition in the industry in which firms are active. The estimates – statistically not different from zero as expected – reinforce the results in table 1.2. In panel D2, the sample coverage is extended to 2014 and the coefficients stay negative and statistically significant.

4.3 Endogeneity

The right-hand-side variables have thus far been treated as exogenous in equation (1.1). Yet, they may be endogenous for diverse reasons.

Two concerns pertain to reverse causality and bad controls (Angrist and Pischke, 2009). Firm-specific control variables X_{ijt} could be affected by tax aggressiveness, Chinese import competition, or both. The coefficient of interest would be biased in the two situations. To alleviate this, table 1.3 panel A reproduces the results of table 1.2 when all variables in X have predetermined values. I employ one-year lags in panel A1 and two-year lags in panel A2, and the results are consistent.

Another reason why the results in table 1.2 could be biased is that changes in the penetration ratio of US imports from China are ascribable to both supply- and demand-side shocks. I proceed with a two-stage least squares (2SLS) estimation to extract the supply-driven changes in Chinese import competition. Building on Autor et al. (2013), Iacovone et al. (2013), and Chakraborty and Henry (2019), I instrument the penetration ratio of US imports from China by the average share of Chinese imports in total imports among eight other high-income countries (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland). Panel B1 shows that the instrument has power. The F-statistic in the first stage is always greater than 29 and above the range of Stock and Yogo (2005)'s critical values. Panel B2 reports the results obtained in the second stage and

shows that, if anything, the baseline coefficients outlined in table 1.2 downplay the effect of import competition on corporate tax avoidance. Following the same line of reasoning, I look at the effect of Mexican import competition and use the average share of imports from Mexico of the same set of high-income countries as an instrument. Mexico is another suitable candidate insofar as the average penetration ratio of US imports from Mexico in manufacturing increased threefold between 1990 and 2005. The results are attached in Appendix table 1.A7 and are qualitatively unchanged. The identification in panel B2 relies on three assumptions. (i) High-income countries are exposed to the supply-driven growth of exports from China in a comparable way, (ii) increasing returns to scale in Chinese manufacturing are moderate, and (iii) demand shocks are uncorrelated across high-income economies. Although the literature suggests that a significant part of the rise of China's total exports during that period comes from the supply-side – due to the progressive dismantling of state-owned companies, the gradual removal of barriers to foreign investments, and, later, entry into the World Trade Organization (WTO) in 2001 (Brandt, Ma, and Rawski, 2014) – we cannot categorically reject that demand shocks are correlated across countries. In the same vein, the exclusion restriction can be debated for MNEs.

To overcome these shortcomings, an alternative strategy exploits a quasi-natural experiment: the US conferral of PNTR status on China in late 2000. US imports from non-market economies are normally subject to higher tariff rates called non-normal trade relations (NNTR) tariff rates. However, the US Trade Act of 1974 allows US presidents to grant most favored nation (MFN) tariff rates to non-market economies on an annual basis and upon approval by the US Congress. That explains why China's exports to the US were subject to normal trade relations (NTR) tariffs (equivalently, MFN tariffs) between 1980 and 2000, despite China being a non-market economy. The annual renewal generated substantial uncertainty after the Tiananmen Square protests in 1989. While the renewal was nearly automatic in the 1980s, the House of Representatives tried to revoke this temporary status multiple times in the 1990s. These threats were taken seriously (Pierce and Schott, 2016). In 1990, 1991, and 1992, for instance, more than 50 percent of votes in the House of Representatives were against the renewal. Public opinion as well seemed against it. Gallup polls found that 13 percent of Americans expressed a very or mostly unfavorable view of China months before the Tiananmen incidents. This share suddenly increased and remained above 50 percent throughout the 1990s.[15] Other surveys

15. See `https://news.gallup.com/poll/1627/china.aspx`.

Table 1.3 – Effect of import competition on corporate tax avoidance: endogeneity

Column	(1)	(2)	(3)	(4)
Dependent variable	*ETR*	*ETR2*	*CASHETR*	*CFM*
Panel A: lagged controls				
A1. One-year lags	-0.21^a	-0.16^b	-0.19^a	-0.30^a
A2. Two-year lags	-0.21^a	-0.14^d	-0.19^a	-0.27^a
Panel B: 2SLS à la Autor et al. (2013)				
B1. First stage results: IMP_{jt} on instrument				
Point estimate	0.63^a	0.63^a	0.62^a	0.63^a
F-statistic	32.65	33.16	29.12	30.23
B2. Second stage results: CTA_{ijt} on $\widehat{IMP}_{jt}$				
Point estimate	-0.31^a	-0.28^b	-0.28^a	-0.37^a
Panel C: PNTR as a quasi-natural experiment	-0.06^b	-0.08^c	-0.01	-0.07^d
Controls	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes

Notes: This table tackles endogeneity concerns in equation (1.1). The four dependent variables (*ETR*, *ETR2*, *CASHETR*, and *CFM*) measure corporate tax avoidance at the firm-year level. Lower values are associated with higher tax avoidance. In panel A, the coefficients correspond to *IMP*, i.e., the penetration ratio of US imports from China. In panel B, $\widehat{IMP}$ is the prediction of *IMP* after the first stage of the 2SLS procedure. In panel C, *IMP* is replaced with *PNTR*, i.e., the gap between NNTR and NTR tariff rates (DiD variable). In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors are clustered at the 4-digit 1987 SIC industry level and are not reported for space. $^d p < 0.15$, $^c p < 0.10$, $^b p < 0.05$, $^a p < 0.01$. See section 4 for more details.

showed that public opinion favored the US putting pressure on China and disapproved of Bush's handling of Sino-American relations (Skidmore and Gates, 1997). As a consequence, trade between the US and China was largely hampered. The granting of PNTR status after an unanticipated and five-month process played a key role in the boom in China's exports to the US between 2000 and 2005.[16] According to Handley and Limão (2017), the induced reduction in trade policy uncertainty and expected import tariffs is responsible for a third of the growth of US expenditures on Chinese goods during that period. I adopt a DiD approach along the lines of Pierce and Schott (2016). I create a variable $PNTR_{jt}$ equal to 0 before 2001 for all industries j and equal from 2001 onward to the difference between the NNTR tariff rate and the NTR tariff rate in industry j in 1999. The data are retrieved from Pierce

16. Greenland, Ion, Lopresti, and Schott (2020) show that very few newspaper articles mentioned the PNTR status before the introduction of the bill in the House of Representatives in May 2000.

and Schott (2016). Next, I estimate:

$$\begin{aligned} CTA_{ijt} &= \beta PNTR_{jt} + \delta X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \\ \text{with } PNTR_{jt} &= \mathbb{1}_{t \geq 2001} \left(NNTR_{j1999} - NTR_{j1999} \right) \end{aligned} \tag{1.2}$$

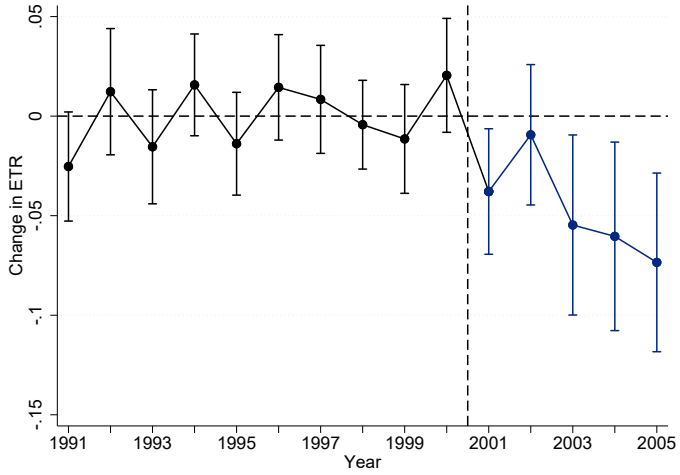
The identifying assumption is that all other things being equal and absent the granting of PNTR status, tax avoidance variables would have evolved similarly in all firms irrespective of their exposure to the shock (*PNTR*). The particularity of *PNTR* resides in its exogeneity. Almost 90 percent of the variation in *PNTR* comes from NNTR tariff rates, established under the Smoot-Hawley Tariff Act in 1930 (Pierce and Schott, 2016). The estimates in table 1.3 panel C align with the previous results and remain globally negative and statistically significant.[17] They are significant at lower levels, however, and three reasons can be adduced. (i) The DiD approach automatically and drastically reduces variation in the treatment; (ii) the shock explains only a part of the boom in China's exports; (iii) as we will see below, the effect is driven by a group of firms, namely MNEs.

Figure 1.2 visualizes changes in *ETR* before and after the event. The left part of the graph proves that the evolution of the effective tax rate prior to 2001 is unrelated to the tariff gap. In a sense, it supports the common trend assumption, can be seen as a placebo test for panel C column (1), and implies that the treatment is unlikely to be a proxy for unobserved industry-year shocks. The right part of the graph indicates that the effect is gradual. Back-of-the-envelope calculations reveal that the average effective tax rate in 2005 could have been 1.5 percentage point higher in absence of the shock.

Another important point recently raised in the econometrics literature is that linear regressions with high-dimensional fixed effects estimate weighted sums of the average treatment effects (ATEs). The fact that some of these weights can be negative and that the ATEs could be heterogeneous across firms or periods is a source of concern. The coefficient of interest $\hat{\beta}$ could be negative even though all ATEs are positive. I follow the guidelines of De Chaisemartin and D'Haultfœuille (2020), who discuss this issue for models with two-way fixed effects akin to equation (1.2). The share of negative weights never exceeds 15 percent. Hence, treatment effect heterogeneity should not constitute a major threat to the validity of the findings.

17. In the same spirit of table 1.3 panel B, using *PNTR* as an instrument in 2SLS regressions delivers similar conclusions (see Appendix table 1.A8).

Figure 1.2 – Pre-trends in *ETR* and dynamics of the effect



Notes: This figure plots the results after replacing in equation (1.2) $PNTR_{j,t}$ (gap between NNTR and NTR tariff rates, DiD variable) with the following set of 15 variables: $\mathbb{1}_{t \geq x} \times \left(NNTR_{j1999} - NTR_{j1999}\right)$, $x \in \{1991, ..., 2005\}$. The dependent variable is the firm-year level effective tax rate *ETR*. Lower values are associated with higher tax avoidance. Firm-year observations with a dependent variable outside the [0,1] interval are omitted. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the 4-digit 1987 SIC industry level. See section 4 for more details.

On the whole, the sensitivity tests in tables 1.A6 and 1.3 lend credence to a positive and causal effect of import competition on corporate tax avoidance.

5 Multinational firms and intangible assets

Section 5 delves into the channels through which import competition fosters corporate tax avoidance. I show that competition affects tax avoidance in a manner that is consistent with profit shifting behavior. The positive effect highlighted in the prior section is specific to MNEs and most striking for those familiar with OFCs. I further show that intangibles are used by MNEs for tax saving purposes and that the China shock prompted MNEs to invest in intangible assets. Again, both patterns are driven by MNEs with tax haven subsidiaries. Before concluding, I demonstrate that intangibles tempered the detrimental impact of the China shock on sales and that companies in import-competitive industries did not enlarge their network of subsidiaries in tax havens. Such observations suggest that MNEs essentially invested in intangibles to cope with competitive pressures and limit losses in sales and profits. At the same time, the intangibles facilitated the income shifting activ-

ities of MNEs well established in OFCs. The effect of import competition on profit shifting is thus indirect.

5.1 Domestic firms versus multinational companies

To fathom what lies behind the average effect estimated in the previous section, I now investigate the existence of heterogeneous effects and differentiate between domestic firms and MNEs. MNEs have more possibilities for avoiding taxes. Unlike domestic companies, MNEs can set up intra-firm transactions to move profits of subsidiaries in high-tax jurisdictions to subsidiaries in low-tax jurisdictions. Moreover, a helpful feature of the dataset is that financial statements are consolidated at the firm level, enabling profit shifting activities to be reflected in the effective tax rates. [18]

$$ETR_{ijt} = \beta_1 PNTR_{jt} + \beta_2 PNTR_{jt} \times MNE_{ijt} + \delta X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \quad (1.3)$$

Equation (1.3) estimates a triple difference. The new variable $PNTR \times MNE$ is the product of the treatment variable *PNTR* and the multinational activity dichotomous variable *MNE*. The results are displayed in table 1.4 column (2), and Appendix figure 1.A7 graphically reports the results for all four metrics of tax avoidance. The coefficient associated with *PNTR* becomes insignificantly different from zero, while the coefficient associated with the interaction term $PNTR \times MNE$ appears negative and statistically significant at the 1 percent level. The effect estimated in section 4 is therefore driven by MNEs.

Appendix figure 1.A9 refines equation (1.3) and separates MNEs present in tax havens from the rest of MNEs. Each year, US-listed firms disclose a list of their significant subsidiaries in Exhibit 21 of Form 10-K in accordance with the rules of the Securities and Exchange Commission. A subsidiary is deemed significant if its assets (or income) represent at least 10 percent of consolidated assets (or income), or if by merging all undisclosed subsidiaries into one composite subsidiary, the latter represents at least 10 percent of assets (or income). In other words, Exhibit 21 filings enumerate subsidiaries where at least 90 percent of firms' consolidated assets and revenues are recorded and thus give a faithful picture of the worldwide network of US-listed firms' subsidiaries. Dyreng and Lindsey (2009)'s database summarizes

18. MNEs are not obliged to disclose in their financial statements the deferred US income tax expense related to their foreign earnings if they declare it as permanently reinvested.

this information starting from 1993.[19] On this basis, I explore whether the most tax-aggressive MNEs, i.e., those implanted in tax havens, are those for which the tax avoidance variables decreased the most. A country is classified as a tax haven if it appears on the lists elaborated by Hines and Rice (1994) and Dyreng and Lindsey (2009) (see Appendix table 1.A9). The results in Appendix figure 1.A9 bear out this conjecture. The effect of competition on tax avoidance is more pronounced for MNEs with tax haven subsidiaries than for MNEs of similar size absent from OFCs. Together, table 1.4 column (2), Appendix figure 1.A7, and Appendix figure 1.A9 are fully reminiscent of tax-motivated income shifting.

5.2 Profit shifting and intangible assets

How did MNEs accentuate their profit shifting activities after the China shock? The literature traditionally distinguishes three methods (Beer et al., 2020). First, MNEs can manipulate transfer prices, i.e., distort the price of the transactions made between their affiliates. Second, MNEs can locate intellectual property rights in tax-friendly jurisdictions and make affiliates in high-tax countries pay license fees and royalties for the use of intangible assets. This approach is sometimes treated as a special case of transfer mispricing. Third, MNEs can adjust the capital structure of their affiliates to shift debt to high-tax countries and thereby capitalize on a higher deduction of interests in high-tax countries. Given that financial statements in Compustat are reported for each corporation on a consolidated basis, transfer prices and intra-firm loans are not visible.[20] I hereafter focus on intangible assets, a well-known channel found by Heckemeyer and Overesch (2017) to be one of the most employed profit shifting techniques.

A possible answer is that Chinese import competition impacted tax avoidance through an increase in intangible assets. Should this be the case, we would expect the China shock to have no significant effect – or at least a smaller effect – on the effective tax rate conditional on the stock of intangible assets. I confront

19. Presence in tax havens as measured by Exhibit 21 provides a conservative indicator of profit shifting. First, profit shifting can occur between affiliates located in non-havens. Second, the 10 percent threshold implies that we might miss some MNEs shifting a small share of profits to tax havens. See Souillard (2022b) for more discussions about these data and Appendix figure 1.A8 for an example.

20. Interestingly, note that controlling for intra-firm trade in Appendix table 1.A6 did not alter the coefficients. Also recall that RPT data are based on merchandise statistics. Section 4 then already demonstrates that transfer pricing through tangibles is unlikely to be the main profit shifting channel at play.

Table 1.4 – Effect of import competition on corporate tax avoidance: mechanism

Column	(1)	(2)	(3)	(4)	(5)
Dependent variable	ETR_{ijt}	ETR_{ijt}	ETR_{ijt}	ETR_{ijt}	$intangibles_{ijt}$
$PNTR_{jt}$	-0.06^{b}	-0.02	-0.03	-0.03	0.02
	(0.03)	(0.03)	(0.03)	.(0.03)	(0.03)
$PNTR_{jt} \times MNE_{ijt}$		-0.06^{a}		-0.02	0.04^{c}
		(0.02)		(0.03)	(0.02)
$intangibles_{ijt}$			0.02^{d}	0.04^{a}	
			(0.01)	(0.02)	
$intangibles_{ijt} \times MNE_{ijt}$				-0.06^{b}	
				(0.03)	
Controls	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
No. of obs.	24,162	24,162	20,758	20,758	24,481

Notes: This table reports the results of equation (1.2) in column (1), equation (1.3) in column (2), equation (1.4) in column (3), equation (1.5) in column (4), and equation (1.6) in column (5). *ETR* is the effective tax rate, *intangibles* is the share of intangible assets in total assets, *PNTR* is the gap between NNTR and NTR tariff rates (DiD variable), and *MNE* is a binary variable identifying MNEs. In all columns except column (5), firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

this hypothesis with data by inserting intangible assets into the right-hand-side variables:

$$ETR_{ijt} = \beta_1 PNTR_{jt} + \gamma intangibles_{ijt} + \delta X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \quad (1.4)$$

$$ETR_{ijt} = \beta_1 PNTR_{jt} + \beta_2 PNTR_{jt} \times MNE_{ijt} + \gamma_1 intangibles_{ijt} + \gamma_2 intangibles_{ijt} \times MNE_{ijt} + \delta X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \quad (1.5)$$

Table 1.4 columns (3) and (4) show that intangible assets diminish the effective tax rate of MNEs. It is particularly true for MNEs involved in OFCs (see Appendix table 1.A10) and provides additional evidence that these firms strategically locate their intangibles to avoid taxes. Importantly, the effect of the China shock dissipates. The coefficient is divided by two and becomes not statistically different from zero at standard levels. It suggests that import competition may indeed affect tax avoidance indirectly via intangibles. Equation (1.6) verifies this:

$$intangibles_{ijt} = \beta_1 PNTR_{jt} + \beta_2 PNTR_{jt} \times MNE_{ijt} + \delta X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \quad (1.6)$$

Firms' intangibles are regressed on *PNTR*, accounting for the same covariates as equation (1.2). In addition, and in light of what has been shown in the previous subsection, I allow for the possibility that rising import competition hit domestic firms and MNEs differently. The estimates in table 1.4 column (5) reveal that the competition shock had little incidence on domestic firms' intangible assets. By contrast, the China shock had a significant impact on intangible assets of MNEs and, more notably, of those established in tax havens (see Appendix table 1.A10).

The observations concur with the view that the China shock led to more innovation and technical change (Bloom et al., 2016), investments in intangibles from industry leaders (Gutiérrez and Philippon, 2017), and product differentiation (Hombert and Matray, 2018). A perhaps more challenging question is whether intangibles reduce income taxes paid by MNEs due to tax breaks offered by governments or by facilitating profit shifting. The results in Appendix table 1.A10 speak in favor of the second proposition. The fact that intangible assets lower the effective tax rate of MNEs and above all that of MNEs having ties with OFCs (holding firm size constant) echoes with the profit shifting literature.

5.3 Robustness

Appendix table 1.A11 reviews an important threat to the validity of the results: the definition of intangible assets. There are two types of intangible assets. US accounting rules are such that intangibles acquired externally appear in balance sheets as part of the intangible assets category. This category is composed of goodwill, i.e., assets that are non-physical and difficult to precisely identify (e.g., human capital, brand, reputation, and identity), and other intangible assets, i.e., assets that are non-physical but identifiable (e.g., copyright, patents, and software). Intangibles created within companies are generally not capitalized on balance sheets. They are recorded as R&D expenditures or Selling, General, and Administrative (SGA) expenditures.[21] Appendix table 1.A11 replicates table 1.4 with a more comprehensive proxy of intangible assets, $intangibles2_{ijt}$, that includes both externally acquired and internally generated intangible assets. As in Eisfeldt and Papanikolaou (2014) and Peters and Taylor (2017), the stock of internally created intangibles is approximated by a fraction (30 percent) of all past and current R&D and SGA expenses. The results attached in table 1.A11 align with the

21. In Compustat, R&D and SGA expenditures are combined and reported in a variable deceptively labeled "Selling, General, and Administrative Expense."

Table 1.5 – Effect of import competition on corporate tax avoidance: A side effect?

Column	(1)	(2)	(3)
Dependent variable	$TAXHAVEN^{ext}_{ijt}$	$TAXHAVEN^{int}_{ijt}$	$ln(sales_{ijt})$
$PNTR_{jt}$	0.04	3.15	-1.17[a]
	(0.07)	(4.50)	(0.41)
$PNTR_{jt} \times intangibles_{ijt}$			3.02[a]
			(0.47)
Controls	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes
No. of obs.	28,443	4,651	28,773

Notes: This table reports the results of equation (1.7) in column (1) and equation (1.8) in column (2). $TAXHAVEN^{ext}$ is a dummy variable identifying firms implanted in tax havens, $TAXHAVEN^{int}$ represents the number of subsidiaries in tax havens, *sales* denotes total sales, *PNTR* is the gap between NNTR and NTR tariff rates (DiD variable), and *intangibles* is the share of intangible assets in total assets. Equation (1.8) is regressed conditional on $TAXHAVEN^{int}_{ijt} > 0$ for the estimate not to capture a mix of extensive- and intensive-margin effects. The results in column (3) mirror those presented in Appendix table 1.A5. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

prior results in all respects.

Symmetrically, Appendix table 1.A12 narrows the definition of intangible assets and focuses on patents. The database of the NBER Patent Data Project covers the 1976-2006 period and reports numerous details on the patents registered at the US Patent and Trademark Office: assignee number, patent number, granting and application dates, etc. The information is used to replace the variable $intangibles_{ijt}$ with another one, $patents_{ijt}$, indicating the number of patents each firm was granted each year. The results go in the same direction and thus further strengthen the findings.

Lastly, Appendix table 1.A13 shows that the results outlined in this section are consistent when *intangibles* is expressed in current million US dollars, while Appendix table 1.A14 shows that the findings are equivalent when data sources are triangulated and the multinational activity variable is constructed using exclusively Exhibit 21 documents.

5.4 A side effect

MNEs' expenditures on intangibles increased after the China shock, which spurred profit shifting. One question is still pending: Were these intangibles used mostly for tax saving purposes or competitive differentiation? Table 1.5 clarifies this point. Equations (1.7) and (1.8) examine whether firms in the most-exposed sectors expanded into tax havens:

$$TAXHAVEN^{ext}_{ijt} = \beta PNTR_{jt} + \delta X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \quad (1.7)$$

$$TAXHAVEN^{int}_{ijt} = \beta PNTR_{jt} + \delta X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \quad (1.8)$$

$TAXHAVEN^{ext}_{ijt}$ is a binary variable equal to 1 if firm *i* operating in sector *j* has at least one subsidiary located in a tax haven in year *t*. $TAXHAVEN^{int}_{ijt}$ counts the number of subsidiaries incorporated in tax havens. If MNEs invested in intangible assets mainly for tax saving purposes, we would expect MNEs to broaden their activities in OFCs after the China shock. Perhaps surprisingly in columns (1) and (2), Chinese import competition did not produce any effect on US-listed firms' foreign direct investments in OFCs, notwithstanding the soaring activity in OFCs in that period (Souillard, 2022b). Moreover, column (3) fine-tunes Appendix table 1.A5 and shows that the negative impact of the China shock on sales is mitigated by intangible assets. These findings hint that the positive effect of import competition on profit shifting is indirect. The primary objective of investments in intangibles was not to save taxes but to escape import competition in the first place.

6 Conclusion

The paper studies the effect of competition on corporate tax avoidance with an empirical study and an accent on import competition and US-listed firms. The first part of the analysis provides robust and causal evidence of a positive effect of import competition on corporate tax avoidance. The second part of the analysis investigates the underlying mechanism. It shows that the rise in corporate tax avoidance is asymmetric and behaves in a way that is reminiscent of profit shifting. The positive effect of competition on tax avoidance merely holds for MNEs and particularly kicks in for those implanted in tax havens. To mitigate the competition pressures induced by the China shock and counterbalance their adverse impact on sales and profits, MNEs significantly invested in intangible assets. However, the latter also made tax-motivated income transfers easier for the most tax-aggressive MNEs, i.e.,

MNEs already present in OFCs. The findings uncover a new (and indirect) channel whereby competition can stimulate corporate tax avoidance. From a more general viewpoint, they shed light on the evolution of effective tax rates, help interpret the current hostility to MNEs and globalization, and emphasize the necessity to link trade and tax policies at the international level.

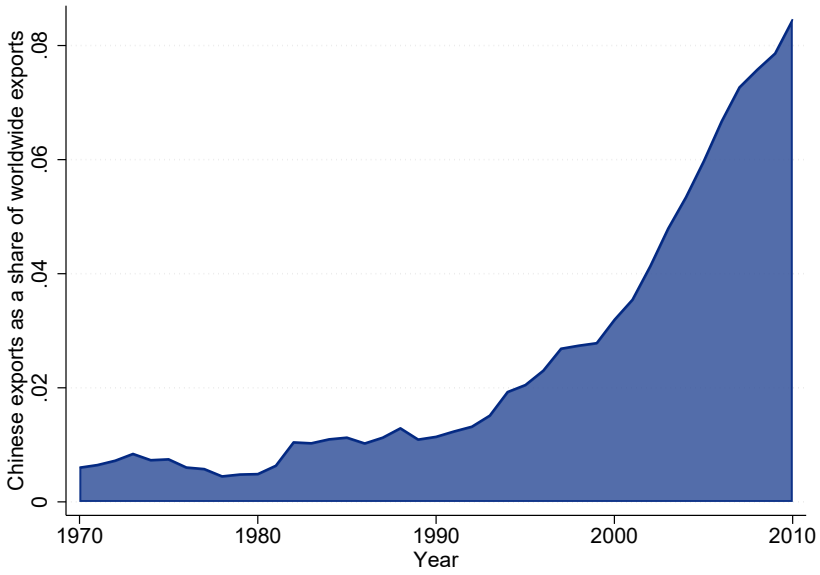
Appendix

Table 1.A1 – Definition of the main variables

Variable	Definition
ETR_t	Income taxes over pre-tax income (excluding special items) $\frac{TXT_t}{PI_t - SPI_t}$
$ETR2_t$	Non-deferred income taxes over pre-tax income (excluding special items) $\frac{TXT_t - TXDI_t}{PI_t - SPI_t}$
$CASHETR_t$	Cash income taxes paid over pre-tax income (excluding special items) $\frac{TXPD_t}{PI_t - SPI_t}$
CFM_t	Cash income taxes paid over operating cash flows (excluding extraordinary items and discontinued operations) $\frac{TXPD_t}{OANCF_t + TXPD_t - XIDOC_t}$
$sales_t$	Sales $SALE_t$
$pre\text{-}tax\ income_t$	Pre-tax income (excluding special items) $PI_t - SPI_t$
$size_t$	Total assets AT_t
$profitability_t$	Pre-tax income (excluding extraordinary items) over total assets $\frac{PI_t - XI_t}{AT_t}$
$leverage_t$	Long-term debt over assets $\frac{DLTT_t}{AT_t}$
mtb_t	Market value of equity divided by book value of equity $\frac{CSHO_t \times PRCCF_t}{CEQ_t}$
$market\ power_t$	Sales over the cost of goods sold $\frac{SALE_t}{COGS_t}$
$inventory_t$	Inventories over total assets $\frac{INVT_t}{AT_t}$
$tlcf_t$	Dummy equal to 1 if there is a tax loss carryforward $\mathbb{1}_{TLCF_t > 0}$
MNE_t	Dummy equal to 1 if the firm is incorporated in a foreign country $FIC_t \neq USA$ or the pre-tax foreign income is different from zero $PIFO_t \neq 0$ or foreign income taxes are different from zero $TXFO_t \neq 0$ or deferred foreign income taxes are different from zero $TXDFO_t \neq 0$
$intangibles_t$	Intangible assets $INTAN_t$
$intangibles2_t$	Intangible assets + 30 percent of past and current selling, general and administrative expenses $INTAN_t + 0.3 \times \sum_{k=1990}^{t} XSGA_k$

Notes: This table lists the firm-specific variables from Compustat used in the paper. They are constructed following the accounting literature (e.g., Armstrong, Blouin, and Larcker, 2012; Hoi, Wu, and Zhang, 2013; McGuire et al., 2014; Higgins et al., 2015; Khan et al., 2016).

Figure 1.A1 – Exports from China between 1970 and 2010



Notes: This graph plots the share of exports from China in worldwide exports (World Bank data).

Table 1.A2 – Import competition and corporate tax avoidance: macro-level regressions

Column	(1)	(2)	(3)	(4)
Dependent variable	$\overline{ETR}_t$	$\overline{ETR2}_t$	$\overline{CASHETR}_t$	$\overline{CFM}_t$
$\overline{IMP}_t$	-1.36^a	-1.79^a	-1.47^a	-1.40^a
	(0.09)	(0.31)	(0.21)	(0.27)
Controls	No	No	No	No
No. of obs.	16	16	16	16

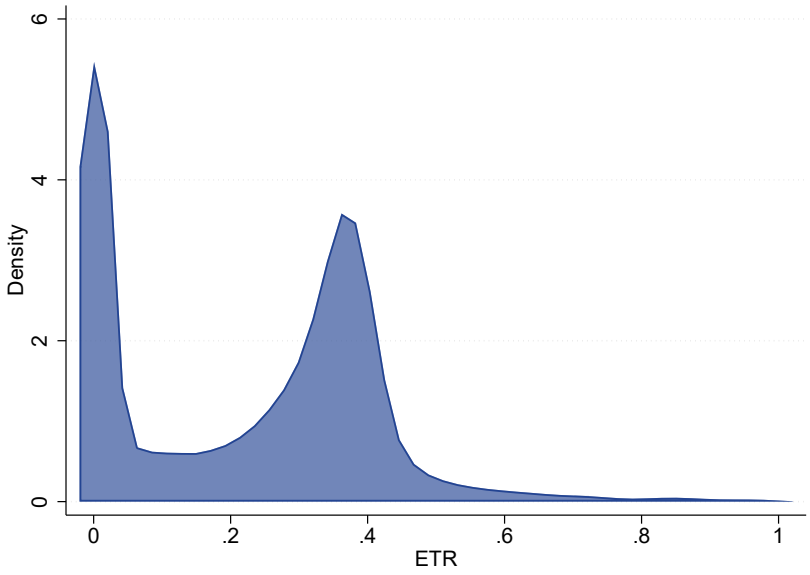
Notes: This table reports regressions performed with OLS. The dependent variable is the yearly average of *ETR* in column (1), that of *ETR*2 in column (2), that of *CASHETR* in column (3), and that of *CFM* in column (4). $\overline{IMP}_t$ is the yearly average of the penetration ratio of US imports from China. Firm-year observations are set as missing if the tax avoidance variable lies outside the [0,1] interval. Standard errors, in parentheses, are heteroskedasticity-robust. $^d p < 0.15$, $^c p < 0.10$, $^b p < 0.05$, $^a p < 0.01$. See section 3 for more details.

Table 1.A3 – Import competition and corporate tax avoidance: industry-level regressions

Column	(1)	(2)	(3)	(4)
Dependent variable	$\overline{ETR}_{jt}$	$\overline{ETR2}_{jt}$	$\overline{CASHETR}_{jt}$	$\overline{CFM}_{jt}$
IMP_{jt}	-0.11^{d}	-0.11^{c}	-0.06	-0.12^{d}
	(0.07)	(0.06)	(0.06)	(0.08)
Industry FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
No. of obs.	1,785	1,771	1,783	1,783

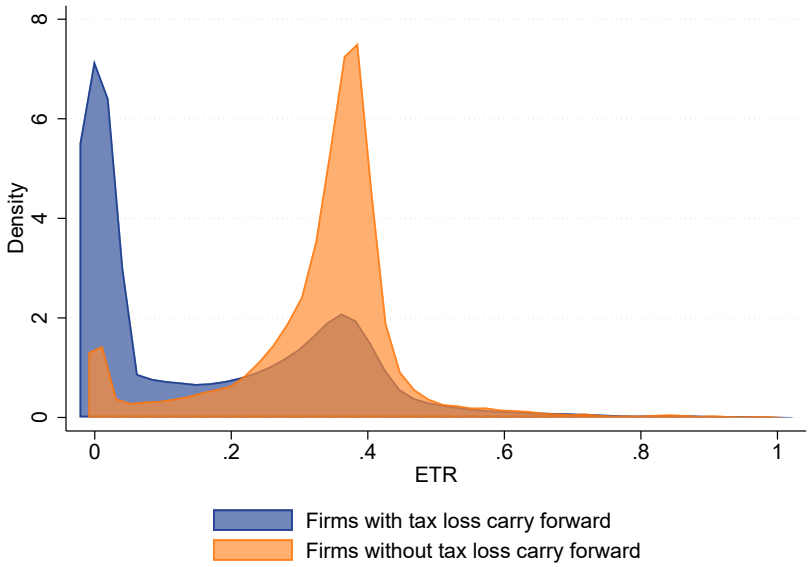
Notes: This table reports regressions performed with OLS. The dependent variable is the industry-year average of *ETR* in column (1), that of *ETR2* in column (2), that of *CASHETR* in column (3), and that of *CFM* in column (4). IMP_{jt} is the industry-year penetration ratio of US imports from China. Firm-year observations are set as missing if the tax avoidance variable lies outside the [0,1] interval. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 3 for more details.

Figure 1.A2 – Distribution of effective tax rates



Notes: This graph plots the distribution of effective tax rates (*ETR*). Firm-year observations with an *ETR* outside the [0,1] interval are omitted.

Figure 1.A3 – Distribution of effective tax rates: firms with or without tax loss carryforward



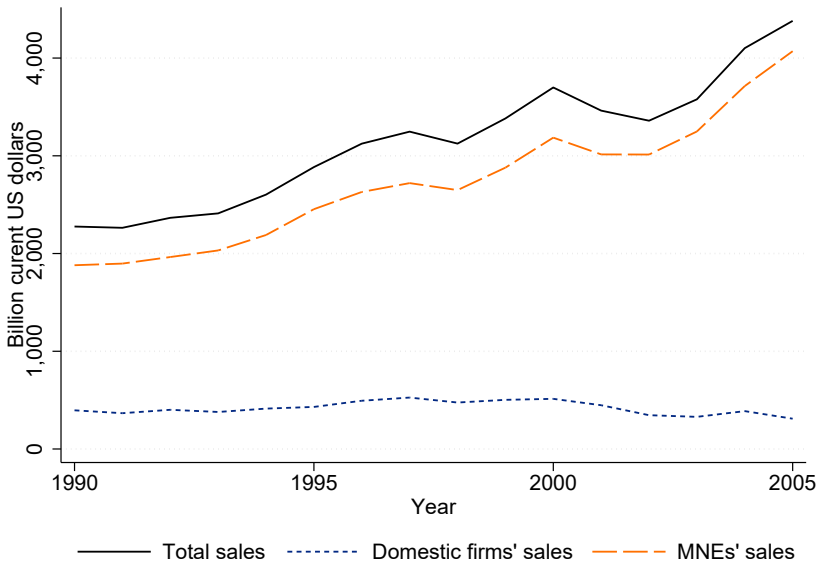
Notes: This graph plots the distribution of effective tax rates (*ETR*). Firm-year observations with an *ETR* outside the [0,1] interval are omitted.

Table 1.A4 – Import competition and corporate tax avoidance: macro-level regressions (bis)

Column	(1)	(2)	(3)	(4)
Dependent variable	$\widetilde{ETR}_t$	$\widetilde{ETR2}_t$	$\widetilde{CASHETR}_t$	$\widetilde{CFM}_t$
$\overline{IMP}_t$	-1.13^b	-0.58	-0.72^d	0.88
	(0.48)	(0.51)	(0.43)	(0.78)
Controls	No	No	No	No
No. of obs.	16	16	16	16

Notes: This table reports regressions performed with OLS. In column (1), the dependent variable $\widetilde{ETR}_t$ is obtained by regressing, for each year, the numerator (income taxes) on the denominator (pre-tax income). This way, the dependent variable minimizes the sum of quadratic errors for each year and gets closer to the statutory tax rate. The dependent variables in columns (2), columns (3), and columns (4) are obtained analogously. In each of the 64 (= 4×16) regressions run to compute the dependent variables, firm-year observations are set as missing if the tax avoidance variable lies outside the [0,1] interval. $\overline{IMP}_t$ is the yearly average of the penetration ratio of US imports from China. Standard errors, in parentheses, are heteroskedasticity-robust. $^d p < 0.15$, $^c p < 0.10$, $^b p < 0.05$, $^a p < 0.01$. See section 3 for more details.

Figure 1.A4 – Aggregate sales



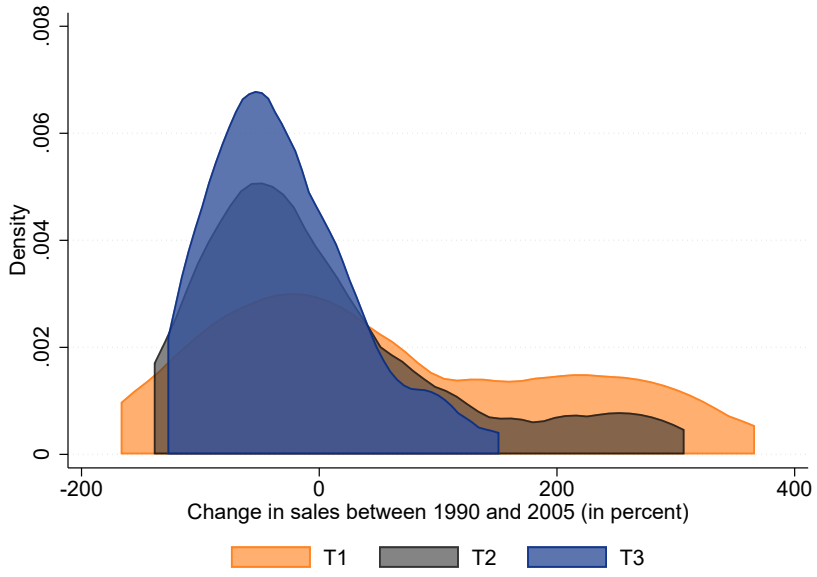
Notes: This figure plots total sales among companies included in the sample between 1990 and 2005. See section 3 for more details.

Table 1.A5 – Chinese import competition and firm sales

Dependent variable	$sales_{ijt}$	$pre\text{-}tax\ income_{ijt}$
IMP_{jt}	-2,712.80	-341.52^{c}
	(2,141.90)	(174.67)
Controls	Yes	Yes
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
No. of obs.	33,297	32,470

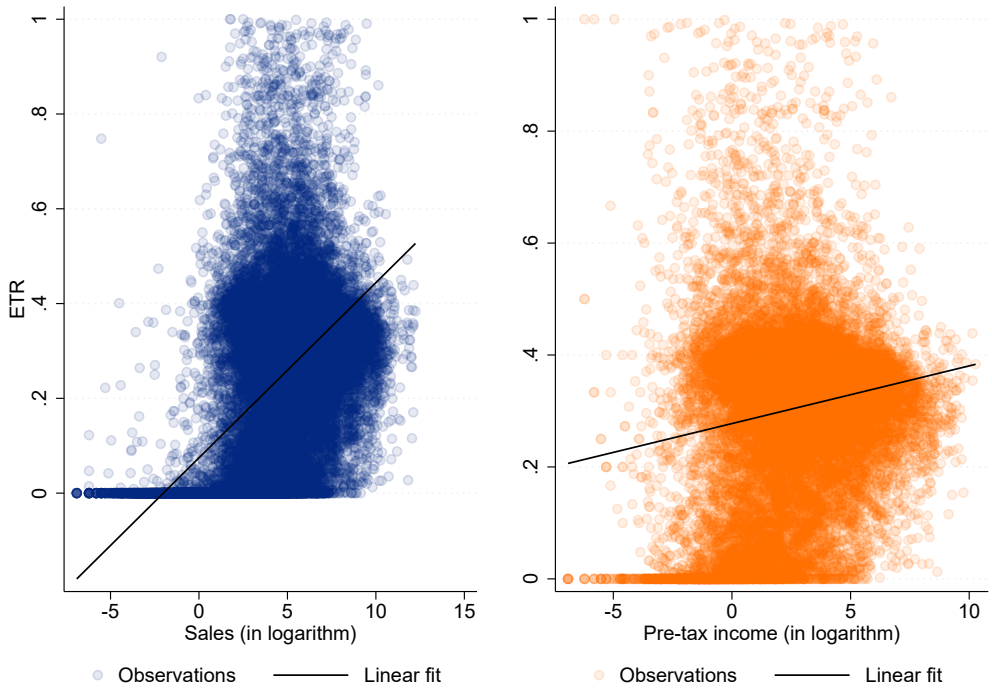
Notes: This table reports regressions performed with OLS. *sales* represents firm sales, *pre-tax income* represents firm pre-tax income, and *IMP* is the penetration ratio of US imports from China. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 3 for more details.

Figure 1.A5 – Chinese import competition and sales of domestic enterprises



Notes: This figure plots sales growth distribution between 1990 and 2005 at the industry level and by tercile. Only domestic firms operating throughout the period are taken into account to calculate industry sales. Terciles are constructed based on the change in the penetration ratio of US imports from China between 1990 and 2005. T3 contains the sectors that were most affected by rising Chinese import competition and vice versa. See section 3 for more details.

Figure 1.A6 – Sales, pre-tax income, and effective tax rates



Notes: The subfigure on the left plots firms' sales (in logarithm) on the *x*-axis and firms' effective tax rate (*ETR*) on the *y*-axis, while the subfigure on the right plots firms' pre-tax income (in logarithm) on the *x*-axis and firms' *ETR* on the *y*-axis. Firm-year observations are set as missing if *ETR* lies outside the [0,1] interval. The slope of the linear fit in the first graph is equal to 3.7e-2, with a standard error equal to 3.1e-4. The slope of the linear fit in the second graph is equal to 1.0e-2, with a standard error equal to 4.0e-4. Note that the trend remains positive once observations with *ETR* = 0 are removed. See section 3 for more details.

Table 1.A6 – Effect of import competition on corporate tax avoidance: robustness checks

Column	(1)	(2)	(3)	(4)
Dependent variable	*ETR*	*ETR*2	*CASHETR*	*CFM*
Baseline estimates	-0.20^{a}	-0.18^{b}	-0.18^{a}	-0.26^{a}
Panel A: exclusion of outliers				
A1. Extreme values	-0.36^{a}	-0.30^{a}	-0.33^{a}	-0.43^{a}
A2. Negative profits	-0.15^{a}	-0.11^{c}	-0.17^{a}	-0.22^{a}
A3. Entries and exits	-0.22^{a}	-0.23^{a}	-0.17^{a}	-0.22^{a}
A4. Involved in M&A	-0.23^{a}	-0.19^{a}	-0.18^{a}	-0.27^{a}
Panel B: more controls				
B1. Trends in globalization	-0.23^{a}	-0.20^{a}	-0.23^{a}	-0.19^{a}
B2. Trends in globalization (USDIA + RTP data included)	-0.23^{a}	-0.18	-0.18^{d}	-0.13^{d}
B3. State-year FEs	-0.20^{a}	-0.19^{a}	-0.16^{a}	-0.26^{a}
B4. State-year-MNE status FEs	-0.21^{a}	-0.18^{a}	-0.15^{a}	-0.27^{a}
B5. 2-digit SIC industry-year FEs	-0.13^{a}	-0.05	-0.13^{a}	-0.19^{a}
Panel C: alternative specifications				
C1. SIC 3-digit industry	-0.15^{a}	-0.16^{a}	-0.10^{b}	-0.18^{a}
C2. 4-year periods	-0.30^{a}	-0.11	-0.17^{c}	-0.23^{a}
C3. 16-year differences	-0.18^{c}	-0.36^{a}	-0.16^{c}	-0.32^{b}
Panel D: falsification test and extension of the period				
D1. Random industry	0.01	-0.02	-0.01	0.05
D2. 1990-2014 data	-0.04^{c}	-0.08^{a}	-0.05^{a}	-0.05^{a}

Notes: This table assesses the robustness of the results outlined in table 1.2. The four dependent variables (*ETR*, *ETR*2, *CASHETR*, and *CFM*) measure corporate tax avoidance. Lower values are associated with higher tax avoidance. The coefficients reported in the table correspond to *IMP*, i.e., the penetration ratio of US imports from China. In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors are clustered at the 4-digit 1987 SIC industry level and are not reported for space. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

Table 1.A7 – Effect of import competition on corporate tax avoidance: the Mexican case

Column	(1)	(2)	(3)	(4)
Dependent variable	ETR_{ijt}	$ETR2_{ijt}$	$CASHETR_{ijt}$	CFM_{ijt}
IMP_{jt}	-1.05^{c}	-0.55	-1.17^{d}	-1.50^{b}
	(0.58)	(0.52)	(0.72)	(0.75)
Controls	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
No. of obs.	20,728	20,728	15,329	15,187

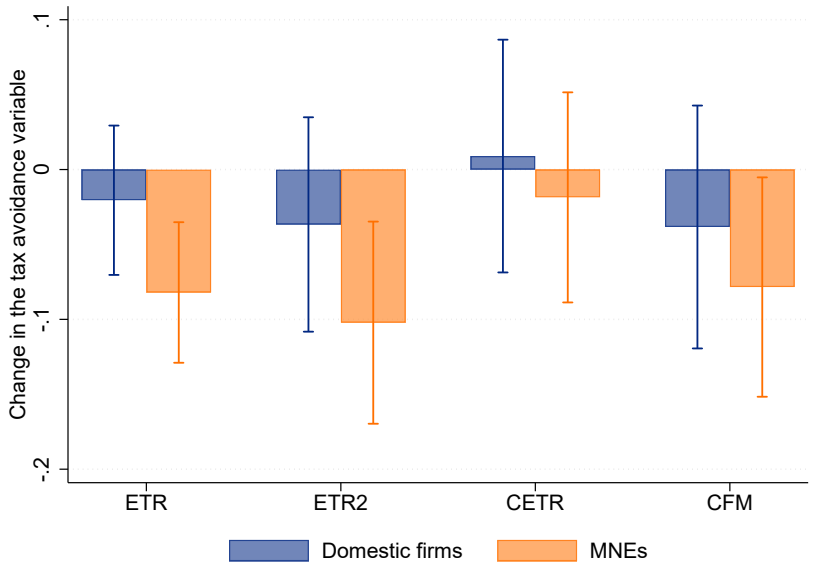
Notes: This table replicates table 1.3 panel B using Mexican import competition instead of Chinese import competition. The four dependent variables (*ETR*, *ETR*2, *CASHETR*, and *CFM*) measure corporate tax avoidance. Lower values are associated with higher tax avoidance. *IMP* is the penetration ratio of US imports from Mexico. The results are obtained with 2SLS. The instrument is the average share of imports from Mexico among total imports in Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland. In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

Table 1.A8 – Effect of import competition on corporate tax avoidance: *PNTR* as an instrument

Column	(1)	(2)	(3)	(4)
Dependent variable	ETR_{ijt}	$ETR2_{ijt}$	$CASHETR_{ijt}$	CFM_{ijt}
IMP_{jt}	-0.54^{a}	-0.79^{a}	-0.31	-0.74^{b}
	(0.21)	(0.29)	(0.29)	(0.37)
Controls	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
No. of obs.	22,715	22,286	16,286	16,157

Notes: This table supplements table 1.3 panel C. This time, *PNTR* is used as an instrument for *IMP*. The four dependent variables (*ETR*, *ETR*2, *CASHETR*, and *CFM*) measure corporate tax avoidance. Lower values are associated with higher tax avoidance. *PNTR* is the gap between NNTR and NTR tariff rates (DiD variable). *IMP* is the penetration ratio of US imports from China. The results are obtained with 2SLS. In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

Figure 1.A7 – Effect of import competition on corporate tax avoidance: domestic firms and MNEs



Notes: This graph plots the results of equation (1.3). The four dependent variables (*ETR*, *ETR2*, *CASHETR*, and *CFM*) measure corporate tax avoidance. Lower values are associated with higher tax avoidance. Point estimates with 95 percent intervals. Standard errors are clustered at the 4-digit 1987 SIC industry level. See section 5 for more details.

Figure 1.A8 – Subsidiaries reported by PFIZER INC

EX-21 6 y46668ex21.htm SUBSIDIARIES OF THE COMPANY

EXHIBIT 21

SUBSIDIARIES OF THE COMPANY

The following is a list of subsidiaries of the Company as of December 31, 2000, omitting some subsidiaries which, considered in the aggregate, would not constitute a significant subsidiary.

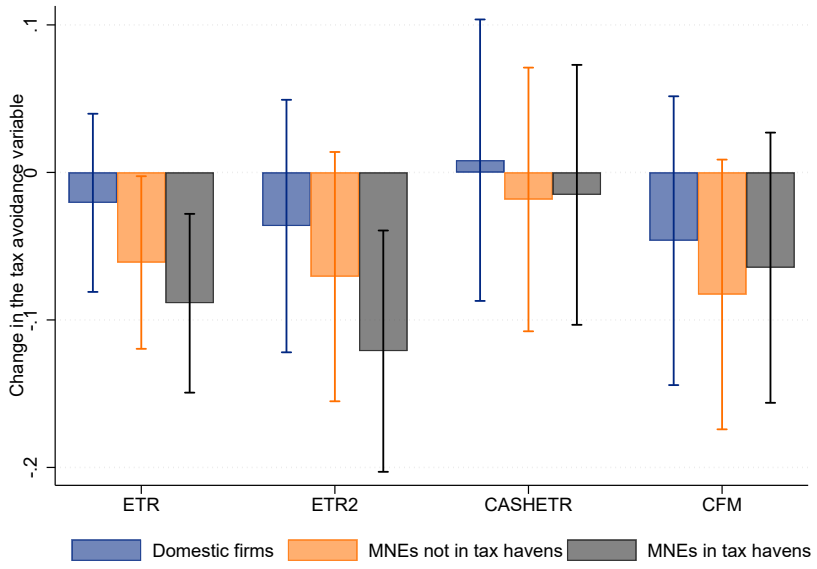
NAME	WHERE INCORPORATED
412357 Ontario Inc	Canada
A S Ruffel (Mozambique) Limitada	Mozambique
A S Ruffel (Private) Ltd	Zimbabwe
A.S. Ruffel (Proprietary) Limited	South Africa
A/O Pfizer	Russia
Adams (Thailand) Limited	Thailand
Adams Panama, Sociedad Anonima	Panama
Adams S.A	Argentina
Adenylchemie GmbH	Germany
Agouron Pharmaceuticals (Europe) Limited	United Kingdom
Agouron Pharmaceuticals Canada Inc	Canada
Agouron Pharmaceuticals, Inc	United States
American Chicle Company	United States
American Foods Industries, Inc	United States
AMS Medical Systems AG	Switzerland
Anaderm Research Corp	United States
Andean Services SA	Colombia
Bioindustria Farmaceutici S.p.A.	Italy
Biorell GmbH	Germany
Blue Cross S.r.l	Italy
C.P. Pharmaceuticals International C.V	Netherlands
Cachou Lajaunie	France
Capsugel AG/SA/ Ltd	Switzerland
Capsugel France	France
Charwell Pharmaceuticals Limited	United Kingdom
Chicle Adams, S.A	Colombia

Notes: This snapshot is a non-exhaustive list of the significant subsidiaries reported by PFIZER INC in Exhibit 21 in December 2000.

Table 1.A9 – List of tax havens

Andorra, Anguilla, Antigua and Barbuda, Aruba, Bahamas, Bahrain, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Cook Islands, Costa Rica, Cyprus, Dominica, Gibraltar, Grenada, Guernsey, Hong Kong, Ireland, Isle of Man, Jersey, Jordan, Lebanon, Liberia, Liechtenstein, Luxembourg, Macau, Malaysia, Maldives, Malta, Marshall Islands, Mauritius, Monaco, Montserrat, Nauru, Netherlands Antilles, Niue, Panama, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Saint Martin, Samoa, San Marino, Seychelles, Singapore, Switzerland, Turks and Caicos Islands, Vanuatu.

Figure 1.A9 – Effect of import competition on corporate tax avoidance: domestic firms, MNEs not in tax havens, and MNEs in tax havens



Notes: This graph plots the results of (a slightly different version of) equation (1.3). The four dependent variables (*ETR*, *ETR*2, *CASHETR*, and *CFM*) measure corporate tax avoidance. Lower values are associated with higher tax avoidance. Point estimates with 95 percent intervals. Standard errors are clustered at the 4-digit 1987 SIC industry level. See section 5 for more details.

Table 1.A10 – Effect of import competition on corporate tax avoidance: mechanism (distinction between MNEs present or not in tax havens)

Column	(1)	(2)
Dependent variable	ETR_{ijt}	$intangibles_{ijt}$
$PNTR_{jt}$	-0.03	0.02
	(0.03)	(0.03)
$PNTR_{jt} \times MNE_{ijt}$	-0.01	0.02
	(0.01)	(0.02)
$PNTR_{jt} \times TAXHAVEN^{ext}_{ijt}$	-0.03	0.04^{b}
	(0.02)	(0.02)
$intangibles_{ijt}$	0.04^{a}	
	(0.01)	
$intangibles_{ijt} \times MNE_{ijt}$	-0.03	
	(0.03)	
$intangibles_{ijt} \times TAXHAVEN^{ext}_{ijt}$	-0.06^{a}	
	(0.03)	
Controls	Yes	Yes
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
No. of obs.	20,758	24,481

Notes: This table reports the results of equation (1.5) in column (1) and of equation (1.6) in column (2) (both slightly modified). *ETR* is the effective tax rate, *intangibles* is the share of intangible assets in total assets, *PNTR* is the gap between NNTR and NTR tariff rates (DiD variable), *MNE* is a dummy variable identifying MNEs, and $TAXHAVEN^{ext}$ is a dummy variable identifying firms implanted in tax havens. In column (1), firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

Table 1.A11 – Effect of import competition on corporate tax avoidance: mechanism (extended definition of intangibles)

Column	(1)	(2)	(3)	(4)	(5)
Dependent variable	ETR_{ijt}	ETR_{ijt}	ETR_{ijt}	ETR_{ijt}	$intangibles2_{ijt}$
$PNTR_{jt}$	-0.06^{b}	-0.02	-0.03	-0.02	0.29
	(0.03)	(0.03)	(0.03)	.(0.03)	(0.30)
$PNTR_{jt} \times MNE_{ijt}$		-0.06^{a}		-0.02	0.15^{b}
		(0.02)		(0.02)	(0.08)
$intangibles2_{ijt}$			0.01^{a}	0.01^{a}	
			(0.00)	(0.00)	
$intangibles2_{ijt} \times MNE_{ijt}$				-0.01^{a}	
				(0.01)	
Controls	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
No. of obs.	24,162	24,162	19,834	19,834	23,464

Notes: This table reports the results of equation (1.2) in column (1), equation (1.3) in column (2), equation (1.4) in column (3), equation (1.5) in column (4), and equation (1.6) in column (5). *ETR* is the effective tax rate, *intangibles*2 is the share of intangible assets in total assets (more comprehensive measure), *PNTR* is the gap between NNTR and NTR tariff rates (DiD variable), and *MNE* is a dummy variable identifying MNEs. In all columns but column (5), firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

Table 1.A12 – Effect of import competition on corporate tax avoidance: mechanism (patents)

Column	(1)	(2)	(3)	(4)	(5)
Dependent variable	ETR_{ijt}	$patents_{ijt}$	$patents_{ijt}$	ETR_{ijt}	$log(1 + patents_{ijt})$
$PNTR_{jt}$	-0.05^{c}	3.53	0.16	-0.05^{c}	-0.22
	(0.03)	(6.73)	(0.19)	(0.03)	(0.16)
$PNTR_{jt} \times MNE_{ijt}$	-0.04	31.26^{c}	0.23^{c}	-0.02	0.69^{a}
	(0.05)	(16.20)	(0.13)	(0.04)	(0.17)
$patents_{ijt}$	3.16e-4^{b}				
	(1.39e-4)				
$patents_{ijt} \times MNE_{ijt}$	-3.56e-4^{b}				
	(1.41e-4)				
$log(1 + patents_{ijt})$				3.03e-3^{d}	
				(1.94e-3)	
$log(1 + patents_{ijt}) \times MNE_{ijt}$				-5.40e-3^{b}	
				(2.40e-3)	
Controls	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
No. of obs.	24,162	28,443	18,917	24,162	28,443

Notes: This table replicates columns (4) and (5) in table 1.4. *ETR* is the effective tax rate, *patents* is the number of patents, *PNTR* is the gap between NNTR and NTR tariff rates (DiD variable), and *MNE* is a dummy variable identifying MNEs. In columns (1), (2), and (3), *patents* is in absolute value. The equations are estimated with OLS in columns (1) and (2) and a negative binomial regression in column (3). In columns (4) and (5), *patents* is augmented by one unit and in logarithm, and the equations are estimated with OLS. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

Table 1.A13 – Effect of import competition on corporate tax avoidance: mechanism (intangibles in million US dollars)

Column	(1)	(2)	(3)	(4)
Dependent variable	ETR_{ijt}	$intangibles_{ijt}$	ETR_{ijt}	$log(1 + intangibles_{ijt})$
$PNTR_{jt}$	-0.03	-103.45	-0.03	-1.02[a]
	(0.03)	(270.53)	(0.03)	(0.33)
$PNTR_{jt} \times MNE_{ijt}$	-0.04[d]	480.99[b]	-0.01	1.92[a]
	(0.03)	(201.39)	(0.01)	(0.32)
$intangibles_{ijt}$	1.87e-5[a]			
	(6.79e-6)			
$intangibles_{ijt} \times MNE_{ijt}$	-2.14e-5[a]			
	(6.91e-6)			
$log(1 + intangibles_{ijt})$			0.01[a]	
			(0.00)	
$log(1 + intangibles_{ijt}) \times MNE_{ijt}$			-0.01[a]	
			(0.00)	
Controls	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
No. of obs.	20,758	24,481	20,758	24,481

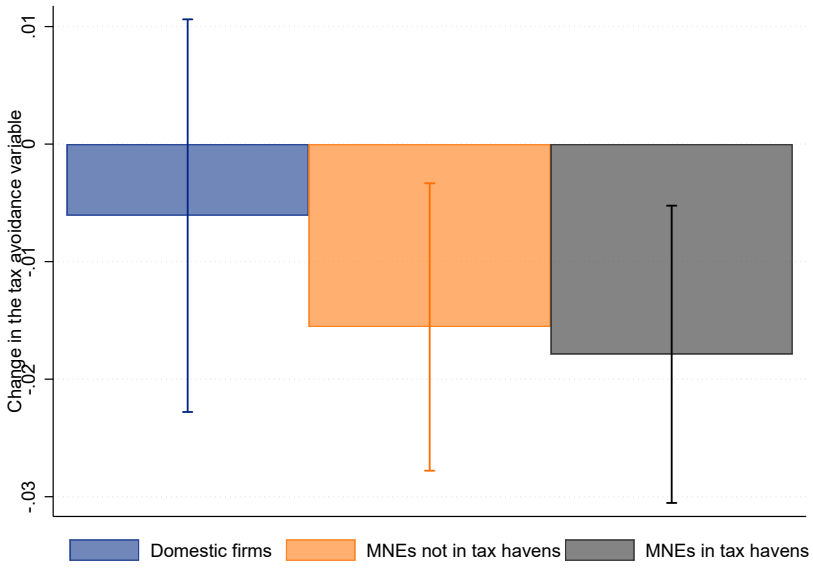
Notes: This table replicates columns (4) and (5) in table 1.4. *ETR* is the effective tax rate, *intangibles* is the amount of intangible assets in current million US dollars, *PNTR* is the gap between NNTR and NTR tariff rates (DiD variable), and *MNE* is a dummy variable identifying MNEs. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

Table 1.A14 – Effect of import competition on corporate tax avoidance: mechanism (MNE activity measured with Exhibit 21 files)

Column	(1)	(2)	(3)
Dependent variable	ETR_{ijt}	ETR_{ijt}	$intangibles_{ijt}$
$PNTR_{jt}$	-0.04	-0.03	0.02
	(0.03)	(0.03)	(0.03)
$PNTR_{jt} \times MNE_{ijt}$	-0.05^{a}	-0.03	0.05^{a}
	(0.02)	(0.02)	(0.02)
$intangibles_{ijt}$		0.03^{b}	
		(0.01)	
$intangibles_{ijt} \times MNE_{ijt}$		-0.03^{c}	
		(0.01)	
Controls	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes
No. of obs.	24,162	20,758	24,481

Notes: This table replicates columns (2), (4), and (5) in table 1.4. *ETR* is the effective tax rate, *intangibles* is the share of intangible assets in total assets, *PNTR* is the gap between NNTR and NTR tariff rates (DiD variable), and *MNE* is a dummy variable identifying MNEs (defined using Exhibit 21 filings exclusively). Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details and Souillard (2022b) for more discussions about these data.

Figure 1.A10 – Effect of import competition on corporate tax avoidance: domestic firms, MNEs not in tax havens, and MNEs in tax havens (Henry and Sansing (2018)'s tax avoidance variable)



Notes: This figure plots the results of (a slightly modified version of) equation (1.3), the dependent variable being the tax avoidance metric of Henry and Sansing (2018). The latter is similar to a book-tax difference and complements the four other proxies used in the paper (*ETR*, *ETR2*, *CASHETR*, and *CFM*). It is equal to the difference between (i) the taxes paid and (ii) the pre-tax income multiplied by the statutory tax rate. It indicates whether the firm is tax-favored (negative values) or not (positive values). The difference is then scaled by assets to ensure cross- and within-company comparability. It should be noted that the magnitude of the effect cannot directly be compared to Appendix figure 1.A9. Point estimates with 95 percent intervals. Standard errors are clustered at the 4-digit 1987 SIC industry level. See section 5 for more details.

2

Intra-industry spillovers of profit shifting and tax haven FDIs

Solo-authored paper [*]

Do tax avoidance practices spread across firms? The present paper provides systematic evidence along these lines. An event study shows that a US-listed enterprise is more likely to enter a specific tax haven if another US-listed enterprise operating in the same sector owns subsidiaries in this tax haven. The inclusion of three-way fixed effects, the absence of pre-trends, and several robustness checks consolidate the results. Moreover, profit shifting spillovers vary over time, across sectors, and by tax haven. The findings suggest that firms replicate the aggressive tax planning schemes of their peers and carry policy implications.

*. I would like to thank Micael Castanheira, Paola Conconi, Ronald B. Davies, Yvette Lind, Catherine Lions, Gaëtan Nicodème, Mathieu Parenti, Nadine Riedel, Thomas Wainwright, and two anonymous referees for valuable comments and suggestions. Funding from the Fund for Scientific Research-FNRS is gratefully acknowledged.

1 Introduction

Many multinational enterprises (MNEs) are under public scrutiny in the wake of the last tax scandals. They are suspected of artificially shifting profits from high- to low-tax jurisdictions to decrease their average effective tax rate. The techniques designed to this end are now relatively well identified and documented in the literature. They involve transfer mispricing, a tax-efficient use of intercompany debt, and a relocation of intellectual property (IP) rights in tax havens (Dharmapala, 2014; Riedel, 2018; Beer et al., 2020). Less is known about the factors prompting MNEs to engage in large-scale tax avoidance and profit shifting. Tax rate differentials naturally play a key role in profit shifting. Countries[2] with high corporate income tax rates are more exposed to outward profit shifting, and the lion's share of these profits is directed toward tax havens, where corporate income tax rates are on the opposite close to zero. Perhaps, a more challenging question is whether an MNE influences the income shifting behavior of other MNEs. The literature points in this direction. An old body of research establishes the existence of technology spillovers. Research and development, innovation, exports, and foreign direct investment (FDI) activities conducted by some firms generate positive externalities and foster the performance of other firms, for instance through labor mobility. A more recent strand of research suggests that the same could apply to tax planning. Cen et al. (2017), Lim et al. (2018), Gallemore et al. (2019), and Barrios and Gallemore (2021) show that firms connected to low-tax firms via auditor, bank, employee, and supply ties have lower effective tax rates (ETRs). Moreover, Bauckloh, Hardeck, Wittenstein, and Zwergel (2021) observe that news about the tax avoidance practices of an MNE entails a negative stock price reaction among its peers. They claim that it is because investors expect similar firms to employ similar practices.

The present paper delves into the latter assertion and focuses on intra-industry spillovers, profit shifting, and tax haven FDIs. The first part of the paper builds a database on the worldwide network of US-listed firms' subsidiaries between 1993 and 2013. The Securities and Exchange Commission (SEC) requires these companies to disclose every year a list of their subsidiaries, and the reports are publicly available on its website. On this basis, I compile a unique database disaggregated at the firm-country-year level that gives the number of subsidiaries

2. "Jurisdiction" and "country" are used interchangeably for simplicity.

declared by each US-listed enterprise in each offshore financial center (OFC)[3] and each year. The second part of the paper proceeds with an event study. I examine the probability to report subsidiaries in a particular tax haven when at least one other company operating in the same 4-digit SIC sector also does. The granularity of the database allows inserting three-way fixed effects. Hence, the impact of peer entry into tax havens is quantified while controlling for numerous confounding factors. Among others, the firm-year, country-year, and firm-country fixed effects neutralize all firm-, sector-, and country-year causes of tax haven FDIs such as firm productivity and corporate tax rates. They greatly fine-tune the identification strategy and mitigate endogeneity concerns.

The benchmark results reveal that, all other things being equal, the average probability to report a subsidiary in a specific OFC is 10 percent higher when a peer is already present in this OFC. The spillover effect is sizable and gradual. It slowly grows and reaches a peak four years post peer entry. The mere fact that the diffusion of profit shifting schemes is both OFC-specific and progressive suggests that it is more likely to be induced by a learning mechanism than by competitive pressures. The finding is corroborated by multiple sensitivity checks. First, it holds with various estimation methodologies. Linear probability models and binary estimators converge toward the same conclusion. The finding holds too when the persistence of FDIs over time is taken care of via dynamic panel models à la Blundell and Bond (1998). Second, the conclusion is robust across tax haven classifications. The baseline equation leverages two lists commonly used in the field (Hines and Rice, 1994; Dyreng and Lindsey, 2009). Adopting only one list, using the intersection of the two lists, omitting one tax haven at a time, or incorporating the classification of Tørsløv et al. (2021) delivers concordant results. On the same note, I find consistent results after excluding the largest and most central tax havens. Workhorse international trade theories predict that FDIs should be directed toward large and central countries (e.g., Brainard, 1993; Head and Mayer, 2004; Helpman et al., 2004). As a consequence, subsidiaries in large and well-connected tax havens like Ireland might have nothing to do with aggressive tax planning in the first place. It is on the contrary reasonable to consider that FDIs in small and isolated jurisdictions such as the Marshall Islands have no or little economic substance and are purely attributable to profit shifting. Furthermore, the results are validated by a couple of falsification tests. I assign companies to random industries and see whether profit shifting strategies

3. "Tax haven" and "offshore financial center" are also used interchangeably for simplicity.

disseminate within these fictitious industries. This is not the case. I do not find evidence of spatial spillovers either. Last but not least, no pre-existing trend emerges, i.e., firm presence in OFCs does not depend on future peer entry into OFCs. This rules out the possibility that the treatment variable picks the effect of past and unobserved firm- and sector-country-year shocks, lends credence to the parallel trend assumption, and more generally supports a causal interpretation of the results.

I also investigate the existence of heterogeneous spillover effects along three dimensions: over time, across sectors, and by tax haven. There is compelling evidence that profit shifting amplified in the last decades (Grubert, 2012; Klassen and Laplante, 2012) and that it is more prevalent in finance and services (Gumpert et al., 2016; Merz and Overesch, 2016), something for which I provide additional support. I thus hypothesize that spillovers are more pronounced in the most recent subperiod and in services and financial sectors. The regression results confirm both assumptions. In addition, profit shifting spillovers differ by OFC. They are stronger for the most tax aggressive OFCs (e.g., Barbados, Luxembourg, and Switzerland), where corporate income tax rates are at very low levels.

The findings are new as they are to the best of my knowledge the first to uncover the existence of (intra-industry) profit shifting spillovers. As such, they contribute to the flourishing literature on the determinants of corporate tax avoidance and profit shifting (Alm, 2019; Beer et al., 2020; Wang et al., 2020). They more notably resonate with the work of Cen et al. (2017), Lim et al. (2018), Gallemore et al. (2019), Barrios and Gallemore (2021), and Bauckloh et al. (2021). The aforementioned papers suggest that interactions between firms play a role in tax avoidance practices. From a methodological perspective, they usually resort to firm-level data and look at firm-year-level ETRs. However, one shortcoming of ETRs is that they encompass diverse tax avoidance activities (Hanlon and Heitzman, 2010). They also are highly volatile and can fluctuate for a number of reasons unrelated to tax avoidance (Dyreng et al., 2008). The data used in this paper are much finer. They offer a clearer indication of corporate tax avoidance, make it possible to single out profit shifting, and highlight the OFCs involved. They make it possible to refine the statistical approach at the same time.

In a sense, the findings partly explain the rapid development of profit shifting activities witnessed in the 1990s-2000s. They have policy implications too. Profit

shifting has become a topical matter in a decade of economic, political, and social turmoil. The successive data leaks, the rise of within-country income inequalities, the persistence of budget deficits in Europe and the US, and the COVID-19 pandemic have pushed governments to implement anti profit shifting measures. Against this background, the results emphasize that firms tend to reproduce the profit shifting schemes of their peers. They indicate that when a firm undertakes tax dodging activities in a tax haven, there is a higher chance that other corporations operating in the same sector carry out operations with this tax haven. Anti profit shifting reforms could thus be more efficient in the long term by concentrating efforts on some sectors and OFCs. The fact that spillovers are more salient in services and finance and for very aggressive OFCs reaffirms that policymakers might want to pay more attention to these specific industries and jurisdictions.

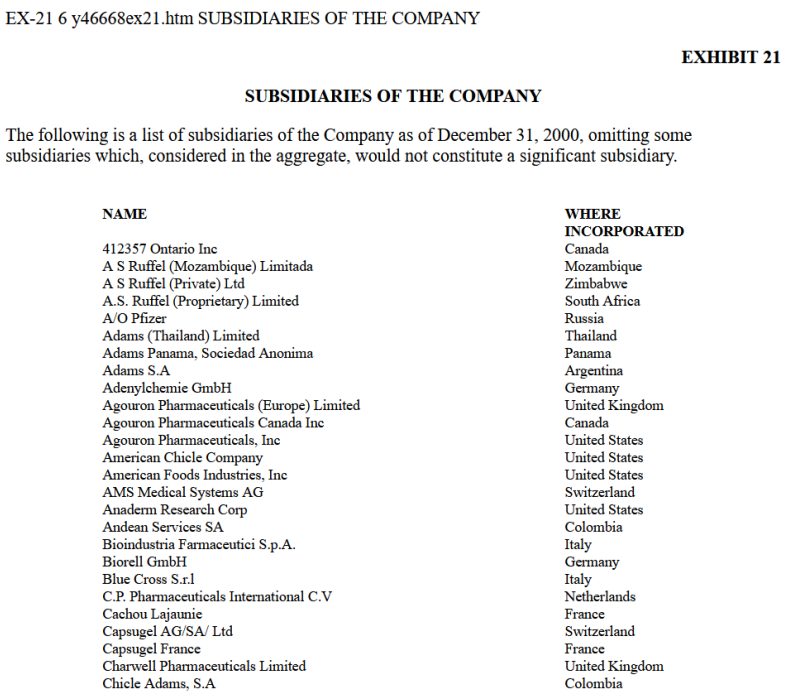
The remainder of the paper is structured as follows. First, section 2 introduces the data and outlines a set of facts on US-listed firms' presence in tax havens. Next, section 3 lays out the econometric exercise, the results, and the robustness checks. Section 4 briefly concludes and discusses avenues for subsequent research.

2 Data

2.1 Sources

The data originate from two sources: Compustat and Exhibit 21 filings. Compustat contains extensive information on (consolidated) balance sheets, income statements, and cash flows of publicly listed firms in North America. These firms are the most productive ones. Albeit few in number, they account for a substantial share of overall sales, profits, and employment (e.g., Asker et al., 2014). Importantly, they are the most likely to engage in tax haven FDIs and profit shifting. Earlier work hints at the existence of a fixed cost of FDI. Foreign investments generally require completing market research ex ante, creating distribution networks, establishing facilities overseas, etc. Merely the largest and most productive firms can afford and find it profitable to pay these costs (Helpman et al., 2004). A similar logic applies to profit shifting (Krautheim and Schmidt-Eisenlohr, 2011; Langenmayr, 2015; Bilicka et al., 2020). Avoiding taxes necessitates excellent knowledge of the tax code. MNEs must recruit expensive tax experts to take advantage of legal technicalities and artificially book their income in tax-friendly jurisdictions (Jones

Figure 2.1 – Subsidiaries reported by PFIZER INC



EX-21 6 y46668ex21.htm SUBSIDIARIES OF THE COMPANY

EXHIBIT 21

SUBSIDIARIES OF THE COMPANY

The following is a list of subsidiaries of the Company as of December 31, 2000, omitting some subsidiaries which, considered in the aggregate, would not constitute a significant subsidiary.

NAME	WHERE INCORPORATED
412357 Ontario Inc	Canada
A S Ruffel (Mozambique) Limitada	Mozambique
A S Ruffel (Private) Ltd	Zimbabwe
A.S. Ruffel (Proprietary) Limited	South Africa
A/O Pfizer	Russia
Adams (Thailand) Limited	Thailand
Adams Panama, Sociedad Anonima	Panama
Adams S.A	Argentina
Adenylchemie GmbH	Germany
Agouron Pharmaceuticals (Europe) Limited	United Kingdom
Agouron Pharmaceuticals Canada Inc	Canada
Agouron Pharmaceuticals, Inc	United States
American Chicle Company	United States
American Foods Industries, Inc	United States
AMS Medical Systems AG	Switzerland
Anaderm Research Corp	United States
Andean Services SA	Colombia
Bioindustria Farmaceutici S.p.A.	Italy
Biorell GmbH	Germany
Blue Cross S.r.l	Italy
C.P. Pharmaceuticals International C.V	Netherlands
Cachou Lajaunie	France
Capsugel AG/SA/ Ltd	Switzerland
Capsugel France	France
Charwell Pharmaceuticals Limited	United Kingdom
Chicle Adams, S.A	Colombia

Notes: This snapshot is a non-exhaustive list of the significant subsidiaries reported by PFIZER INC in Exhibit 21 in December 2000.

et al., 2018). Anecdotal evidence for instance shows that PricewaterhouseCoopers received nearly $55 million from Caterpillar for developing its tax dodging strategy (US Senate Permanent Subcommittee on Investigations, 2014). For these reasons, a very narrow circle of MNEs have the resources to engage in profit shifting (Gumpert et al., 2016). Compustat arguably includes these companies and not having a representative sample of the universe of firms should not be seen as a problem in this context. [4]

Compustat is merged with data extracted from Exhibit 21 filings. Every year, the SEC requires US-listed firms to disclose a list of their significant subsidiaries in Exhibit 21 of Form 10-K. A subsidiary is qualified as significant if its assets (or revenues) represent at least 10 percent of consolidated assets (or revenues). Moreover, any undisclosed subsidiary is treated as significant if by combining all undisclosed subsidiaries into one composite subsidiary, the latter accounts for at least 10

4. Small and medium enterprises (SMEs) have fewer resources, have a lower probability to be audited, and are less internationally oriented. They are therefore more inclined to *evade* taxes and to turn to informality. The key difference is that tax evasion is undoubtedly illegal, whereas tax avoidance is closer to the sharp line between legality and illegality.

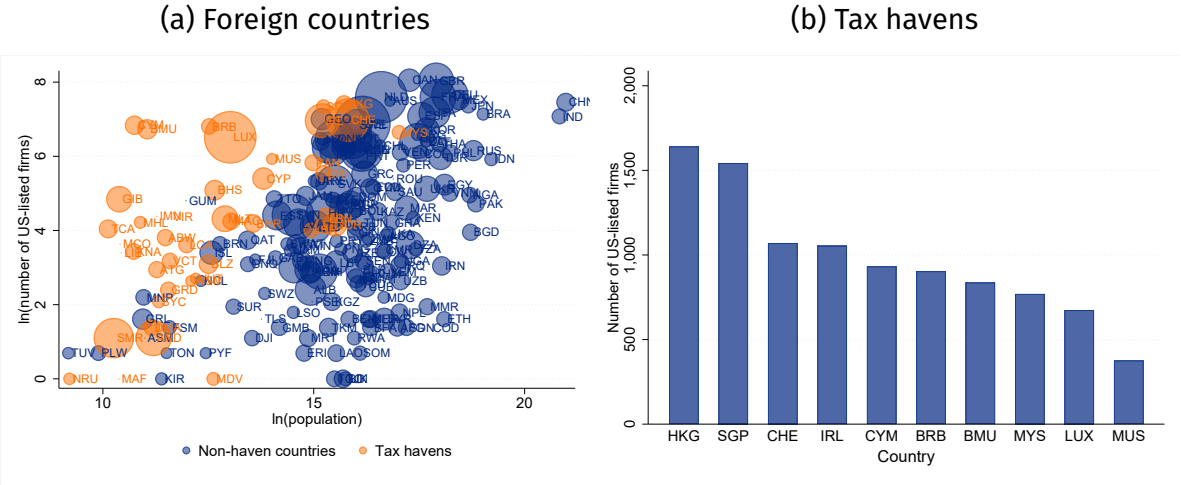
Table 2.1 – List of tax havens (Hines and Rice, 1994; Dyreng and Lindsey, 2009)

Andorra, Anguilla, Antigua and Barbuda, Aruba, Bahamas, Bahrain, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Cook Islands, Costa Rica, Cyprus, Dominica, Gibraltar, Grenada, Guernsey, Hong Kong, Ireland, Isle of Man, Jersey, Jordan, Lebanon, Liberia, Liechtenstein, Luxembourg, Macau, Malaysia, Maldives, Malta, Marshall Islands, Mauritius, Monaco, Montserrat, Nauru, Netherlands Antilles, Niue, Panama, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Saint Martin, Samoa, San Marino, Seychelles, Singapore, Switzerland, Turks and Caicos Islands, Vanuatu.

percent of global assets (or revenues). Hence, Exhibit 21 filings reflect where more than 90 percent of US-listed firms' assets and revenues are recorded. They allow observing where the vast majority of US-listed firms' subsidiaries are incorporated and how these networks evolve over time. An interesting feature of Exhibit 21 reports is that they are electronically filed since 1993 and are publicly available on the Electronic Data Gathering, Analysis, and Retrieval (EDGAR) platform maintained by the SEC. Figure 2.1 gives an example. It displays (a part of) the list of subsidiaries reported by PFIZER INC in the US and abroad in December 2000. In what follows, I exploit an updated version of the database constructed by Dyreng and Lindsey (2009) covering the 1993-2013 period.

One potential caveat is that firms might have incentives to under-report tax haven subsidiaries. Dyreng, Hoopes, Langetieg, and Wilde (2020) argue however that most disclosures are accurate, even when it comes to tax havens. Another caveat is that subsidiaries incorporated in tax havens are not automatically involved in profit shifting. Disentangling both types of tax haven subsidiaries is challenging. Information at the subsidiary level is sparse since US-listed companies are not obliged to convey financial information at this level. Nevertheless, note that tax havens are essentially small jurisdictions (see table 2.1 and stylized fact 1 below). Therefore, tax haven subsidiaries not used for profit shifting purposes are unlikely to reach the 10 percent threshold. We will see that entry into OFCs is systematically associated with a decrease in US-listed firms' ETRs (see stylized fact 4 below), and we will also abstract from the largest tax havens in one of the robustness checks to better address this concern.

Figure 2.2 – Firm presence overseas



Notes: Graph (a) shows the relationship between US-listed firms' presence in foreign countries (y-axis), population size (x-axis), and centrality (bubble size). Population data are from 2003 and come from the World Bank. Centrality of country c is calculated as $\sum_j GDP_{j,2003}/dist_{jc}$. GDP and bilateral distance data are standardized and retrieved from CEPII. Graph (b) shows the top 10 OFCs where US-listed firms were implanted over the period 1993-2013.

2.2 Sample

The final sample consists of 14,070 firms active in 436 4-digit SIC sectors, all of which reported one or several subsidiaries at some point inside or outside the US. The database is arranged at the firm-OFC-year level. The OFC list draws on Hines and Rice (1994) and Dyreng and Lindsey (2009). These classifications are typical in the corporate tax avoidance literature and a country is assumed to be a tax haven if it figures in at least one of the two lists. In total, 50 foreign countries are marked as tax havens (see table 2.1).

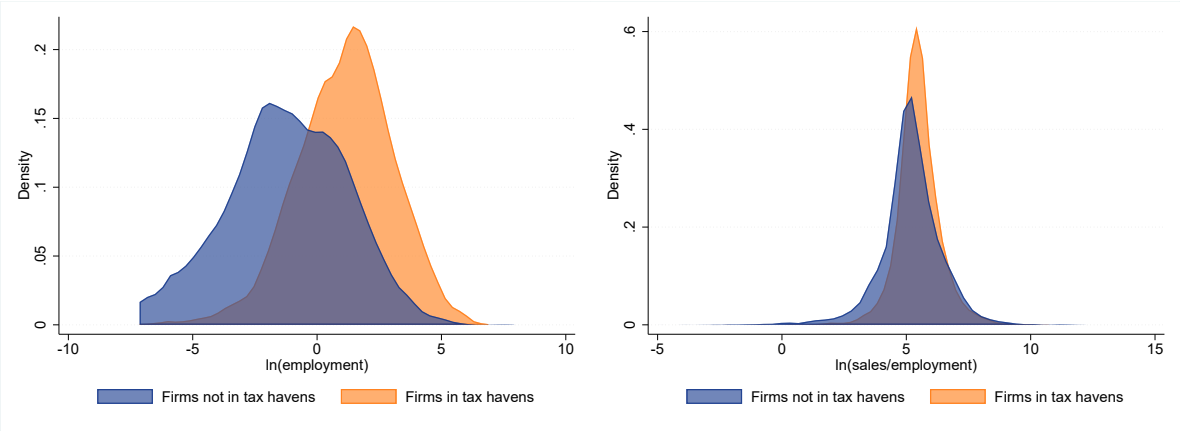
2.3 Stylized facts

Stylized fact 1: Tax havens attract a disproportionately high number of firms given their small size and remoteness.

Figure 2.2a illustrates the relationship between countries' attractiveness (y-axis), size (x-axis), and centrality (bubble size). Tax havens (in orange) are separated from non-haven countries (in blue). The orange point cloud is higher than the

Figure 2.3 – Firm size and productivity (distribution)

(a) Firm size (b) Firm productivity



Notes: In Compustat, employment is given by the variable denoted *EMP* and sales are given by the variable labeled *SALE*. Employment is expressed in thousands and sales are measured in million US dollars.

blue one. Tax havens thus concentrate more US-listed companies on average than non-haven countries of the same size. The proposition holds for centrality. This pattern is worth noticing because it re-questions the empirical validity of common international trade models according to which small and isolated countries receive less FDIs than their counterparts (e.g., Brainard, 1993; Head and Mayer, 2004; Helpman et al., 2004). It suggests that FDIs in OFCs are principally motivated by an environment conducive to tax dodging. Among OFCs, Hong Kong appears as the most attractive one. 11.66 percent of the US-listed firms in the sample disclosed at least one subsidiary in this jurisdiction (see figure 2.2b). Singapore (10.97 percent), Switzerland (7.60 percent), Ireland (7.49 percent), and the Cayman Islands (6.62 percent) join the top 5.

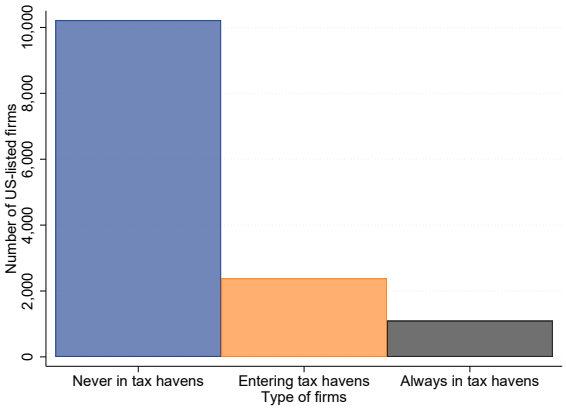
Stylized fact 2: US-listed firms in tax havens are few, but their number is rising over time. They also are larger and more productive than their peers.

10,220 companies out of 14,070 (73 percent) never divulged any tax haven subsidiary between 1993 and 2013. Among MNEs linked with OFCs, 2,387 firms (17 percent) entered at least one tax haven for the first time during this period, while 1,097 firms (8 percent) always reported at least one tax haven subsidiary (see also Appendix figure 2.A1).[5] It means that a handful of firms were in OFCs and that

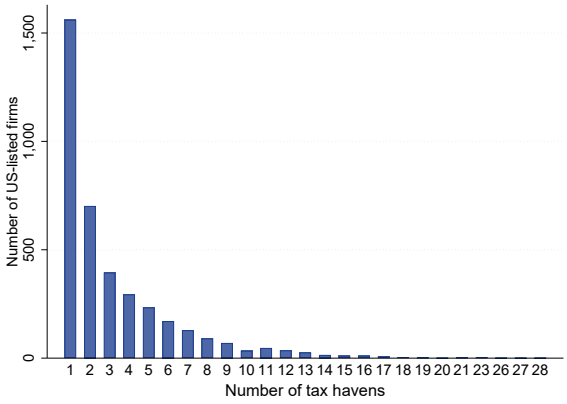
5. The remaining 366 corporations (2 percent) were in tax havens in the first year of observation

Figure 2.4 – Firm presence in OFCs

(a) Extensive margin



(b) Intensive margin



the 1993-2013 period is optimal for the analysis since operations in OFCs soared over the time span. An industry decomposition attached in Appendix table 2.A1 shows that the upward trend is most striking in finance (SIC 60-67) and services (SIC 70-89). Moreover, figure 2.3 highlights a mapping between firm presence in tax havens, firm size, and firm productivity. [6] The fact that not all US-listed companies were in tax havens and those who did were larger and more productive concurs with the view that profit shifters form a club of superstar MNEs.

Stylized fact 3: US-listed firms implanted in tax havens are mostly located in one or two tax havens.

On average, profit shifting MNEs [7] were located in three distinct tax havens. 40 (18) percent of these companies were implanted in one (two) tax haven(s), so a fistful of companies declared subsidiaries in many tax havens (see figure 2.4b). Nine companies were for example active in more than 20 OFCs. Again, the

and exited at a later stage. By the same token, among the 2,387 companies entering for the first time between 1993 and 2013, 182 companies left tax havens after a few years. No information at hand allows us to identify the reason(s) for such exits. The 10 percent threshold requirement could be part of the story. All the same, these firms have very limited influence and do not affect the results. More details are available upon request.

6. See Appendix figure 2.A2 for alternative metrics: assets, turnover, and profits.

7. Recall that the profit shifting metric used in this paper (having a significant subsidiary in tax havens) is conservative. As discussed in section 2, some OFC subsidiaries used for tax saving purposes might be unobserved due to the reporting threshold. Moreover, although profits are essentially directed toward OFCs (Dowd et al., 2017; Garcia-Bernardo and Janskỳ, 2022), firms can shift profits between non-havens to reduce their tax liability.

skewness of the distribution reinforces the idea that the subgroup of MNEs that massively shift profits across borders comprises the most performing corporations.

Stylized fact 4: US-listed firms implanted in tax havens exhibit lower ETRs.

If presence in OFCs fulfills tax saving purposes, then ETRs should decrease when US-listed firms enter tax havens. The regression attached in Appendix table 2.A2 examines this. Firm-year-level ETRs are regressed on the number of tax havens with which US-listed corporations are connected, controlling for firm size and tax loss carryforward. Firm and year fixed effects correct for systematic heterogeneity across firms and over time. The objective is to compare the tax liability of companies with a similar profile but different exposure to OFCs. The results reveal that entry into a tax haven is indeed associated with a decline in ETRs. The drop amounts to 0.4 percentage point. This coefficient means that tax haven subsidiaries allow the most tax aggressive US-listed firms to diminish their global average ETR by almost 10 percentage points.

3 Econometric analysis

I now turn to the econometric analysis and prove that profit shifting schemes propagate within industries. The first part of the analysis computes an average spillover effect and gauges its robustness. The second part tests for heterogeneous effects to gain insight into the diffusion of tax avoidance practices.

3.1 Average spillover effect

3.1.1 Identification strategy

The baseline approach consists of a linear probability model (LPM) with ordinary least squares:

$$FDI_{i,c,t} = \alpha TREAT_{i,c,t} + \mu_{i,t} + \upsilon_{c,t} + \gamma_{i,c} + \epsilon_{i,c,t} \quad (2.1)$$

The dependent variable $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm i has at least one subsidiary in tax haven c in year t. On the right-hand side, $TREAT_{i,c,t}$ is a dichotomous variable equal to 1 if another firm from the same 4-digit SIC sector discloses in year t a subsidiary in tax haven c. Three-way fixed effects

purge the treatment effect of confounding factors and thereby reduce endogeneity. Firm-year fixed effects $\mu_{i,t}$ absorb sector- and firm-year determinants of FDIs and aggressive tax planning. They incorporate, among other things, sector trends in tax haven FDIs as well as firm-level determinants highlighted in the literature such as productivity and intangible assets. Country-year fixed effects $\upsilon_{c,t}$ encompass country-year factors influencing inward FDIs from US-listed firms. These factors include (but are not limited to) corporate tax rates and financial opacity. Firm-country fixed effects $\gamma_{i,c}$ neutralize firm-country time-invariant causes of tax haven FDIs, inclusive of the distance between headquarters and OFCs.

The coefficient α captures the average profit shifting spillover. In other words, it captures the effect of peer presence in a tax haven on the firm's probability to own subsidiaries in this tax haven. Take two firms *i* and *i*′ active in two different sectors denoted s_i and $s_{i'}$ respectively. Assume that they have comparable global trends in tax haven FDIs, i.e., $\mu_{i,t} - \mu_{i,t-1} \approx \mu_{i',t} - \mu_{i',t-1}$, and that no firm was established in tax haven *c* in year $t-1$. Further assume that at least one firm in s_i starts operating in tax haven *c* in year *t* but no company in $s_{i'}$ penetrates tax haven *c* in year *t*. The identification of α relies on the hypothesis that FDIs of *i* and *i*′ in jurisdiction *c* would have evolved similarly between $t-1$ and *t* without any entry in s_i. In the same spirit, take two OFCs *c* and *c*′ such that $\upsilon_{c,t} - \upsilon_{c,t-1} \approx \upsilon_{c',t} - \upsilon_{c',t-1}$. Assume that no firm in s_i had subsidiaries in *c* and *c*′ in year $t-1$ and that at least one company enters tax haven *c* in year *t*. The conjecture is that FDIs of firm *i* in tax havens *c* and *c*′ would have moved in parallel had there not been any entry into tax haven *c* in year *t* among s_i companies.

3.1.2 Results

The benchmark result is outlined in table 2.2. $\hat{\alpha}$ is equal to 0.14 percent and is statistically significant at the 1 percent level. Other things held constant, the average probability to own a subsidiary in a particular OFC is 0.14 percentage point (equivalently, 10 percent) higher if another firm from the same sector also does.

Supplementary regressions displayed in Appendix table 2.A3 replace the dichotomous treatment variable $TREAT_{i,c,t}$ with $TREAT^{C}_{i,c,t}$ (number of peers in tax haven *c* in year *t*, column (1)) or $TREAT^{S}_{i,c,t}$ (share of peers in tax haven *c* in year *t*, column (2)). The coefficient remains positive and statistically significant at the 1 percent level in the two configurations. It indicates that the probability to disclose subsidiaries

Table 2.2 – Profit shifting spillovers: baseline results

Dependent variable	$FDI_{i,c,t}$
$TREAT_{i,c,t}$	1.35e-3^a
	(2.74e-4)
Firm-year FEs	Yes
Country-year FEs	Yes
Firm-country FEs	Yes
R^2	0.69
No. of obs.	5,514,400
Mean value of the dependent variable	1.33e-2

Notes: Results of equation (2.1). $FDI_{i,c,t}$ is a dummy equal to 1 if firm i has at least one subsidiary in tax haven c in year t. $TREAT_{i,c,t}$ is a dummy equal to 1 if another company operating in the same sector as firm i has at least one subsidiary in tax haven c in year t. The standard error, in parentheses, is clustered at the sector-year level. $^b p < 0.05$, $^a p < 0.01$. See section 3 for more details.

in a given OFC increases by 1 percentage point if the share of peers implanted in this OFC rises by 10 percentage points. Appendix figure 2.A3 zooms in and measures the level of peer presence in OFCs above which spillovers become statistically significant. Interestingly, the graph reveals that profit shifting spillovers kick in when more than 10 percent of peers have ownership ties with tax havens. There does not seem to be any "snowball effect," however.

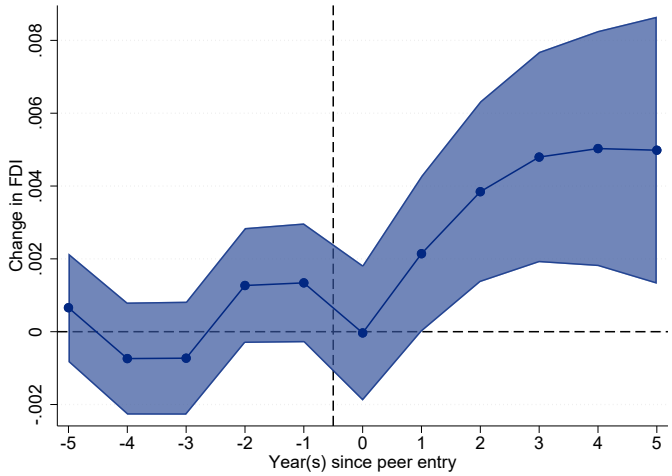
3.1.3 Robustness

Dynamics A battery of tests assess the robustness of the finding. The first robustness check further scrutinizes how the probability to disclose a subsidiary in a tax haven varies before and after peer entry into this specific tax haven. Equation (2.1) is enriched with lagged and leading values of $TREAT_{i,c,t}$ denoted $TREAT^{t-k}_{i,c,t}$ and $TREAT^{t+k}_{i,c,t}$ respectively. I select a 10-year window around the treatment and estimate equation (2.2) below:

$$FDI_{i,c,t} = \alpha TREAT_{i,c,t} + \sum_{k=1}^{5} \beta_k TREAT^{t+k}_{i,c,t} + \sum_{k=1}^{5} \zeta_k TREAT^{t-k}_{i,c,t} + \mu_{i,t} + \upsilon_{c,t} + \gamma_{i,c} + \epsilon_{i,c,t} \quad (2.2)$$

Two comments emerge from figure 2.5. First, there is little evidence of pre-trends. The $\hat{\beta}$ are not significantly different from zero, i.e., firm presence in OFCs does not significantly vary before peer entry into OFCs. This pattern supports the common trend assumption, implies that the treatment variable is unlikely to be correlated

Figure 2.5 – Profit shifting spillovers: dynamics



Notes: Results of equation (2.2). $FDI_{i,c,t}$ is a dummy equal to 1 if firm *i* has at least one subsidiary in tax haven *c* in year *t*. On the *x*-axis, the left part represents the $\hat{\beta}_k$, i.e., how $FDI_{i,c,t}$ varies before peer entry. The coefficient for "-3" for instance represents $\hat{\beta}_3$, i.e, how $FDI_{i,c,t}$ varies 3 years before peer entry into OFC *c*. The right part represents the $\hat{\alpha} + \sum_k \hat{\zeta}_k$, $k = \{0, ..., 5\}$, i.e., how $FDI_{i,c,t}$ varies post peer entry. The coefficient for "3" for instance represents $\hat{\alpha} + \sum_{k=1}^{3} \hat{\zeta}_k$, i.e., how $FDI_{i,c,t}$ varies 3 years after peer entry into OFC *c*. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the sector-year level. See section 3 for more details and Appendix table 2.A4 for a full table.

with unobserved firm- or sector-country-year shocks (e.g., technology shocks), and reduces endogeneity concerns. Second, the spillover effect intensifies and persists over time. It becomes significant after one or two years. It then reaches 40 percent after four years and finally stabilizes.

The graduality sheds light on the mechanism. In principle, entry decisions could be either simultaneous (e.g., due to competitive pressures) or sequential (e.g., due to knowledge diffusion). Disentangling the two cases is not straightforward, but two elements are reminiscent of a sequential game. First, spillovers are OFC-specific. If entry into OFCs were triggered by competitive pressures, then it is unclear why US-listed firms would enter the same OFCs as their peers. They would penetrate any OFC with the aim of saving taxes. Notice that the firm-year fixed effects nest global trends in tax haven FDIs at the industry-year level. In this respect, the impact of competition on firm entry into OFCs is more likely to pass through the firm-year fixed effects than through the treatment variable $TREAT_{i,c,t}$. Second, profit shifting spillovers grow over time. It suggests that firms progressively learn from the expe-

rience of their peers.

Estimation method Other tests question the relevance of the baseline estimation technique. There is to the best of my knowledge no consensus in the literature on the estimator one should use when the dependent variable is binary (e.g., Horrace and Oaxaca, 2006; Angrist and Pischke, 2009; Battey, Cox, and Jackson, 2019; Gomila, 2021a). On the one hand, LPMs are easier to interpret and more transparent, but they might deliver inconsistent estimates under some conditions. On the other hand, binary models guarantee that the predicted probabilities lie on the unit interval, but they may suffer from the so-called incidental parameters problem. Estimating binary models with high-dimensional fixed effects is not trivial. Groups for which the dependent variable stays constant should be excluded and this omission biases the point estimates. In Appendix table 2.A5 column (1), I build on recent advances in the econometric literature. Hinz, Stammann, and Wanner (2020) design a correction procedure for binary models with three-way fixed effects akin to equation (2.1). I estimate a logit model with three-way fixed effects and apply their guidelines. Reassuringly, the average partial effect is positive, statistically significant at standard levels, and close to the benchmark $\hat{\alpha}$.

An alternative empirical strategy to investigate profit shifting spillovers involves dynamic panel models. As discussed in section 2, tax haven FDIs entail fixed costs. Firm *i*'s presence in tax haven *c* and period *t* thus crucially depends on its presence there in period $t-1$, which is precisely something equation (2.1) does not account for. To address this issue of persistence, the lagged value of the dependent variable is inserted into equation (2.1) in a supplementary sensitivity check:

$$FDI_{i,c,t} = \alpha TREAT_{i,c,t} + \kappa FDI_{i,c,t-1} + \mu_{i,t} + \upsilon_{c,t} + \gamma_{i,c} + \epsilon_{i,c,t} \tag{2.3}$$

OLS estimations of equation (2.3) are reported in Appendix table 2.A5 column (2). They give a positive and significant $\hat{\kappa}$. The value of the autoregressive parameter is not far from 1 and attests that tax haven FDIs are highly persistent. As for the main coefficient of interest, $\hat{\alpha}$ drops but remains sizable and close to its benchmark value. Additional regressions proceed with two-stage least squares (2SLS) and generalized method of moments (GMM) to tackle the endogeneity inherent to dynamic models. On the one hand, instrumenting $FDI_{i,c,t-1}$ with $FDI_{i,c,t-3}$ mitigates the issue generated by an autocorrelation of residuals in equation (2.3). The results are outlined in column (3) and align with the rest. On the other hand, system-GMM estimators à la Blundell and Bond (1998) are the most popular in dynamic panel modeling – at

least among international business studies (Li et al., 2021). They also lead to similar results (column (4)). [8]

Tax haven classification Appendix table 2.A6 reflects upon the tax haven classification. Tax havens are traditionally defined as jurisdictions where corporate income tax rates are low and where operations are opaque. The first criterion is relatively easy to evaluate. The second one, however, is more difficult to assess. Secrecy is multidimensional and elements such as the exchange of information are not always quantifiable. Hence, characterizing a country as a tax haven might turn out to be arbitrary. I rerun equation (2.1) by using the classifications of Hines and Rice (1994) and Dyreng and Lindsey (2009) separately (HR, column (1); DL, column (2)) or by forming a restricted list composed of the jurisdictions found in the two lists (DL ∩ HR, column (3)). [9] Appendix figure 2.A4 replicates the results after omitting one OFC at a time. A complementary regression puts six tax havens aside: Hong Kong, Ireland, Luxembourg, Malaysia, Singapore, and Switzerland (EX6, column (4)). The rationale is the following. Since these countries are relatively large and well connected with the rest of the world, FDIs of US-listed firms in these countries could very well be unrelated to tax avoidance. Notice in this regard that all six countries are in figure 2.2b. FDIs in remote and small jurisdictions like Jersey and Mauritius, on the contrary, more certainly fall within the sole scope of profit shifting. Last but not least, I leverage the classification used in a newly influential contribution in the field: Tørsløv et al. (2021). A major advantage of this list is that it covers some major OFCs absent from both Hines and Rice (1994) and Dyreng and Lindsey (2009), like the Netherlands and Puerto Rico. Column (5) introduces these additional OFCs into equation (2.1). [10] Overall, the results are stable and coincide with the baseline estimate. They should therefore hold for a wide range of classifications.

8. Assumptions and applications to international business studies are extensively discussed in Li et al. (2021). Here, system-GMM estimators (Blundell and Bond, 1998) are preferred to difference-GMM estimators (Arellano and Bond, 1991) since the dependent variable *FDI* is highly persistent, and system-GMM are known to perform better in such cases. One lag of *FDI* is included and *TREAT* is treated as a predetermined variable. As expected, note that the Arellano-Bond test for zero autocorrelation in first-differenced errors rejects the null hypothesis of no autocorrelation for the first lag but not for the second one (p-value = 0.00 for the lag of order 1, p-value = 0.64 for the lag of order 2).

9. The two lists share 37 OFCs. The classification of Dyreng and Lindsey (2009) is the only one to enumerate Aruba, Costa Rica, Malaysia, Mauritius, Nauru, Niue, Samoa, San Marino, and Seychelles. Nonetheless, Hines and Rice (1994) retain the British Virgin Islands, Jordan, Maldives, and Saint Martin, unlike Dyreng and Lindsey (2009).

10. These OFCs are: Belgium, Bonaire, Curacao, the Netherlands, and Puerto Rico.

Industry definition Along the same lines, Appendix table 2.A7 adjusts the industry definition. A shortcoming not addressed thus far is that $\hat{\alpha}$ might be essentially driven by small sectors, where firms could for instance be more connected via alliances or mergers and acquisitions (M&A). To verify that it is not the case, I reproduce the results by keeping only 4-digit SIC sectors with more than 15 enterprises ($TREAT^{>15}_{i,c,t}$, column (1)) or by extending sectors at the 3-digit SIC level ($TREAT^{3-digit}_{i,c,t}$, column (2)). The estimates are not surprisingly of lower magnitude but stay statistically significant. They confirm that profit shifting spillovers are quite pervasive. To cope with the particular issue of M&A operations, a regression retains only companies recording no acquisitions between 1993 and 2013 ($TREAT^{acq}_{i,c,t}$, column (3))[11] and one regression re-performs the analysis with firms appearing in the database throughout the period ($TREAT^{1993-2013}_{i,c,t}$, column (4)). The results are still positive and significant, meaning that they should not be mechanical and imputable to M&A deals made with corporations already present in OFCs.

Falsification tests Appendix table 2.A8 finally performs a couple of falsification tests. The test in column (1) first mixes all firms together and then forms 436 random sectors ($TREAT^{random}_{i,c,t}$). If the estimates exposed until now truly reflect intra-industry spillovers, then we should observe no changes in FDIs in tax haven *c* when another random company enters *c*. In the same spirit, column (2) verifies that the profit shifting spillovers are not spatial. There might be some overlap between industry peers and geographic neighbors, in which case the results displayed throughout the paper could be induced by *spatial* profit shifting spillovers (Grieser, LeSage, and Zekhnini, 2021). I retrieve information about US-listed companies' state of incorporation (from Compustat) and US subsidiaries (from Exhibit 21). Next, I replace $TREAT_{i,c,t}$ with an analogous variable $TREAT^{spatial}_{i,c,t}$ that is equal to 1 if another US-listed company implanted in the same US state(s) as firm *i* has subsidiaries in OFC *c* in year *t*. The two exercises bear out the benchmark results insofar as $\hat{\alpha}$ is not statistically different from zero. All in all, the robustness checks substantiate the existence of intra-industry profit shifting spillovers.

3.2 Heterogeneous spillover effects

Before concluding, I explore the existence of heterogeneous effects over time, across industries, and between OFCs.

11. Compustat provides very few details on M&A transactions. Here, firms recording no acquisitions are identified thanks to the *ACQMETH* Compustat variable.

Disparities over time and across sectors Equation (2.1) estimates an average profit shifting spillover effect. Yet, there are reasons to expect disparities over time and across sectors. Grubert (2012) and Klassen and Laplante (2012) find that profit shifting of US MNEs escalated in previous decades, notably thanks to declining audit rates and the implementation of the "check-the-box" rules in 1997 (see also Appendix figure 2.A1). The latter originally aimed at simplifying tax procedures by granting firms the right to select themselves their organizational form and tax treatment (corporation, partnership, etc). They had the unintended consequence of facilitating the tax dodging of US MNEs with the expansion of hybrid entities, i.e., entities that are recognized as corporations by one jurisdiction but not by another one.

Another stream of research emphasizes industry-specific heterogeneity in profit shifting. Gumpert et al. (2016) and Merz and Overesch (2016) show that profit shifting is more prevalent in services and finance. This is because intangible assets remarkably ease tax-motivated income transfers across borders (see also Beer and Loeprick, 2015; Barrios and d'Andria, 2020, and Appendix table 2.A1). Intangible assets are highly mobile by nature. They can be developed in a particular country, and their property rights can then be transferred to a tax-friendly jurisdiction. Besides being mobile, intangibles make transfer pricing regulations hard to enforce. It is difficult for the regulator to define an arm's length price for an IP-related transaction because there is generally no comparable transaction between unrelated parties that can serve as a reference.

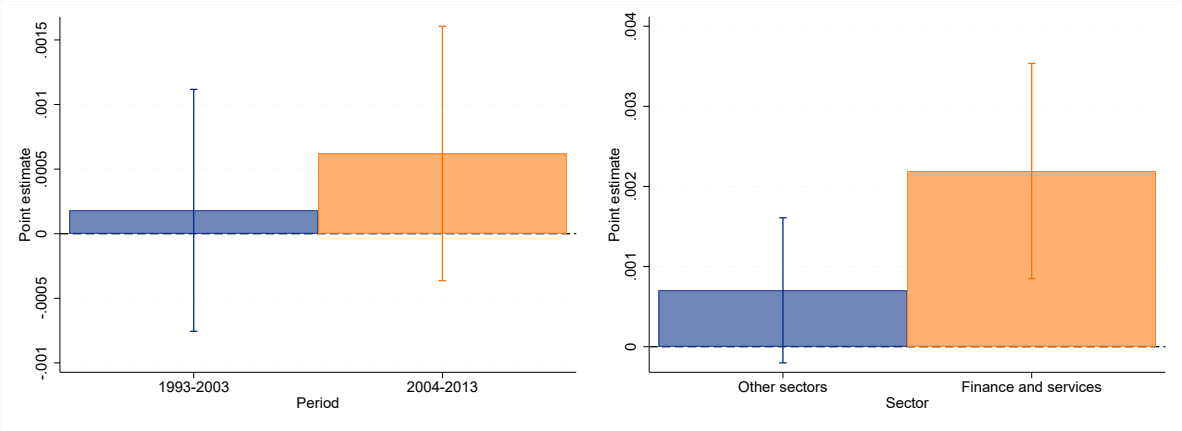
Therefore, I posit that spillover effects are larger between 2004 and 2013, and in services and financial sectors (SIC 60-67, SIC 70-89). To confront these hypotheses with data, regression (2.1) is run on the four corresponding subsamples. Figures 2.6a and 2.6b depict the regression results and globally support both hypotheses. The diffusion of tax dodging practices is stronger in the second subperiod (figure 2.6a), [12] and in services and financial industries (figure 2.6b).

Country-specific spillovers Spillover effects could also differ by tax haven. Appendix figure 2.A5 confirms this and, in fact, reveals considerable disparities across jurisdictions. The figure plots the results obtained after adding a series of variables

12. The second coefficient is significant at the 15 percent level.

Figure 2.6 – Profit shifting spillovers over time and across sectors

(a) 1993-2003 versus 2004-2013 (b) Finance and services versus other sectors



Notes: Results of equation (2.1) for four subsamples. The bars represent the point estimates $\hat{\alpha}$. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the sector-year level. See section 3 for more details and Appendix table 2.A9 for a full table.

that interact the treatment term $TREAT_{i,c,t}$ with tax haven dummies $\mathbb{1}_c$:

$$FDI_{i,c,t} = \sum_c \alpha_c TREAT_{i,c,t} \times \mathbb{1}_c + \mu_{i,t} + \upsilon_{c,t} + \gamma_{i,c} + \epsilon_{i,c,t} \tag{2.4}$$

Well-known OFCs such as Barbados, Luxembourg, and Switzerland, already visible in figure 2.2b, stand out and feature in the top 10. A plausible explanation is that spillovers depend on tax havens' aggressiveness:

$$\hat{\alpha}_c = \delta + \eta THs_c + \zeta_c \tag{2.5}$$

In equation (2.5), THS_c denotes the tax haven score computed by the Tax Justice Network (Ateş, Cobham, Harari, Janskỳ, Meinzer, Millán, and Palanskỳ, 2021).[13] $\hat{\alpha}_c$ and THS_c are standardized for the ease of interpretation. The results of equation (2.5) are provided in table 2.3 column (1) and uncover a positive correlation between profit shifting spillovers and tax havens' aggressiveness. A one standard deviation increase in the tax haven score is associated with a 0.29 standard deviation increase in income shifting spillovers. Columns (2)-(6) supplement column (1). They focus on the five components of the index, namely: lowest available

13. Owing to data limitations, the data are from 2019. Given that OFCs' characteristics are quite persistent over time, this should not constitute a major problem. Moreover, note that the tax haven score is not defined for all 50 tax havens.

Table 2.3 – Profit shifting spillovers across OFCs

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	$\hat{\alpha}_c$	$\hat{\alpha}_c$	$\hat{\alpha}_c$	$\hat{\alpha}_c$	$\hat{\alpha}_c$	$\hat{\alpha}_c$	$\hat{\alpha}_c$	$\hat{\alpha}_c$
THs_c	0.29^b							
	(0.14)							
$LACIT_c$		0.46^b					0.42^b	
		(0.21)					(0.18)	
LG_c			0.24				-0.19	
			(0.17)				(0.53)	
$TRSP_c$				-0.19			-0.20	
				(0.14)			(0.16)	
AA_c					-6.46e-4		-0.04	
					(0.10)		(0.12)	
$DTTA_c$						0.25^b	0.34	
						(0.12)	(0.50)	
ETR_c^{CBCR}								-0.22^b
								(0.10)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.12	0.30	0.08	0.05	0.00	0.09	0.38	0.06
No. of obs.	27	27	27	27	27	27	27	37

Notes: Results of equation (2.5) with different specifications. $\hat{\alpha}_c$ is the profit shifting spillover effect for tax haven *c*. THS_c is the tax haven score computed by the Tax Justice Network for tax haven *c*. The five other explanatory variables in columns (2)-(7) refer to the components of THS_c. ETR_c^{CbCR} is the average ETR in OFC *c*, as calculated via CbCR reports. All variables are defined in section 3 and standardized. Standard errors, in parentheses, are heteroskedasticity-robust. $^b p < 0.05$, $^a p < 0.01$. See section 3 for more details.

corporate income tax rate (LACIT), loopholes and gaps (LG), transparency (TRSP), anti-avoidance (AA), and double tax treaty aggressiveness (DTTA). Higher values are associated with higher tax aggressiveness. The results highlight the prominent role of corporate income tax rates applicable in tax havens (columns (2) and (7)).

Capitalizing on OECD Country-by-Country Reports (CbCRs) strengthens this point (column (8)). CbCRs emerged as a result of Base Erosion and Profit Shifting (BEPS) Action 13 and under the initiative of the OECD and G20. MNEs headquartered in the countries that have adopted the regulation and recording group revenues over €750 million are required to document their activities where they operate: sales, profits, number of employees, corporate income taxes paid, etc. The information is aggregated at the parent-host country level and made publicly available by the OECD. CbCR-based ETRs offer the best indication of the tax rates faced by MNEs in OFCs for various reasons (Casella and Souillard, 2022). First, ETRs better describe

corporate tax liability than statutory tax rates (STRs) as they take into account numerous tax breaks (e.g., credits and exemptions). The gap between STRs and ETRs is especially striking in OFCs due to greater resort to fiscal incentives and preferential tax treatments. Second, among ETRs, those based on CbCRs are the most likely to mirror the taxes paid by MNEs since only MNEs fill CbCRs. Replacing THS_c with tax havens' ETR (ETR_c^{CbCR}) in equation (2.5) yields an estimate that is negative, significant at the 5 percent level, and coherent with columns (2) and (7). [14]

4 Conclusion

Using information on the tax haven subsidiaries of US-listed companies, I unveil in this paper the existence of intra-industry spillovers of profit shifting. A firm is more prone to establish a physical presence in a tax haven if another firm from the same industry owns subsidiaries in this tax haven. The profit shifting spillover effects are sizable. Moreover, they are heterogeneous. They are more intense in the most recent subperiod. The pattern echoes with prior work showing that profit shifting soared during the 2000s (Grubert, 2012; Klassen and Laplante, 2012). Furthermore, they are bigger in finance and services, which coincides with the idea that intangible-intensive industries are more inclined to undertake profit shifting activities (Gumpert et al., 2016; Merz and Overesch, 2016; Barrios and d'Andria, 2020). Last but not least, profit shifting spillovers are more pronounced for the most aggressive OFCs. The results pass several robustness checks, suggest that firms learn the profit shifting techniques of their peers, and help grasp the surge of profit shifting activities witnessed in the last decades.

More work is now needed in this direction. Although many US-listed firms are multinational and thus likely to appear in alternative databases, it would be valuable to ascertain the external validity of the findings through triangulation of data sources. Unraveling the exact channels whereby tax haven knowledge disseminates across MNEs is another promising task for future research.

14. Several comments are in order. (i) CbCR-based ETRs are also less likely to be contaminated by double counting of income and profits (compared to other series of ETRs), and loss-making companies can be ruled out to polish the computation of ETRs (Casella and Souillard, 2022). (ii) The first year of OECD CbCR data is 2016 but reporting at that time was not mandatory. I thus exploit data from 2017 and take simple averages across parent countries. ETR_c^{CbCR} is computed for 37 distinct tax havens. Its average is 7 percent. By contrast, the average STR is 17 percent (data from the Tax Foundation).

Appendix

Figure 2.A1 – Firm presence in OFCs over time

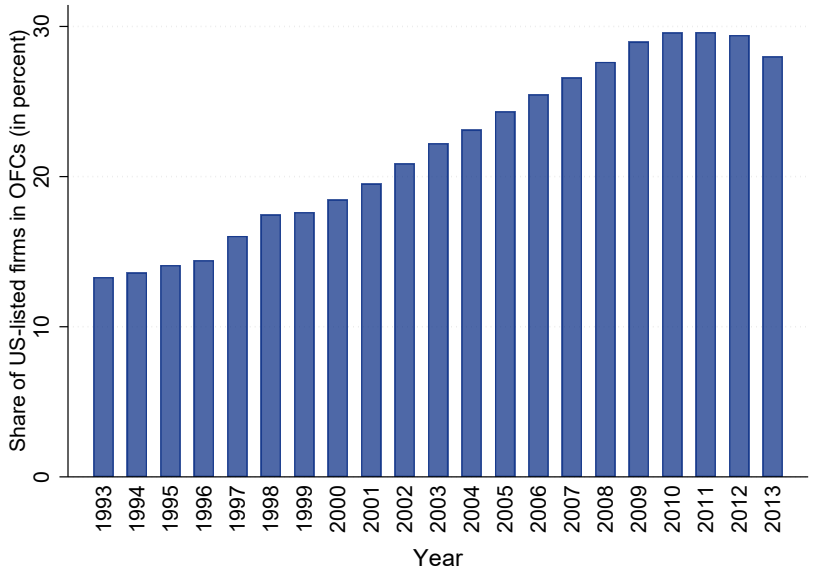
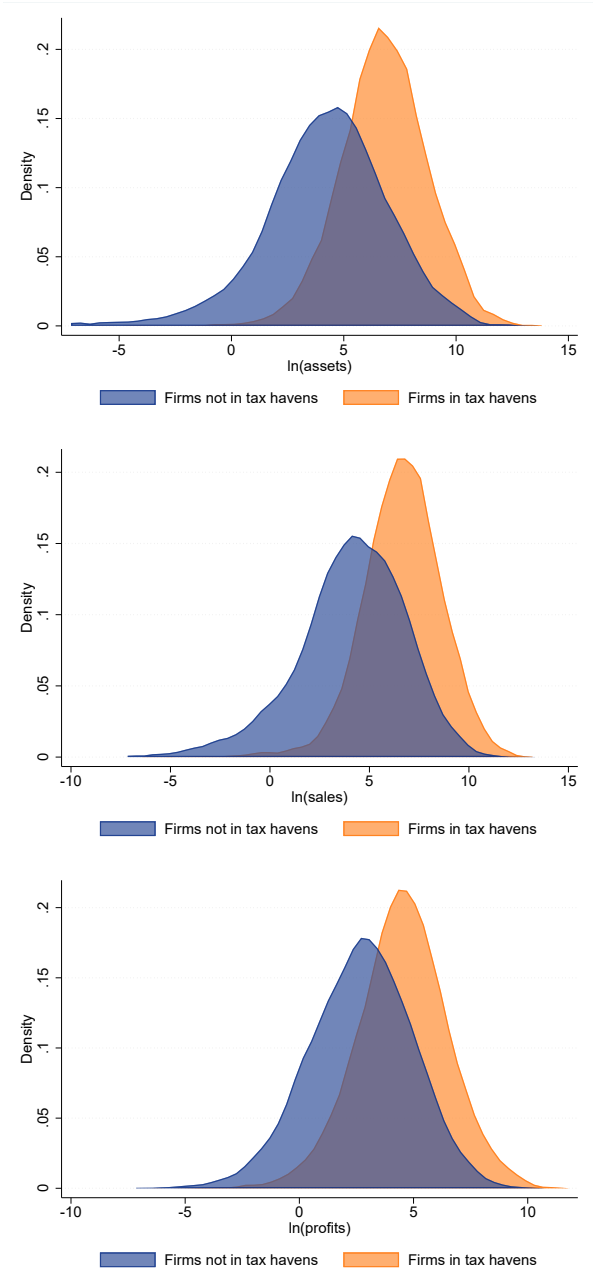


Table 2.A1 – Firm presence in OFCs across sectors

SIC sectors	Share of firms in OFCs in 2013 (in %)	Change between 1993 and 2013 (in %)
Services (SIC 70-89)	34.13	243.19
Finance, real estate, insurance (SIC 60-67)	33.44	276.43
Manufacturing (SIC 20-39)	28.13	199.52
Retail & wholesale trade (SIC 50-59)	24.27	203.57
Mining (SIC 10-14)	19.82	31.41
Transportation & public utilities (SIC 40-49)	16.76	81.25
Public administration (SIC 91-99)	12.94	40.00

Figure 2.A2 – Assets, turnover, and profits (distribution)



Notes: In Compustat, assets are given by the variable denoted *AT*, sales by the variable labeled *SALE*, and profits by the variable *PI – SPI*. All three are measured in million US dollars.

Table 2.A2 – Firm presence in OFCs and effective tax rates

Dependent variable	$ETR_{i,t}$
$TH_{i,t}$	-0.004[a]
	(0.001)
Firm FEs	Yes
Year FEs	Yes
Controls	Yes
R^2	0.64
No. of obs.	76,559

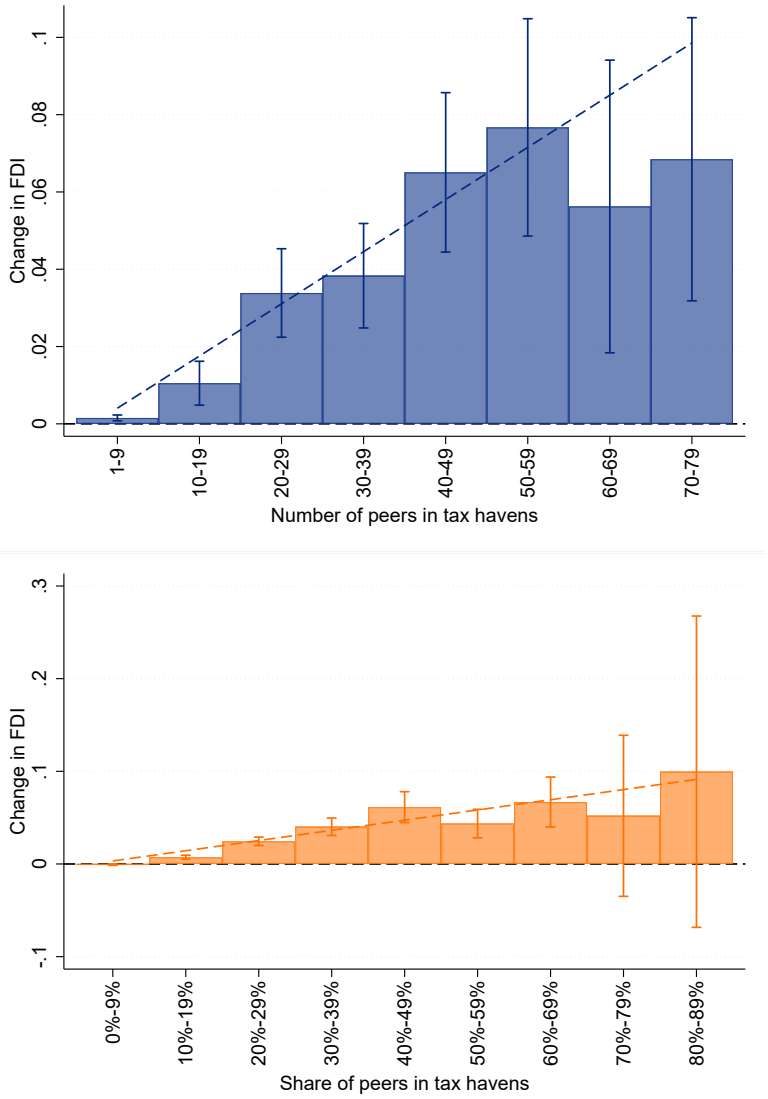
Notes: Results of the regression: $ETR_{i,t} = \alpha TH_{i,t} + \beta X_{i,t} + \mu_i + \upsilon_t + \epsilon_{i,t}$. $ETR_{i,t}$ is the effective tax rate of firm *i* in year *t*. The variable is constructed using the variables *TXT*, *PI*, and *SPI* in Compustat. It is equal to $TXT/(PI - SPI)$. For interpretability, and as is customary in the corporate tax avoidance literature, values outside the [0,1] interval are omitted. $TH_{i,t}$ is a count variable that represents the number of tax havens where firm *i* discloses subsidiaries in year *t*. $X_{i,t}$ is an array of controls: tax loss carryfoward (whose construction is based on the variable labeled *TLCF* in Compustat), employment (whose construction is based on the variable labeled *EMP* in Compustat), sales (whose construction is based on the variable labeled *SALE* in Compustat), and assets (whose construction is based on the variable labeled *AT* in Compustat). Employment (in thousands), sales, and assets (in million US dollars) are in logarithm. μ_i are firm-level fixed effects. υ_t are year-level fixed effects. The standard error, in parentheses, is clustered at the firm level. $^b p < 0.05$, $^a p < 0.01$. See section 2 for more details.

Table 2.A3 – Profit shifting spillovers: supplementary results

Column	(1)	(2)
Dependent variable	$FDI_{i,c,t}$	$FDI_{i,c,t}$
$TREAT^{C}_{i,c,t}$	1.95e-3[a]	
	(2.45e-4)	
$TREAT^{S}_{i,c,t}$		0.11[a]
		(7.66e-3)
Firm-year FEs	Yes	Yes
Country-year FEs	Yes	Yes
Firm-country FEs	Yes	Yes
No. of obs.	5,514,400	5,514,400

Notes: Results of two slightly modified versions of equation (2.1). $FDI_{i,c,t}$ is a dummy equal to 1 if firm i has at least one subsidiary in tax haven c in year t. $TREAT^{C}_{i,c,t}$ represents the number of companies operating in the same sector as firm i with at least one subsidiary in tax haven c in year t. $TREAT^{S}_{i,c,t}$ represents the share of companies operating in the same sector as firm i with at least one subsidiary in tax haven c in year t. Standard errors, in parentheses, are clustered at the sector-year level. [b] $p < 0.05$, [a] $p < 0.01$. See section 3 for more details.

Figure 2.A3 – Profit shifting spillovers: supplementary results (ctd)



Notes: These figures are generated after replacing $TREAT_{i,c,t}$ in equation (2.1) with $TREAT^{C}_{i,c,t}$ (number of peers in tax haven c in year t, first subfigure) or $TREAT^{S}_{i,c,t}$ (share of peers in tax haven c in year t, second subfigure). $TREAT^{C}_{i,c,t}$ and $TREAT^{S}_{i,c,t}$ are first categorized and then inserted through a set of dummy variables. For instance, $TREAT^{C}_{1-9,i,c,t}$ is a dummy equal to 1 if firm i has between 1 and 9 peers present in OFC c in year t. Two equations are estimated: $FDI_{i,c,t} = \sum_k \alpha_k x_{k,i,c,t} + \mu_{i,t} + \upsilon_{c,t} + \gamma_{i,c} + \epsilon_{i,c,t}$. $FDI_{i,c,t}$ is a dummy equal to 1 if firm i has at least one subsidiary in tax haven c in year t. $x = \{TREAT^{C}, TREAT^{S}\}$ and k denotes the category. The bars represent the point estimates $\hat{\alpha}_k$. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the sector-year level. The dashed lines correspond to $\hat{\alpha}$ in $FDI_{i,c,t} = \alpha x_{i,c,t} + \mu_{i,t} + \upsilon_{c,t} + \gamma_{i,c} + \epsilon_{i,c,t}$. $x = \{TREAT^{C}, TREAT^{S}\}$. The two $\hat{\alpha}$ directly come from Appendix table 2.A3. See section 3 for more details.

Table 2.A4 – Profit shifting spillovers: dynamics (full table)

Dependent variable	$FDI_{i,c,t}$
$TREAT_{i,c,t}^{t+5}$	6.59e-4
	(7.54e-4)
$TREAT_{i,c,t}^{t+4}$	-7.38e-4
	(7.78e-4)
$TREAT_{i,c,t}^{t+3}$	-7.28e-4
	(7.85e-4)
$TREAT_{i,c,t}^{t+2}$	1.27e-3
	(7.98e-4)
$TREAT_{i,c,t}^{t+1}$	1.34e-3
	(8.26e-4)
$TREAT_{i,c,t}$	-0.34e-4
	(9.40e-4)
$TREAT_{i,c,t}^{t-1}$	2.18e-3^{a}
	(8.11e-4)
$TREAT_{i,c,t}^{t-2}$	1.70e-3^{b}
	(7.55e-4)
$TREAT_{i,c,t}^{t-3}$	9.51e-4
	(7.45e-4)
$TREAT_{i,c,t}^{t-4}$	2.34e-4
	(7.63e-4)
$TREAT_{i,c,t}^{t-5}$	-4.58e-5
	(7.98e-4)
Firm-year FEs	Yes
Country-year FEs	Yes
Firm-country FEs	Yes
No. of obs.	1,238,800

Notes: Results of equation (2.2). $FDI_{i,c,t}$ is a dummy equal to 1 if firm i has at least one subsidiary in tax haven c in year t. $TREAT_{i,c,t}$ is a dummy equal to 1 if another company operating in the same sector as firm i has at least one subsidiary in tax haven c in year t. $TREAT_{i,c,t}^{t-k}$ and $TREAT_{i,c,t}^{t+k}$ are lagged and lead values of $TREAT_{i,c,t}$ Standard errors, in parentheses, are clustered at the sector-year level. $^{b}p < 0.05$, $^{a}p < 0.01$. See section 3 for more details.

Table 2.A5 – Profit shifting spillovers: alternative estimation techniques

Column	(1)	(2)	(3)	(4)
Dependent variable	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$
$TREAT_{i,c,t}$	1.63e-3^{b*}	1.02e-3^{b}	9.88e-4^{b}	1.29e-3^{a}
	(8.15e-4)	(4.85e-4)	(4.80e-4)	(2.36e-4)
$FDI_{i,c,t-1}$		0.85^{a}	0.82^{a}	0.87^{a}
		(2.12e-3)	(9.54e-3)	(3.01e-3)
Firm-year FEs	Yes	Yes	Yes	Yes
Country-year FEs	Yes	Yes	Yes	Yes
Firm-country FEs	Yes	Yes	Yes	Yes
No. of obs.	82,736	4,799,150	3,605,350	4,474,100
Method	Logit	OLS	2SLS	System-GMM

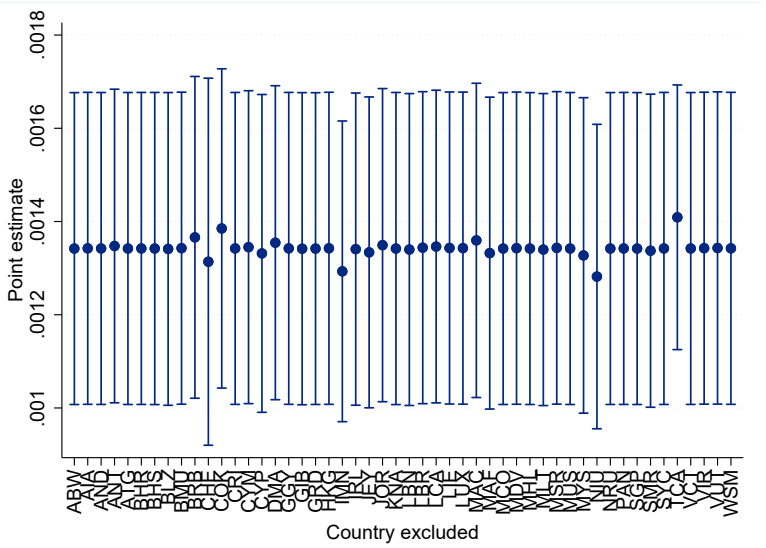
Notes: Results of four slightly modified versions of equation (2.1). $FDI_{i,c,t}$ is a dummy equal to 1 if firm i has at least one subsidiary in tax haven c in year t. $TREAT_{i,c,t}$ is a dummy equal to 1 if another company operating in the same sector as firm i has at least one subsidiary in tax haven c in year t. *The reported coefficient corresponds to an average marginal effect. Standard errors, in parentheses, are clustered at the sector-year level. $^{b}p < 0.05$, $^{a}p < 0.01$. See section 3 for more details.

Table 2.A6 – Profit shifting spillovers: alternative tax haven classifications

Column	(1)	(2)	(3)	(4)	(5)
Dependent variable	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$
$TREAT_{i,c,t}$	9.33e-4^{b}	1.32e-3^{a}	8.95e-4^{b}	1.53e-3^{a}	8.69e-4^{b}
	(4.27e-4)	(3.98e-4)	(4.49e-4)	(3.33e-4)	(3.82e-4)
Firm-year FEs	Yes	Yes	Yes	Yes	Yes
Country-year FEs	Yes	Yes	Yes	Yes	Yes
Firm-country FEs	Yes	Yes	Yes	Yes	Yes
No. of obs.	4,301,232	5,073,248	3,860,080	4,852,672	5,845,264
OFC list	HR	DL	HL∩DL	EX6	DL+HR+TWZ

Notes: Results of equation (2.1). $FDI_{i,c,t}$ is a dummy equal to 1 if firm i has at least one subsidiary in tax haven c in year t. $TREAT_{i,c,t}$ is a dummy equal to 1 if another company operating in the same sector as firm i has at least one subsidiary in tax haven c in year t. Standard errors, in parentheses, are clustered at the sector-year level. $^{b}p < 0.05$, $^{a}p < 0.01$. See section 3 for more details.

Figure 2.A4 – Profit shifting spillovers: alternative tax haven classifications (ctd)



Notes: Results of fifty slightly modified versions of equation (2.1). This figure shows how the point estimate $\hat{\alpha}$ varies after excluding one tax haven at a time from regression (2.1). Point estimates with 95 percent confidence intervals. Standard errors are clustered at the sector-year level. See section 3 for more details.

Table 2.A7 – Profit shifting spillovers: changing industry definition

Column	(1)	(2)	(3)	(4)
Dependent variable	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$
$TREAT^{>15}_{i,c,t}$	6.77e-4^{b}			
	(3.32e-4)			
$TREAT^{3-digit}_{i,c,t}$		1.23e-3^{a}		
		(1.09e-4)		
$TREAT^{acq}_{i,c,t}$			5.91e-4^{b}	
			(2.94e-4)	
$TREAT^{1993-2013}_{i,c,t}$				1.36e-3^{b}
				(5.67e-4)
Firm-year FEs	Yes	Yes	Yes	Yes
Country-year FEs	Yes	Yes	Yes	Yes
Firm-country FEs	Yes	Yes	Yes	Yes
No. of obs.	3,646,650	5,514,400	1,741,200	305,550

Notes: Results of four slightly modified versions of equation (2.1). $FDI_{i,c,t}$ is a dummy equal to 1 if firm i has at least one subsidiary in tax haven c in year t. $TREAT_{i,c,t}$ is a dummy equal to 1 if another company operating in the same sector as firm i has at least one subsidiary in tax haven c in year t. $TREAT^{>15}_{i,c,t}$, $TREAT^{3-digit}_{i,c,t}$, $TREAT^{acq}_{i,c,t}$, and $TREAT^{1993-2013}_{i,c,t}$ are very similar to $TREAT_{i,c,t}$ and defined in section 3. Standard errors, in parentheses, are clustered at the sector-year level. $^{b}p < 0.05$, $^{a}p < 0.01$. See section 3 for more details.

Table 2.A8 – Profit shifting spillovers: falsification tests

Column	(1)	(2)
Dependent variable	$FDI_{i,c,t}$	$FDI_{i,c,t}$
$TREAT^{random}_{i,c,t}$	-2.80e-4	
	(3.41e-4)	
$TREAT^{spatial}_{i,c,t}$		-3.24e-4
		(2.01e-4)
Firm-year FEs	Yes	Yes
Country-year FEs	Yes	Yes
Firm-country FEs	Yes	Yes
No. of obs.	5,514,400	5,498,900

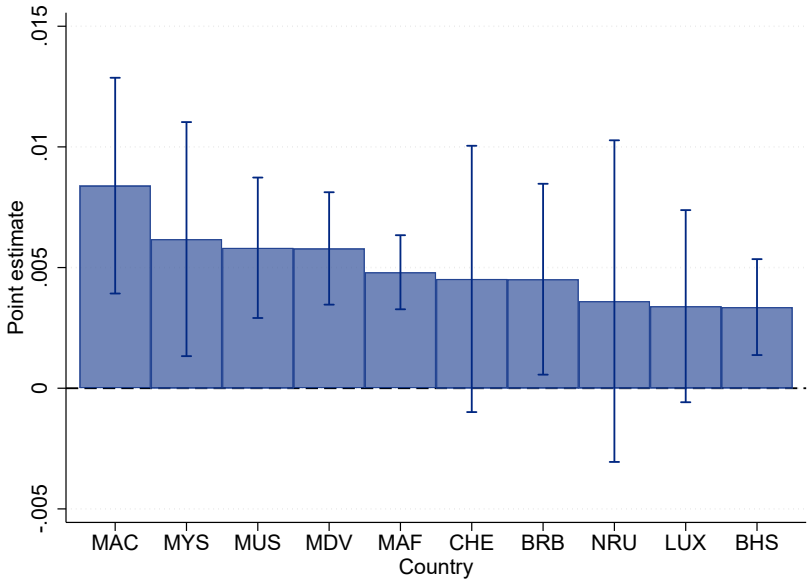
Notes: Results of two slightly modified versions of equation (2.1). $FDI_{i,c,t}$ is a dummy equal to 1 if firm *i* has at least one subsidiary in tax haven *c* in year *t*. $TREAT_{i,c,t}$ is a dummy equal to 1 if another company operating in the same sector as firm *i* has at least one subsidiary in tax haven *c* in year *t*. $TREAT^{random}_{i,c,t}$ and $TREAT^{state}_{i,c,t}$ are quite similar to $TREAT_{i,c,t}$ and defined in section 3. Standard errors, in parentheses, are clustered at the sector-year level. $^{b}p < 0.05$, $^{a}p < 0.01$. See section 3 for more details.

Table 2.A9 – Profit shifting spillovers over time and across sectors (full table)

Column	(1)	(2)	(3)	(4)
Dependent variable	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$
$TREAT_{i,c,t}$	1.81e-4	6.21e-4	2.19e-3[a]	7.04e-4
	(4.73e-4)	(3.73e-4)	(6.78e-4)	(4.57e-4)
Firm-year FEs	Yes	Yes	Yes	Yes
Country-year FEs	Yes	Yes	Yes	Yes
Firm-country FEs	Yes	Yes	Yes	Yes
No. of obs.	3,002,700	2,480,050	1,346,900	4,167,500
Subsample	1993-2003	2004-2013	Finance and services	Other sectors

Notes: Results of equation (2.1) for four subsamples. $FDI_{i,c,t}$ is a dummy equal to 1 if firm i has at least one subsidiary in tax haven c in year t. $TREAT_{i,c,t}$ is a dummy equal to 1 if another company operating in the same sector as firm i has at least one subsidiary in tax haven c in year t. Standard errors, in parentheses, are clustered at the sector-year level. $^{b}p < 0.05$, $^{a}p < 0.01$. See section 3 for more details.

Figure 2.A5 – Profit shifting spillovers across OFCs



Notes: Results of equation (2.4). The figure highlights the top 10 OFCs, i.e., those with the highest spillover effect $\hat{\alpha}_c$. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the sector-year level. See section 3 for more details.

3

Executive experience and expansion strategies of multinational firms

Solo-authored paper [*]

What helps firms expand abroad? This paper demonstrates that the experience of executives contributes to the internationalization process of multinational companies. Evidence reveals a strong pattern between the recruitment of executives used to oversee business affairs in a given country and the probability of disclosing subsidiaries in this country in subsequent years. This link is more marked for foreign investments in low-income countries and senior executives such as chief operating officers. Evidence also reveals that only country-specific experience is determinant and that experience in managing multinational activities yields a compensation premium. Thus, the analysis shows that managers develop valuable country-specific knowledge and significantly assist firms in stepping up their operations abroad.

*. I would like to thank Michela Bonani, Micael Castanheira, Paola Conconi, Peter Cziraki, Ronald B. Davies, Swati Dhingra, Christopher Esposito, Kerstin Holzheu, Julien Martin, Gaëtan Nicodème, Mathieu Parenti, and Nadine Riedel for valuable comments, Mai Nguyen for her help with the data, and participants at various conferences and seminars for insightful discussions and suggestions. Funding from the F.R.S.-FNRS is gratefully acknowledged.

1 Introduction

Governments use multiple incentives to attract foreign direct investments (FDIs) and thereby stimulate employment, technology transfers, and economic growth. For firms, however, branching out overseas is a difficult and risky step. Only the most productive firms have the resources to become multinational (Helpman et al., 2004). Furthermore, companies experiment with exports before engaging in FDIs due to uncertainty about profitability in foreign markets (Conconi, Sapir, and Zanardi, 2016). Vast anecdotal evidence suggests that executives facilitate this process and that their expertise fosters business activities.[2] Systematic evidence along these lines, on the other hand, remains limited. The present paper contributes to filling this gap. It confirms that executives develop country-specific knowledge and play a major role in the expansion of multinational enterprises (MNEs). They help their current company broaden its network of subsidiaries in the countries where the companies they previously worked for had subsidiaries themselves.

The paper is divided into two parts. The first part assembles rich data on firms listed on the Standard & Poor's (S&P) 1500 index between 1993 and 2013. The data originate from Compustat, ExecuComp, and Exhibit 21. Compustat provides balance sheets, income statements, and cash flows of US-listed firms, whereas ExecuComp informs on the function and compensation of executives in S&P 1500 companies. Both databases are relatively standard in economics, finance, international business, and management. They notably track executives across the largest and most productive firms. Exhibit 21 data are more rarely used. The Securities and Exchange Commission (SEC) requires US-listed companies to disclose every year a list of their worldwide subsidiaries. Access to the filings is

2. In 2015, Black Box, a multinational specialized in communications products and listed on the NASDAQ index, nominated two new executives "*to drive sales growth for the key Europe Middle East and Africa (EMEA) region and Japanese markets*." Hans-Peter Kuhnert was appointed Vice President of Sales for the Europe Middle East and Africa region, and Koichiro Fukumoto was appointed Country Manager for Japan. In a press release distributed by Business Wire, the firm states: "*Hans-Peter and Koichiro are important appointments for Black Box as they bring extensive experience and add the necessary leadership that will help us to accelerate sales growth. [...] Mr. Kuhnert joins Black Box from Rohde & Schwarz where he helped to implement a global indirect sales channel structure. At Tektronix he held the position of vice president of sales and operations for the instrument and solutions business in the EMEA region. [...] Prior to joining Black Box, Mr. Fukumoto was President and CEO of a Japanese distributor of electronic test and measurement products from global suppliers*." More details here: `https://www.businesswire.com/news/home/20150303005074/en/Black-Box-Announces-New-Executive-Appointments-International`.

free and public. I compile on this basis a dataset at the firm-country-year level to study the nexus between the country-specific experience of executives and FDIs, which is the key contribution of this paper. For each S&P 1500 firm and each year, the dataset indicates the number of subsidiaries reported in each foreign country as well as the number of executives having already overseen business affairs in this country before joining. The second part of the paper proceeds with an event study. I scrutinize the number of subsidiaries declared by a firm in a country before and after appointing an executive having worked with this country. The granularity of the data allows neutralizing confounding factors via three-way fixed effects. They include firm- and country-level determinants of FDIs (e.g., firm size and productivity, labor costs, market size, fiscal incentives), firm-year-specific attributes of executives (inclusive of education and within-firm experience), and firm-country factors driving firms' location choices (distance between the headquarters and the foreign country, among others). The three-way fixed effects guarantee to pick up the effect of the country-specific experience gained by executives and rule out unobserved variables not attributable to the professional background of these individuals.

The baseline equation focuses on the extensive margin of FDIs. Regressions show that employing an executive having worked for a firm present in country *c* at the time augments the probability to be implanted in this country by 2.4 percentage points on average, i.e., 57 percent. Interestingly, the reverse is not true. Once experienced executives leave their company, the latter is not more likely to exit foreign markets. It thus seems that executive experience eases FDIs through a reduction of the sunk cost of entry, whose existence has long been acknowledged in the trade literature (e.g., Helpman et al., 2004; Kimura and Kiyota, 2006; Greenaway and Kneller, 2007). Similar results are found at the intensive margin of FDIs, and the findings are validated by numerous robustness checks. They hold when removing possible outliers (either firms or countries), adopting different estimation methodologies (linear probability and binary models), and adjusting for potential measurement errors. They also hold after controlling for executives' origin, inferred by way of web scraping techniques (via *FamilySearch*) or machine learning algorithms (via *NamePrism*).

The paper then discusses endogeneity concerns. The benchmark results uncover a strong connection between appointments of experienced executives and firm entry into foreign markets. A caveat is that firms might make other firm-country-year

investments before engaging in FDIs. Such investments are unobserved. Hence, the results could still be imputable to some shocks that cannot be unaccounted for. More generally, identifying whether executives *facilitate* or *initiate* MNEs' international expansion is empirically challenging, if not impossible; but both situations suggest that their experience is pivotal. The mere fact that the hiring of experienced executives coincides with an increase in FDIs attests that executive experience matters for firm performance in foreign markets. In this respect, endogeneity should not be seen as a major threat. All the same, four tests are proposed to investigate the existence of a causal effect.

First, I carry out a placebo test to verify that there are no pre-existing trends in firms' presence overseas. Besides supporting the common trend assumption, the absence of pre-trends implies that the results are unlikely to mirror past firm-country-year shocks and other omitted variables. Second, I borrow the identification strategy of Mion and Opromolla (2014) and use the number of experienced executives three years prior as an instrument. The hypothesis is that new recruitments have no additional effect on MNEs' expansion after three years, something for which I provide suggestive evidence, and two-stage least squares (2SLS) results align with the reference ones. Third, I consult official reports and use Factiva to scan newspapers, newswires, and press releases. The material lets us know whether some movements of executives occurring throughout the period are precipitated by unforeseen circumstances, i.e., abrupt resignations, retirements, deaths, sudden layoffs, or resignations and layoffs subsequent to legal investigations. I treat these movements as an exogenous source of variation in the number of experienced executives. Again, the new results concur in terms of economic and statistical significance. Finally, I exploit the US conferral of Permanent Normal Trade Relations (PNTR) status on China in late 2000 as a quasi-natural experiment. The literature documents (i) that policy uncertainty dampens trade, corporate investment, and FDIs (Gulen and Ion, 2016; Wu, Zhang, Wu, and Kong, 2020; Choi, Furceri, and Yoon, 2021), and (ii) that this event largely reduced trade policy uncertainty between the US and China (Pierce and Schott, 2016; Handley and Limão, 2017). Accordingly, we expect the firms that were the most exposed to trade policy uncertainty before the granting to invest more in China in response to the shock. If we believe that the experience of managers truly affects companies' presence abroad, we can also expect this reaction to be stronger for firms having executives used to pilot multinational operations with China. Both predictions are validated with a subsample of enterprises in which the

number of executives familiar with the Chinese market stayed constant between 1995 and 2005.

Four exercises supplement the results to understand when and how executive experience shapes multinational operations. Two of them explore heterogeneous effects. The results show that executive experience is more influential for FDIs in low-income countries, thus hinting that this asset could be more salient for greenfield FDIs (Davies, Desbordes, and Ray, 2018a). The effect of executive experience also intensifies with the distance of the host country from the US and slightly decreases with the quality of its institutions. Moreover, the expertise acquired by chief executive officers (CEOs) and chief operating officers (COOs) plays a bigger role than that of chief financial officers (CFOs) and other executives. The smaller incidence of CFOs' experience is in line with the previous observation, as CFOs are presumably more involved in merger and acquisition (M&A) operations than in greenfield investments. The third exercise examines whether executive experience has to be necessarily country-specific or whether, on the opposite, experience in supervising operations with any foreign country can still assist firms in reaching new foreign markets. Regressions stand for the first proposition. There exists no significant pattern between inflows of executives familiar with some foreign markets and firm entry into other foreign markets. The final exercise narrows the analysis and investigates if executives used to handle multinational activities receive higher compensations. Statistical evidence points in this direction. Holding other things constant, multinational experience is associated with a 34 percent compensation premium. Firms consequently compete for this rare knowledge in a labor market in short supply. They invest in such expertise because they expect higher returns in (specific) foreign countries.

The findings complement the existing literature in two main dimensions. First, they reiterate the need to go beyond the classical black-box conception of the firm to fathom multinational activities and location decisions of MNEs. The paper proves that executive experience is an asset that enhances firm performance and that is valuable in the labor market. Importantly, it is to the best of my knowledge the first to clarify that only the country-specific experience of top managers really matters for FDIs. Second, the findings reveal that executive mobility is one of the channels through which FDI-related knowledge disseminates across firms. This is relevant in various regards. From a competition policy perspective, the results hint that a cap on executive compensations might be useful for mitigating concentration. They

might as well be relevant for fiscal policy. To some extent, the findings suggest that inspecting the movements of executives across firms could help public authorities better anticipate MNEs' presence in offshore financial centers and then facilitate their fight against aggressive tax planning and profit shifting.

The remainder of the paper is structured in five sections. To begin with, section 2 reviews the related literature and situates the paper within this body of research. The ensuing sections are dedicated to the empirical analysis. Section 3 describes the database and the sample. Section 4 discusses the econometric strategy, displays the main results, and assesses their robustness. Section 5 provides more insights into the role of executive experience in FDIs. Section 6 finally concludes.

2 Literature and contribution

2.1 Determinants of FDIs

The paper resonates with three distinct strands of research. An old line of inquiry examines the determinants of FDIs. The influence of labor costs, market access, institutions, political risk, and firm productivity, to mention only a few, has largely been established (e.g., Antràs and Yeaple, 2014; Blonigen and Piger, 2014). Nevertheless, most of the factors hitherto uncovered are either country- or firm-specific. The present study goes a step further. It takes advantage of rich data to separate what comes from the firm and what comes from its executives. It proves that the characteristics of senior executives, and more precisely their experience, are essential to shaping business operations and the network of MNEs.

In addition, it is widely recognized that FDIs induce sunk costs (e.g., Helpman et al., 2004; Kimura and Kiyota, 2006; Greenaway and Kneller, 2007). Enterprises interested in setting up subsidiaries in foreign countries must incur the cost of market research, create distribution networks, etc. To the extent that the venue of experienced executives boosts FDIs but their departure is not detrimental, the results suggest that executive experience reduces this sunk cost of FDIs. They unveil at the same time a new mechanism whereby FDI knowledge spills over across firms: executive mobility (Balsvik, 2011; Demena and van Bergeijk, 2017).

2.2 Management practices and firm performance in international markets

A more recent stream of the literature argues that management practices affect firm performance in international markets. Parrotta, Pozzoli, and Sala (2016) and Marchal and Nedoncelle (2019) find evidence of an export-enhancing effect of ethnic diversity and immigrant workers. According to the authors, the effect stems from the fact that ethnic diversity and immigrant workers enrich firms' relational capital, convey information on foreign markets, and increase firms' productivity.[3] The papers written by Mion and Opromolla (2014), Choquette and Meinen (2015), Sala and Yalcin (2015), Meinen, Parrotta, Sala, and Yalcin (2018), Lenoir and Patault (2019), Mion, Opromolla, and Sforza (2019), and Lööf and Viklund-Ros (2020) are along the same lines and more closely related to the present paper as they focus on managers and directors. They claim that these individuals gain experience in exporting activities and nurture exports to the countries they are familiar with.[4] For example, Lenoir and Patault (2019) exploit French firm-to-firm export data to show that sales managers build buyer-specific knowledge and transmit this knowledge to the companies they join.

The common feature of these analyses is that they revolve around employees and exports. My analysis extends this literature by looking at another dimension of firm performance in international markets, namely FDIs. Although several studies in international business and management already delve into the interplay between CEO experience, firm performance, and FDIs (e.g., Herrmann and Datta, 2006; Boermans and Roelfsema, 2013; Cui, Li, Meyer, and Li, 2015; Hamori and Koyuncu, 2015; Le and Kroll, 2017; Li and Patel, 2019), mine leverages a more disaggregated database. This improvement not only fine-tunes the identification strategy but also provides additional insights into the role played by executives. The paper is notably the first to single out the country-specific experience of executives.

3. See Moriconi, Peri, and Pozzoli (2020) for comparable findings in the context of offshoring. In addition, note that the effect of executive experience on FDIs in the present paper does not include the indirect impact of executive experience on FDIs passing through firm productivity (measured at the firm-year level). In a sense, the point estimates presented hereafter could thus be seen as lower-bound estimates.

4. Bisztray, Koren, and Szeidl (2018) reveal a similar pattern with firm imports.

2.3 Determinants of executive compensation

To a lesser extent, the present paper echoes the literature on the determinants of executive compensations (e.g., Gabaix and Landier, 2008; Graham, Li, and Qiu, 2012). The findings might lead us to better grasp disparities in pay across executives. Country-specific knowledge of executives developed while working for MNEs confers a premium as it spurs firms' international growth.

3 Data

Three distinct sources are pooled together to form the firm-country-year level database: Compustat, ExecuComp, and Exhibit 21. This section describes each of them as well as the final sample.

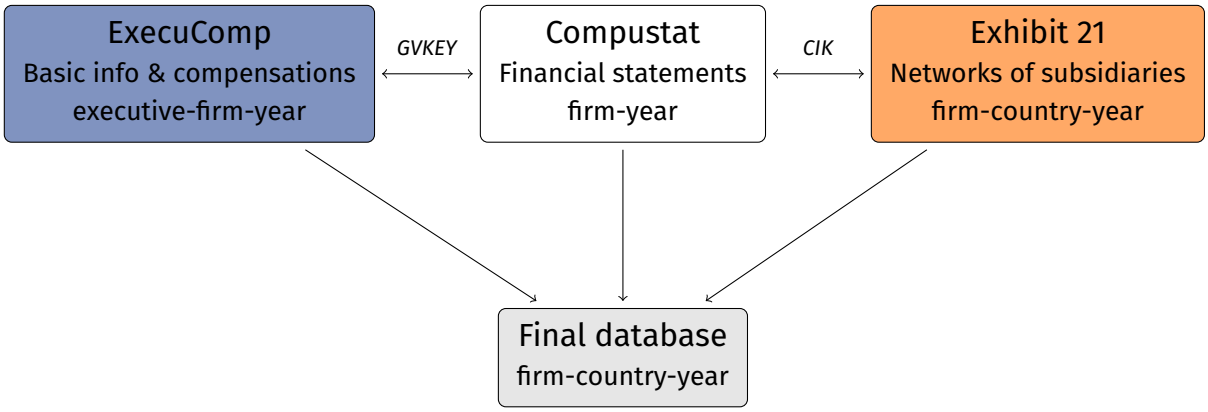
3.1 Sources

Compustat Compustat North America contains extensive information on balance sheets (assets, liabilities, and equity), income statements (revenues, costs, and expenses), and cash flows of publicly listed companies in North America since 1950. The vast coverage and the richness of the data explain why Compustat is frequently used in the literature. Albeit representing a small share of all companies operating in the country, US-listed companies are the largest and most productive ones. They make up 30 percent of total employment and 40 percent of aggregate sales (Asker et al., 2014). Furthermore, the international trade literature predicts that only large and productive companies engage in FDIs (Helpman et al., 2004). The fact that Compustat includes listed companies thus proves useful because they are the most prone to undertake FDIs. Two variables are retained: the *GVKEY* and *CIK* identifiers. They allow connecting the two other databases on executives and subsidiaries (see figure 3.1). Financial data are left aside as they will be fully absorbed by the firm-year fixed effects in the econometric exercise.

ExecuComp ExecuComp gives background information and comprehensive details about the compensation of executives in S&P 1500 firms (e.g., age, gender, title, salary, bonuses).[5] S&P 1500 firms constitute approximately 90 percent of US

5. More precisely, ExecuComp encompasses, in addition to S&P 1500 firms, firms that were once part of the index, firms removed from the index but that are still trading, and a few other firms. Data

Figure 3.1 – Construction of the database



market capitalization. As a consequence, ExecuComp tracks executives both over time and across the largest US-listed firms.

Exhibit 21 The last data source is used for retrieving information on US-listed firms' subsidiaries. Companies listed on a US stock exchange are required to disclose every year their significant subsidiaries in Exhibit 21 of Form 10-K. A subsidiary is significant if its assets exceed 10 percent of consolidated assets or if its income exceeds 10 percent of consolidated income. Moreover, any subsidiary is significant if the subsidiaries that are undisclosed in the first place together exceed 10 percent of assets or revenues.[6] In other words, Exhibit 21 filings reflect where more than 90 percent of US-listed firms' assets and revenues are booked. They therefore draw a faithful picture of the worldwide network of S&P 1500 firms' subsidiaries at the firm-country-year level. The reports are publicly available on the Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system of the SEC. They have been electronically filed since 1993, so the data can easily be obtained and extracted. An example is attached in Appendix figure 3.A1. The image depicts (a part of) the list of subsidiaries enumerated by PFIZER INC in 2000. In what follows, I exploit an updated version of the dataset produced by Dyreng and Lindsey (2009) spanning the 1993-2013 period.

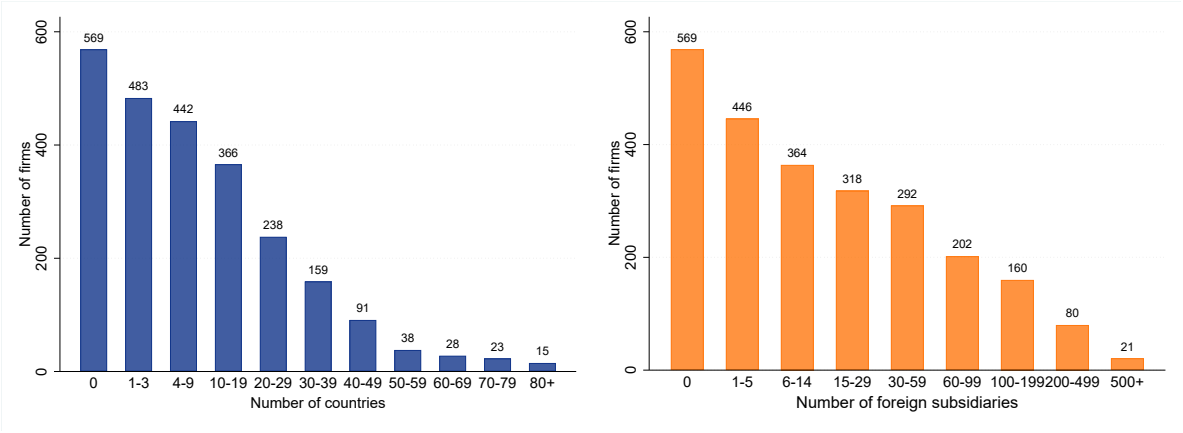
collection on the entire S&P 1500 index began in 1994 but some firms were tracked as of 1992.

6. Note that firms are not obliged to uncover financial information about their subsidiaries. Relatedly, although firms might have incentives not to expose some subsidiaries, especially those located in offshore financial centers, Dyreng et al. (2020) show that the majority of disclosures are accurate. More details and discussions on Exhibit 21 disclosures can be found in Dyreng and Lindsey (2009) and Dyreng et al. (2020).

Figure 3.2 – Summary statistics

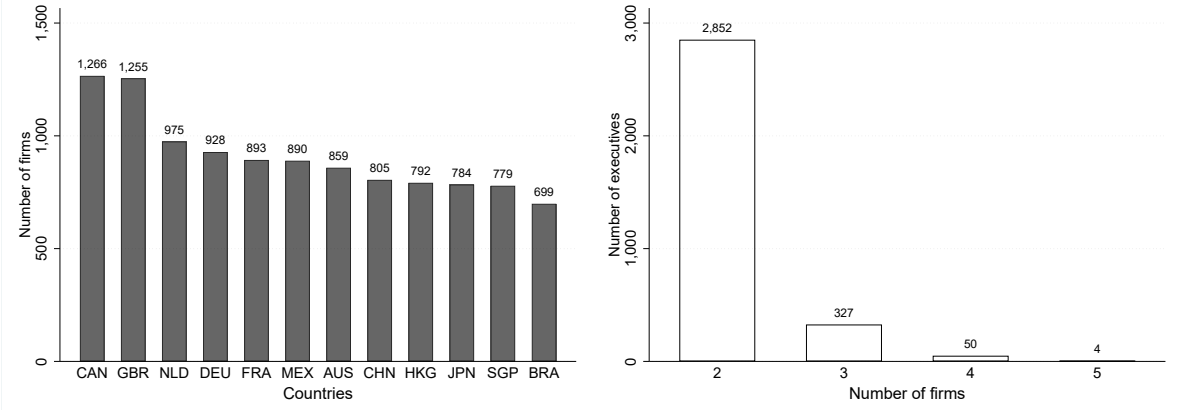
(a) Presence in foreign countries

(b) Number of foreign subsidiaries



(c) Top 12 foreign countries

(d) Presence of executives in companies



3.2 Sample and descriptive statistics

After merging the three databases, the final dataset is arranged at the firm-country-year level (see figure 3.1). The sample consists of 2,452 S&P 1500 firms that reported subsidiaries at some point between 1993 and 2013, inside or outside the US. It covers 218 distinct foreign countries (see Appendix table 3.A1 for a list with 3-digit ISO codes).

Figures 3.2a, 3.2b, and 3.2c display some summary statistics about firm presence in foreign countries. Out of 2,452 companies, 569 did not report any physical presence in the 218 foreign countries over the 1993-2013 period (see figure 3.2a). It means that at least three-quarters of firms are multinational, and it supports the idea that listed firms concentrate a high share of MNEs. MNEs had on average

55 foreign subsidiaries spread across 16 distinct foreign countries. Histograms exhibited in figures 3.2a and 3.2b illustrate the skewness of the two distributions, with a very small share of MNEs having numerous subsidiaries registered in many foreign countries. Figure 3.2c orders the foreign countries with respect to their attractiveness. Unsurprisingly, Canada appears to be the foreign country where the highest number of firms were implanted. Almost 52 percent of the firms declared a subsidiary at some point in this country. The United Kingdom (51 percent), the Netherlands (40 percent), Germany (38 percent), and France (36 percent) complete the top 5. Foreign countries in the top 12 are essentially large and central. The ranking thus broadly coincides with what standard international trade theories would posit (Brainard, 1993; Head and Mayer, 2004; Helpman et al., 2004). Three jurisdictions stand out, however: the Netherlands, Singapore, and Hong Kong.[7] They concentrate a disproportionate number of US-listed firms given their (relative) small size. The recent literature on corporate tax avoidance and profit shifting hints that presence in these jurisdictions is principally motivated by tax saving purposes (Beer et al., 2020; Souillard, 2022b).

Descriptive statistics on executives are visible in figure 3.2d. Only those employed by a minimum of two of the 2,452 firms are retained for the rest of the analysis. Executives linked to one single company are excluded since all their characteristics we can possibly control for will be integrated in some fixed effects in the next section. On average, the 3,233 executives preserved in the database worked for two (observable) firms and stayed for a period of four years and a half in each of these firms.

4 Executive experience and foreign subsidiaries: main results

Equipped with this unique firm-country-year level database, I study the relationship between executive experience and the geographical spread of S&P 1500 companies. The focus is on the extensive margin of FDIs. I first outline the identification strategy, then comment on the baseline results, and finally tackle endogeneity concerns.

7. "Jurisdictions" and "countries" are used interchangeably for simplicity.

4.1 Identification strategy

Equation (3.1) below is the core equation of this paper:

$$FDI_{i,c,t} = \alpha TREAT_{i,c,t} + \mu_{i,t} + \upsilon_{c,t} + \gamma_{i,c} + \epsilon_{i,c,t} \tag{3.1}$$

The dependent variable $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm *i* has at least one subsidiary in country *c* in year *t*. On the right-hand side, $TREAT_{i,c,t}$ is the variable of interest. It represents the number of executives in firm *i* and year *t* who, before joining firm *i*, have worked for a firm that had at least one subsidiary in country *c* at the time. A battery of fixed effects neutralize the effect of confounding factors. By definition, the firm-year fixed effects $\mu_{i,t}$ take into account time-variant and time-invariant firm determinants of FDIs. They encompass (but are not limited to) firm productivity and firm size. The country-year fixed effects $\upsilon_{c,t}$ isolate labor costs, market size, fiscal incentives, and all other time-variant and time-invariant country-specific features influencing inward FDIs. The last set of fixed effects $\gamma_{i,c}$ is defined at the firm-country level. They capture time-invariant firm-country variables affecting the probability of establishing subsidiaries in country *c*, such as bilateral distance between headquarters and country *c*. It is worth noting that the three-way fixed effects also nest fixed, year-, and firm-year specific attributes of executives (e.g., education, age, within-firm and global experience). They should then purge α of the effect of most unobservables.

The coefficient denoted α reflects the effect of appointing an executive experienced with a foreign country on the firm's probability to own subsidiaries in this country. Its estimation requires executive mobility across firms. Take two firms *i* and *i'* with comparable trends in FDIs, i.e., $\mu_{i,t} - \mu_{i,t-1} \approx \mu_{i',t} - \mu_{i',t-1}$. Further assume that *i*, unlike *i'*, hires an executive familiar with country *c* in year *t*. Identification relies on the hypothesis that the network of subsidiaries of the two companies in country *c* would have evolved in the same way between $t-1$ and *t* in the absence of the hiring. Equivalently, take two similar foreign countries *c* and *c'*, so that $\upsilon_{c,t} - \upsilon_{c,t-1} \approx \upsilon_{c',t} - \upsilon_{c',t-1}$. It is assumed that FDIs of firm *i* in *c* and *c'* would have moved in parallel had there not been any change in the composition of its executives.

Table 3.1 – Executive experience and FDIs: baseline results

Dependent variable	$FDI_{i,c,t}$
$TREAT_{i,c,t}$	0.024^a
	(0.003)
Average probability	0.042
Firm-year FEs	Yes
Country-year FEs	Yes
Firm-country FEs	Yes
R^2	0.758
No. of obs.	4,072,458

Notes: This table reports the benchmark regression results of equation (3.1). $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm i has at least one subsidiary in country c in year t. $TREAT_{i,c,t}$ represents the number of executives working for firm i in year t and having already managed operations in country c before joining firm i. The standard error, in parentheses, is clustered at the firm-year level. $^a p < 0.01$. See section 4 for more details.

4.2 Baseline results

Table 3.1 exhibits the results obtained with ordinary least squares (OLS). Consistent with anecdotal evidence, the coefficient is positive and statistically significant at the 1 percent level. Recruiting an executive who has FDI-related experience with a particular country is associated with a 2.4 percentage point increase in the probability to be present in this country. The average value of the dependent variable being equal to 4.2 percent, the probability of reporting subsidiaries in the foreign country rises by approximately 57 percent following the hiring. There is thus a strong connection between executive experience and FDIs.

Complementary regressions reported in Appendix table 3.A2 examine whether the effect is symmetric – more precisely whether the departure of experienced executives is accompanied by market exits. The specification of equation (3.1) is slightly changed to this end. In column (1), $FDI_{i,c,t}$ is replaced with a variable $EXIT_{i,c,t}$ equal to 0 if $FDI_{i,c,t} = 1$ and equal to 1 if $FDI_{i,c,t} = 0$ and $FDI_{i,c,t-1} = 1$. In column (2), $TREAT_{i,c,t}$ is replaced with a dummy equal to 1 if $TREAT_{i,c,t} < TREAT_{i,c,t-1}$. $\hat{\alpha}$ is not significantly different from zero in both cases. Not surprisingly, substituting $FDI_{i,c,t}$ with a binary variable $ENTRY_{i,c,t}$ equal to 0 if $FDI_{i,c,t} = 0$ and 1 if $FDI_{i,c,t} = 1$ and $FDI_{i,c,t-1} = 0$ (column (3)) or $TREAT_{i,c,t}$ with a dichotomous variable equal to 1 if $TREAT_{i,c,t} > TREAT_{i,c,t-1}$ (column (4)) yields a positive and statistically significant $\hat{\alpha}$. Hence, arrivals of experienced executives and foreign market entries are

concomitant but departures, by contrast, are not associated with market exits. This asymmetry seems to suggest that executive experience reduces the sunk cost of FDIs.

Appendix table 3.A3 looks for its part at the intensive margin of FDIs. The dependent variable is the number of subsidiaries owned by firm i in country c in year t, and the regressions are run conditional on $FDI_{i,c,t} > 0$ not to absorb extensive- and intensive-margin effects at the same time. The results reveal that executive experience accelerates the development of MNEs where they are already implanted besides fostering entry into new foreign countries. [8]

4.3 Robustness

Outliers Four types of sensitivity checks gauge the robustness of the benchmark results. The first series of tests explore whether the treatment effect is affected by outliers. Appendix figure 3.A2 lays out the results obtained after removing one foreign country at a time. The 218 coefficients are extremely stable across regressions and confirm that they are not driven by one particular country. Along the same lines, Appendix table 3.A4 column (1) reproduces the results based on 30 random foreign countries, [9] and the coefficient has the same order of magnitude. Column (2) eliminates firms instead of countries. Equation (3.1) is regressed without firms not operating over the entire time span (entering after 1993 and/or exiting before 2013) to rule out composition effects, and the key finding holds. Overall, the tests substantiate that the effect is pervasive and unlikely to be entirely driven by some countries and firms.

Estimation technique Appendix table 3.A4 columns (3) and (4) query this time the pertinence of the estimation method. There is no consensus in the literature on the most appropriate estimator one should use when the dependent variable is dichotomous (e.g., Horrace and Oaxaca, 2006; Angrist and Pischke, 2009; Battey et al., 2019; Gomila, 2021b). On the one hand, linear probability models are popular

8. The effect at the intensive margin holds irrespective of the estimation methodology, i.e., by using OLS or pseudo-poisson maximum likelihood (PPML). Note that we need not apply a correction for the incidental parameter problem with PPML. Weidner and Zylkin (2021) demonstrate that, in a PPML model with three-way fixed effects, (i) estimates are consistent if the number of countries is large enough, and (ii) the bias induced by the incidental parameters problem drastically decreases as either the number of firms or periods increases.

9. These countries are: AFG, AGO, ARE, AUS, BDI, CHL, CHN, CIV, DZA, EST, GLP, GRC, GTM, GUF, GUM, HMD, IDN, LVA, MLI, NER, NOR, PHL, PLW, SUR, SWZ, TGO, TON, URY, VNM, and YEM (3-digit ISO codes).

due to their simplicity and transparency, although it has been raised that OLS estimates with a binary outcome can be inconsistent under some conditions. On the other hand, binary models guarantee that the predicted probabilities lie on the unit interval, but they can be computationally demanding and might suffer from the incidental parameters problem. The latter problem can be overcome following Hinz et al. (2020). Starting from the standard gravity model with exporter-time, importer-time, and exporter-importer fixed effects, they propose a correction for a class of models with three-way fixed effects akin to equation (3.1). Appendix table 3.A4 columns (3) and (4) apply the correction to logit and probit estimations respectively, and the coefficient remains positive and statistically significant.

Measurement errors Appendix table 3.A4 column (5) addresses a measurement issue. Owing to data limitations, it is impossible to track executives prior to 1992 and foreign subsidiaries before 1993. Therefore, an implicit assumption is that executives have no FDI experience in the first year of the sample, i.e., 1993. To verify that the error does not contaminate the results, the analysis is replicated after ruling out the first ten years for the regression. This leaves a ten-year window period during which executives move across firms and acquire (measurable and recent) experience. Again, the coefficient is in line with the baseline one, both in terms of magnitude and statistical significance.

Disentangling experience and origin Another caveat is that the treatment variable could partly embed the effect of executives' origin. The fact that executives in the database oversaw operations with various foreign countries maximizes the chance of capturing experience rather than origin; and while there is no accessible information on origin, it is reasonable to consider that international business activities necessitate certain skills that origin does not automatically provide. To better cope with this problem and infer the origin of executives, I scrape data from the largest collection of family history, family tree, and genealogy records, *FamilySearch*, and I match surnames to a country of origin. The information is then inserted into equation (3.1) with a variable $origins_{i,c,t}$ equal to the number of executives in firm i and year t whose name is linked to country c. The results in Appendix table 3.A4 column (6) validate the benchmark ones. They also validate that origin contributes to FDIs to a lesser extent. An alternative approach hinges on *NamePrism*. *NamePrism* is a non-commercial nationality classification web service based on machine learning algorithms. The correlation coefficient between the two distinct $origins_{i,c,t}$ variables is equal to 0.423, implying that the two matching

methodologies produce a mix of common and uncommon results. Still, the regression results obtained by using *NamePrism* in column (7) resemble and consolidate those obtained with *FamilySearch*.

4.4 Endogeneity

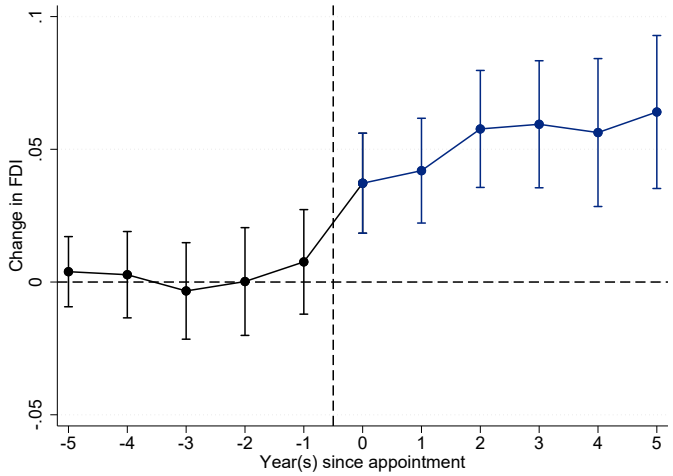
The previous subsections establish a strong relationship between executive experience and FDIs. A potential concern not mentioned thus far, however, pertains to endogeneity. The results above could be biased for a variety of reasons. One is reverse causality. Entry (decision) into foreign countries might precede the recruitment of experienced executives. Another reason is omitted variables. Firms may undertake unobservable firm-country-year investments to reach foreign markets. The treatment variable could in principle capture their effect, notwithstanding the introduction of three-way fixed effects. This discussion comes down to asking whether executives are instruments or instigators. Disentangling these cases is challenging, if not impossible. Yet, both roles are valuable, and the results above suffice to highlight the relevance of executive experience. The mere fact that the venue of experienced executives coincides with an international expansion suggests that executive experience matters for firm performance in foreign markets. Also, we will see in the next section that experience with multinational operations enhances executive pay. Firms pay a premium for this asset precisely because they expect performance gains and higher returns. All the same, I carry out hereafter four complementary exercises to investigate the existence of a causal effect.

Placebo test The first exercise consists of a placebo test. To verify that the baseline results do not derive from the existence of pre-trends and past unobserved firm-country-year shocks, I inspect variations in the explanatory variable around the year of the hiring:

$$FDI_{i,c,t} = \alpha TREAT_{i,c,t} + \sum_{k=1}^{5} \beta_k TREAT_{i,c,t}^{t+k} + \sum_{k=1}^{5} \zeta_k TREAT_{i,c,t}^{t-k} + \mu_{i,t} + \upsilon_{c,t} + \gamma_{i,c} + \epsilon_{i,c,t} \qquad (3.2)$$

$TREAT_{i,c,t}^{t+k}$ is a variable equal in year t to the number of executives in firm i and year $t+k$ having experience with country c. If the $\hat{\beta}$ coefficients are not statistically different from zero, then FDIs are uncorrelated with the future stock of experienced executives, and $\hat{\alpha}$ is unlikely to mirror the effect of past firm-country-year unobserved shocks. Symmetrically, $TREAT_{i,c,t}^{t-k}$ is equal in year t to the number of execu-

Figure 3.3 – Executive experience and FDIs: dynamics



Notes: This figure depicts the regression results of equation (3.2). $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm *i* has at least one subsidiary in country *c* in year *t*. The treatment variable $TREAT_{i,c,t}$ represents the number of executives working for firm *i* in year *t* and having already managed operations in country *c* before joining firm *i*. Leads and lags of $TREAT_{i,c,t}$ are inserted. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the firm-year level. See section 4 for more details.

tives in firm *i* and year $t-k$ experienced with country *c*. The ζ coefficients inform on the effect post recruitment. α is the immediate effect of the hiring, $\alpha + \zeta_1$ the total effect after one year, $\alpha + \zeta_1 + \zeta_2$ the total effect after two years, and so on. Figure 3.3 plots the results. The -*j* coefficients ($j \in \{1, ..., 5\}$) represent the estimated $\hat{\beta}$. Reassuringly, none of them is significantly different from zero at standard levels. The *j* coefficients ($j \in \{1, ..., 5\}$) visualize the estimated $\hat{\alpha} + \sum_{k=1}^{j} \hat{\zeta}_k$. The graph indicates that the effect immediately kicks in, progresses over time, increases by half after three years, and finally stabilizes.

Instrumental variables The placebo test proves that $\hat{\alpha}$ should not reflect the effect of *past* unobserved firm-country-year shocks, but the jump at $t = 0$ hints at the existence of *contemporaneous* shocks unaccounted for. An option to limit their incidence is to instrument $TREAT_{i,c,t}$ with its three-year lagged value $TREAT_{i,c,t-3}$, as in Mion and Opromolla (2014). The authors claim that a three-year period is sufficient for past shocks not to affect current exporting activities, and figure 3.3 implies that executive experience does not bring additional value for FDIs after three years. Hence, I formulate an analogous hypothesis in the present paper and provide the results obtained with two-stage least squares (2SLS) in Appendix table

3.A5 column (1). The F-statistic in the first stage is equal to 198. It attests that the instrument has power and satisfies the rank condition (Stock and Yogo, 2005; Andrews, Stock, and Sun, 2019). The point estimate in the second stage remains positive and statistically significant at the 5 percent level.

Precipitated executive mobility A different strategy to extract exogenous variations in $TREAT_{i,c,t}$ is to examine what makes employees move across firms. Companies hire managers strategically and ideally take the time to select the best fit. A typical example is when they poach the best executives from their competitors. However, they sometimes have to replace executives against their will or urgently after an unanticipated event. I conjecture that endogeneity is less plausible under such circumstances. As S&P 1500 firms are the largest ones, it is possible to recover some information about executive turnover by scrutinizing press releases, newspapers, newswires (all three with Factiva) as well as official reports. The task is done manually for each inflow and outflow of executives to understand as precisely as possible the nature of each movement. I code the following events as sources of exogenous variations in $TREAT_{i,c,t}$: deaths, abrupt resignations, retirements, early layoffs, and resignations and layoffs subsequent to legal investigations. The aim is to retain movements triggered by unexpected incidents or initiated by executives themselves and leave aside movements well planned by firms. For example, if executive *e* working for firm *i* dies in year *t*, then I will say that firm *i* faces an exogenous shock in year *t* and that the change in the stock of experienced managers between $t-1$ and *t* is exogenous. Details and concrete examples are attached in the Supplementary Appendix. I instrument $TREAT_{i,c,t}$ with a new variable $TREAT^{sudden}_{i,c,t}$ equal to 0 in the first year and then to:

$$\text{with } TREAT^{sudden}_{i,c,t} \quad = \quad \mathbb{1}_{i,t}\left(TREAT_{i,c,t} - TREAT_{i,c,t-1}\right)$$

$\mathbb{1}_{i,t}$ is a dummy variable equal to 1 if firm *i* is affected by an exogenous shock in years $t-1$ or *t*, as defined above. $\hat{\alpha}$ is reported in Appendix table 3.A5 column (2) and remains positive and statistically significant at the 1 percent level (first-stage F-stat equal to 542). Triangulating data sources delivers the same conclusion. In a supplementary regression, $\mathbb{1}_{i,t}$ is not based on publicly available information but on the (sparse) information contained in ExecuComp about resignations and retirements. The corresponding $\hat{\alpha}$ stays positive and significant (see Appendix table 3.A5 column (3)).

Conferral of PNTR Appendix table 3.A5 column (4) exploits the granting of Permanent Normal Trade Relations status to China in 2000. US imports from non-market economies are generally subject to higher tariff rates (non-normal-trade-relations tariff rates, hereafter NNTR). Since the US Trade Act of 1974, US Presidents can grant normal-trade-relations tariff rates (NTR) to some non-market economies on an annual basis and upon approval from the US Congress. That is why exports from China to the US were subject to NTR rates between 1980 and 2000, even though China was still considered as a non-market economy at that time. The annual renewal was quite automatic in the 1980s (Pierce and Schott, 2016). Nevertheless, the military assault led by the Chinese government on the pro-democracy protesters in Tiananmen Square in 1989 marked a turning point. In 1990, 1991, and 1992 for instance, the House of Representatives voted against the renewal of the status. More generally, public opinion became hostile toward China. Gallup surveys reveal that while 13 percent of Americans had a very or mostly unfavorable view of China months before the Tiananmen protests, this proportion then soared and stayed above 50 percent throughout the 1990s.[10] Other polls suggest that public opinion wanted the US to put more pressure on China and vigorously opposed Bush's conception of Sino-American relations (Skidmore and Gates, 1997). As a consequence, future tariffs were uncertain, and this uncertainty hindered China-US trade flows. The conferral of PNTR status in October 2000, quick and unanticipated,[11] ended this uncertainty. The quantification analysis conducted by Handley and Limão (2017) indicates that the reduction in trade policy uncertainty was responsible for a third of the growth of US expenditures on Chinese goods between 2000 and 2005. In parallel, Gulen and Ion (2016), Wu et al. (2020), and Choi et al. (2021) find that policy uncertainty stifles corporate investments and FDIs. Two hypotheses can thus be formulated. First, we expect the granting to boost US FDIs in China, especially in the sectors that were the most exposed to trade policy uncertainty. Second, if managers significantly contribute to firms' FDIs, the surge in FDIs should be most striking in firms endowed with experienced executives. To test both assumptions, I measure trade policy uncertainty as the gap between NNTR and NTR tariff rates at the industry level (Pierce and Schott, 2016). Its variation essentially stems from NNTR tariff rates. As they were set by the Smoot-Hawley Tariff Act seventy years earlier, in 1930, the treatment variable is plausibly exogenous. Next, I proceed with

10. See: `https://news.gallup.com/poll/1627/china.aspx`.
11. Greenland et al. (2020) show that the PNTR status was little mentioned in newspapers prior to the introduction of the bill in May 2000.

a triple-difference equation:

$$\begin{aligned} FDI_{i,t} &= \alpha TREAT_i \times TPU_{i,j,t} + \beta TPU_{i,j,t} + \mu_i + \upsilon_t + \epsilon_{i,t} \\ \text{with } TPU_{i,j,t} &= \mathbb{1}_{t \geq 2001} \left(NNTR_{i,j,1999} - NTR_{i,j,1999} \right) \end{aligned} \tag{3.3}$$

$FDI_{i,t}$ is a binary variable indicating whether firm i has at least one subsidiary in China in year t. $TREAT_i$ is the number of executives in firm i experienced in managing operations with China. Note the absence of a time index t. The regression is run between 1995 and 2005 only with firms where the number of executives used to handle activities with China is fixed over the period to eliminate the possibility that firms hired new executives and expanded simultaneously. $TPU_{i,j,t}$ is the treatment variable. It is equal to 0 from 1995 to 2000. As of 2001, this variable is the gap between the NNTR and NTR tariff rates in 1999 in industry j in which firm i mainly operates.[12] The identifying assumption for equation (3.3) is that all else equal and in the absence of the shock, FDIs in China would have evolved in the same way for all firms. The results in Appendix table 3.A5 column (4) corroborate our two predictions. The granting eased FDIs of US-listed firms in China ($\hat{\beta} > 0$), and the pattern is more remarkable for firms employing executives experienced with China ($\hat{\alpha} > 0$). A robustness check similar to figure 3.3 ensures that the results cannot be attributed to pre-existing trends in FDIs. Once added into the right-hand side variables, the leading values of $TPU_{i,j,t}$ in equation (3.3) are not statistically different from zero at the 5 percent level (p-value of the joint significance test = 0.18).

Altogether, the placebo test, the two-stage least squares regressions, and the identification strategy leaning on the PNTR episode confirm that executives are key to firm presence in foreign markets.

12. Sectors are defined at the 4-digit SIC level and information on NNTR and NTR tariff rates is available just for manufacturing sectors. Hence, only firms mainly operating in manufacturing are retained for equation (3.3).

5 Executive experience and foreign subsidiaries: further insights

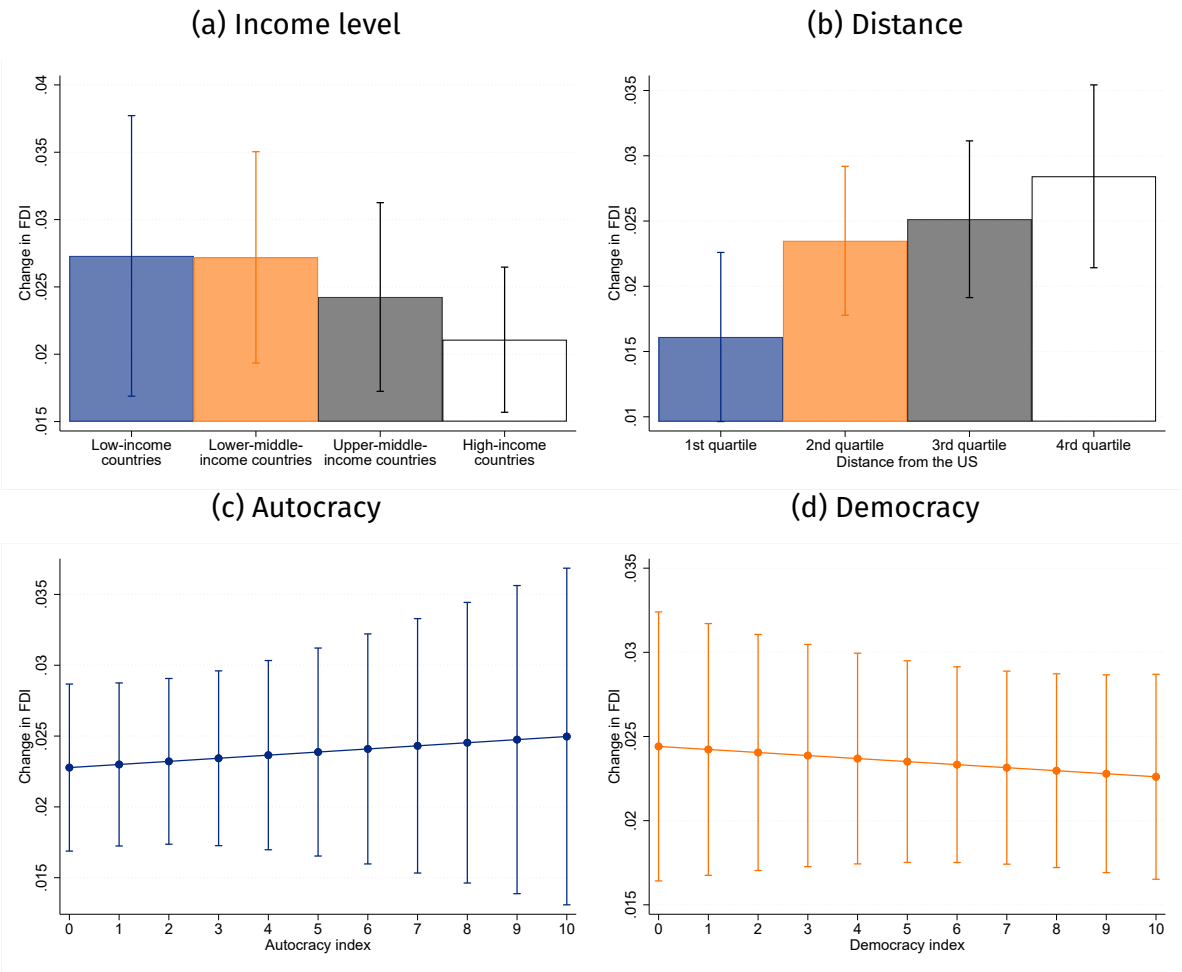
5.1 Heterogeneous effects

The results outlined in section 4 reflect an average effect. Nonetheless, the nexus between executive experience and FDIs might vary along several dimensions. The analysis now delves into heterogeneous effects to better understand when and how executive experience underpins firm performance in international markets. I start by identifying countries for which executive experience is more salient. Next, I zoom in on executives.

Heterogeneous effects across countries A first approach is to look at the characteristics of the countries in scope to see whether executive experience and market entry interact more under some conditions. Particular attention is paid to the income level of host countries. It not only allows us to know if executive experience is more decisive in countries with different income levels, but it also allows us to infer if executive experience is more pertinent to greenfield investments or M&As. A caveat indeed is that available information on FDIs is too scant to distinguish both types of operations. Insofar as greenfield investments are more prevalent in developing economies and M&As are more directed toward developed economies (Davies et al., 2018a), heterogeneous effects across income groups could cast light on the issue. Figure 3.4a illustrates the results for equation (3.1) and four subsamples: low-income countries, lower-middle-income countries, upper-middle-income countries, and high-income countries (World Bank classification). The effect of executive experience on FDIs decreases with the level of development of the host country. This suggests that executive experience could be more influential for greenfield FDIs, when the firm must establish new sites and networks instead of integrating existing targets.

Additional regressions explore the role played by other attributes highlighted in the international trade and gravity literature. Geographical distance amplifies the impact of executive experience on FDIs (see figure 3.4b, data from CEPII) but cultural proximity as measured by language and colonial ties has little repercussion (see Appendix figure 3.A3, data from CEPII). Notably, the quality of institutions of the host country appears determinant. Interacting the treatment variable $TREAT_{i,c,t}$

Figure 3.4 – Executive experience and FDIs: the role of host countries



Notes: $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm *i* has at least one subsidiary in country *c* in year *t*. The treatment variable $TREAT_{i,c,t}$ represents the number of executives working for firm *i* in year *t* and having already managed operations in country *c* before joining firm *i*. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the firm-year level. The first subfigure (a) depicts the regression results of equation (3.1) after dividing the sample into four groups according to the income level of the host country (World Bank classification). The regression is run for each subsample. The second subfigure (b) depicts the regression results of equation (3.1) after splitting host countries into four categories of equal size according to their distance from the US (CEPII data). The first quartile contains the closest neighbors and vice versa. The regression is run for each subsample. The third subfigure (c) depicts the regression results of equation (3.1) after introducing an additional term interacting the treatment variable with the Polity 5 autocracy index. The autocracy index varies between 0 and 10. Higher values of the index are associated with a higher level of autocracy. The fourth subfigure (d) depicts the regression results of equation (3.1) after introducing an additional term interacting the treatment variable with the Polity 5 democracy index. The democracy index varies between 0 and 10. Higher values of the index are associated with a higher level of democracy. See section 5 for more details.

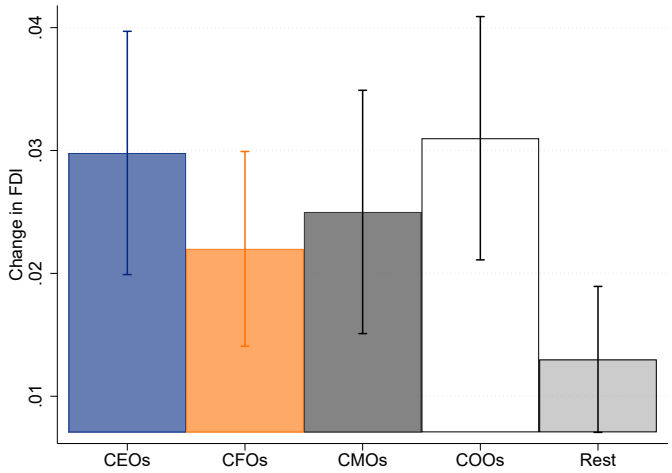
with the autocracy and democracy indices of the Polity 5 project reveals some non-linearity along these lines (see figures 3.4c and 3.4d). The regressions show that country-specific knowledge acquired by executives is more critical for investments where institutions are eventually weak and plagued by corruption.

Heterogeneous effects across executives Another source of heterogeneity concerns executives themselves. The database pools together 3,233 executives whose profile greatly differs. Among other things, executives do not occupy the same position. ExecuComp does not provide much personal information about executives but clearly reports the title of C-level executives. Furthermore, since C-level executives set the tone at the top, we might expect their experience to be more helpful. Figure 3.5 tests the validity of this hypothesis. CEOs, CFOs, CMOs, and COOs are separated from the rest, for whom the job description is poorly reported and who arguably occupy lower rank functions. The results are obtained after inserting into equation (3.1) four new binary variables signaling whether the CEO, CFO, CMO, and COO are familiar with the specific country. They bear out our prior and confirm that the experience of C-suite executives is more instrumental in MNEs' expansion. This is especially true for COOs and, to a lesser degree, for CEOs and CMOs. The fact that CFOs have less incidence among top executives resonates with figure 3.4a. CFOs are more likely to be involved in M&A-type FDIs, for which we just saw that executive experience is potentially less important.

5.2 Country-specific versus global experience

A question in the same vein relates to the experience of executives per se: Does FDI experience have to be necessarily country-specific to help firms penetrate new markets? Put otherwise, is experience in managing operations with country c sufficient to spur activities in country c'? The firm-year fixed effects inserted thus far nest all year-specific characteristics of executives. The effect of international experience is then already neutralized but it cannot directly be compared to the one of country-specific experience. To clarify this, firm-year fixed effects $\mu_{i,t}$ are replaced with firm fixed effects μ_i and a new term $TREAT_{i,t}^{global}$ is added into equation (3.1). $TREAT_{i,t}^{global}$ denotes the number of executives used to handle multinational operations broadly defined. The results are attached in figure 3.6. The coefficient for the country-specific experience of executives concurs with the previous ones, notwithstanding the replacement of the firm-year fixed effects. Perhaps more interestingly, the results indicate that the recruitment of executives formerly working for

Figure 3.5 – Executive experience and FDIs: the role of top executives



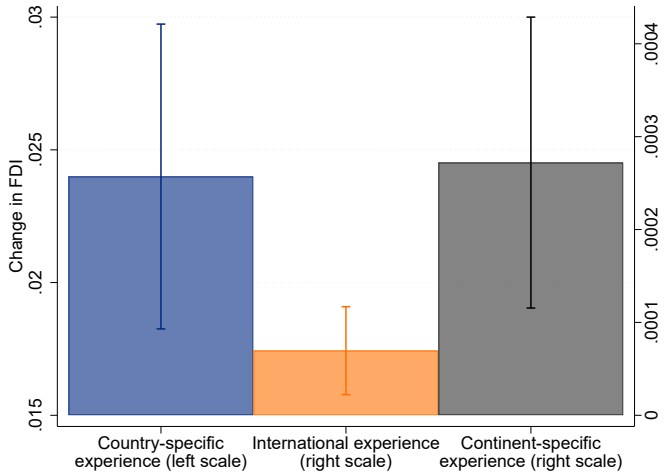
Notes: This figure depicts the regression results of equation (3.1) after differentiating CEOs, CFOs, CMOs, and COOs from the rest of the executives. $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm *i* has at least one subsidiary in country *c* in year *t*. The main treatment variable $TREAT_{i,c,t}$ represents the number of executives working for firm *i* in year *t* and having already managed operations in country *c* before joining firm *i*. $CEO_{i,c,t}$ is a binary variable equal to 1 if the CEO of firm *i* in year *t* has already managed operations in country *c* prior to joining firm *i*. A similar definition applies to $CFO_{i,c,t}$, $CMO_{i,c,t}$, and $COO_{i,c,t}$. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the firm-year level. See section 5 for more details.

global firms not implanted in country *c* is hardly followed by an entry into country *c*. A finer exercise, visible in the same figure, replaces $TREAT^{global}_{i,t}$ with $TREAT^{continent}_{i,c,t}$. $TREAT^{continent}_{i,c,t}$ counts the number of executives experienced with foreign countries located in the same continent as country *c*. The point estimate is four times larger than the one associated with $TREAT^{global}_{i,t}$. Yet, its order of magnitude is still negligible compared to the coefficient obtained for $TREAT_{i,c,t}$. These two sets of results attest that only the country-specific experience of executives really bolsters firm presence overseas.

5.3 Executive pay and multinational experience

Before concluding, I investigate whether multinational experience yields a compensation premium in the labor market. First, prior research shows that executives are in short supply (e.g., Bennedsen, Pérez-González, and Wolfenzon, 2020; Sauvagnat and Schivardi, 2020). Second, their experience with multinational activities strengthens firm growth in international markets (see section 4). Third, only

Figure 3.6 – Executive experience and FDIs: country-specific versus global experience



Notes: This figure depicts the regression results of equation (3.1) after differentiating the country-specific and global experience of executives. $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm *i* has at least one subsidiary in country *c* in year *t*. The main treatment variable $TREAT_{i,c,t}$ represents the number of executives working for firm *i* in year *t* and having already managed operations in country *c* before joining firm *i*. The first two bars depict the regression results of equation (3.1) after incorporating $TREAT^{global}_{i,t}$ into the right-hand side variables. $TREAT^{global}_{i,t}$ represents the number of executives working for firm *i* in year *t* and having already managed multinational operations before joining firm *i*. The third bar depicts the regression results of equation (3.1) after incorporating $TREAT^{continent}_{i,c,t}$ into the right-hand side variables. $TREAT^{continent}_{i,c,t}$ represents the number of executives working for firm *i* in year *t* and having already managed multinational operations in the same continent as country *c* before joining firm *i*. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the firm level. See section 5 for more details.

country-specific expertise significantly contributes to MNEs' expansion abroad (see section 5.3). Therefore, companies presumably compete in the labor market and award a compensation premium to attract this rare skill. Descriptive evidence goes in this direction. Appendix figure 3.A4 depicts the distribution of compensations for executives with and without FDI experience. The data come from ExecuComp and give an accurate proxy for executives' compensations as they encompass salaries, bonuses, stock and option awards, non-equity incentive plans, and all other payments.[13] The graph shows that experienced executives receive higher compensa-

13. As is common practice in the literature (Gabaix and Landier, 2008; Chhaochharia and Grinstein, 2009; Faulkender and Yang, 2010; Graham et al., 2012), the variable used for compensations corresponds to the variable labeled *TDC*1 in ExecuComp. Note that its calculation changed in 2006 after the promulgation of Financial Accounting Statement 123R. Pre- and post-2006 values are har-

Table 3.2 – Executive experience and FDIs: the compensation premium

Dependent variable	$ln\left(compensation_{e,i,t}\right)$
$experience^{FDI}_{e,i,t}$	0.342^{a}
	(0.071)
$age_{e,t}$	-0.007
	(0.007)
$experience^{firm}_{e,i,t}$	0.013^{c}
	(0.007)
$CEO_{e,i,t}$	0.405^{a}
	(0.016)
$CFO_{e,i,t}$	0.226^{a}
	(0.019)
Executive FEs	Yes
Firm-year FEs	Yes
R^2	0.912
No. of obs.	54,542

Notes: This table reports the regression results of equation (3.4). $compensation_{e,i,t}$ is the compensation received by executive e working for firm i in year t. $experience^{FDI}_{e,i,t}$ is a dummy equal to 1 if executive e already managed multinational activities prior to joining firm i. $age_{e,t}$ is the age of executive e in year t. $experience^{firm}_{e,i,t}$ represents in year t the number of years executive e has been working for firm i. $CEO_{e,i,t}$ is a dichotomous variable equal to 1 if executive e is the CEO of company i in year t. $CFO_{e,i,t}$ is a dichotomous variable equal to 1 if executive e is the CFO of company i in year t. Standard errors, in parentheses, are clustered at the firm-year level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

tions on average. Equation (3.4) digs into this with a more refined methodology. On the left-hand side, $compensation_{e,i,t}$ is the compensation of executive e working for firm i in year t. On the right-hand side, $experience^{FDI}_{e,i,t}$ is a binary variable equal to 1 if executive e has worked for an MNE before joining firm i. Control variables include executives' age ($age_{e,t}$), within-firm experience ($experience^{firm}_{e,i,t}$), CEO and CFO dummies ($CEO_{e,i,t}$ and $CFO_{e,i,t}$), and executive and firm-year fixed effects. The fixed effects capture constant characteristics of executives, systematic differences in compensations across firms, as well as global trends in compensations and transitory shocks.

$$\begin{aligned} ln\left(compensation_{e,i,t}\right) = {} & \kappa experience^{FDI}_{e,i,t} + \lambda age_{e,t} + \iota experience^{firm}_{e,i,t} \\ & + \delta CEO_{e,i,t} + \eta CFO_{e,i,t} + \nu_e + \omega_{i,t} + u_{e,i,t} \end{aligned} \tag{3.4}$$

Table 3.2 lends credence to the existence of such premiums. $\hat{\kappa}$ is equal to 0.342 and significant at the 1 percent level, meaning that experience with multinational

monized following Gabaix, Landier, and Sauvagnat (2014).

activities is associated with a 34.2 percent rise in compensations.

6 Conclusion

FDI determinants in the existing literature are either country- or firm-specific. The present paper takes a further step forward and sheds light on the role of executive employees. Three micro-level databases are merged to this end. They provide rich information on the executives and worldwide subsidiaries of S&P 1500 enterprises. They notably allow retrieving, for each firm-year pair, the number of subsidiaries in a given foreign country as well as the number of executives having already overseen business activities in this country.

In line with anecdotal evidence, an event study shows a strong correlation between executive experience and firm presence in foreign markets. Appointing an executive experienced with a particular foreign country is associated with a hefty increase in the probability of disclosing subsidiaries in this country in subsequent years. The pattern holds at both margins of FDIs but is not symmetric. A firm's presence overseas does not shrink when experienced executives leave at a later stage. Interestingly, the analysis reveals heterogeneous effects across host countries and executives and shows that only the country-specific experience of executives fosters FDIs. It also documents the existence of a compensation premium for executives used to manage multinational operations. These findings are validated by numerous sensitivity tests and confirm that firms hire experienced executives to enlarge their network of subsidiaries in certain countries. They carry implications for (at least) competition and fiscal policies.

Appendix

Figure 3.A1 – Subsidiaries reported by PFIZER INC

EX-21 6 y46668ex21.htm SUBSIDIARIES OF THE COMPANY

EXHIBIT 21

SUBSIDIARIES OF THE COMPANY

The following is a list of subsidiaries of the Company as of December 31, 2000, omitting some subsidiaries which, considered in the aggregate, would not constitute a significant subsidiary.

NAME	WHERE INCORPORATED
412357 Ontario Inc	Canada
A S Ruffel (Mozambique) Limitada	Mozambique
A S Ruffel (Private) Ltd	Zimbabwe
A.S. Ruffel (Proprietary) Limited	South Africa
A/O Pfizer	Russia
Adams (Thailand) Limited	Thailand
Adams Panama, Sociedad Anonima	Panama
Adams S.A	Argentina
Adenylchemie GmbH	Germany
Agouron Pharmaceuticals (Europe) Limited	United Kingdom
Agouron Pharmaceuticals Canada Inc	Canada
Agouron Pharmaceuticals, Inc	United States
American Chicle Company	United States
American Foods Industries, Inc	United States
AMS Medical Systems AG	Switzerland
Anaderm Research Corp	United States
Andean Services SA	Colombia
Bioindustria Farmaceutici S.p.A.	Italy
Biorell GmbH	Germany
Blue Cross S.r.l	Italy
C.P. Pharmaceuticals International C.V	Netherlands
Cachou Lajaunie	France
Capsugel AG/SA/ Ltd	Switzerland
Capsugel France	France
Charwell Pharmaceuticals Limited	United Kingdom
Chicle Adams, S.A	Colombia

Notes: This snapshot is a non-exhaustive list of the significant subsidiaries reported by PFIZER INC in Exhibit 21 in December 2000.

Table 3.A1 – List of foreign countries (3-digit ISO codes)

ISO3 ABW, AFG, AGO, AIA, ALB, AND, ANT, ARE, ARG, ARM, ASM, ATG, AUS, AUT, AZE, BDI, BEL, BEN, BFA, BGD, BGR, BHR, BHS, BIH, BLM, BLR, BLZ, BMU, BOL, BRA, BRB, BRN, BWA, CAN, CCK, CHE, CHL, CHN, CIV, CMR, COD, COK, COL, CRI, CUB, CXR, CYM, CYP, CZE, DEU, DJI, DMA, DNK, DOM, DZA, ECU, EGY, ERI, ESP, EST, ETH, FIN, FJI, FLK, FRA, FSM, GAB, GBR, GGY, GHA, GIB, GIN, GLP, GMB, GNQ, GRC, GRD, GRL, GTM, GUF, GUM, HKG, HMD, HND, HRV, HTI, HUN, IDN, IMN, IND, IRL, IRN, IRQ, ISL, ISR, ITA, JAM, JEY, JOR, JPN, KAZ, KEN, KGZ, KHM, KIR, KNA, KOR, KWT, LAO, LBN, LBR, LBY, LCA, LIE, LKA, LSO, LTU, LUX, LVA, MAC, MAF, MAR, MCO, MDA, MDG, MDV, MEX, MHL, MKD, MLI, MLT, MMR, MNG, MNP, MRT, MSR, MTQ, MUS, MWI, MYS, NAM, NCL, NER, NGA, NIC, NIU, NLD, NOR, NPL, NRU, NZL, OMN, PAK, PAN, PER, PHL, PLW, PNG, POL, PRI, PRT, PRY, PSE, PYF, QAT, REU, ROU, RUS, RWA, SAU, SDN, SEN, SGP, SGS, SLE, SLV, SMR, SOM, SPM, SRB, SUR, SVK, SVN, SWE, SWZ, SYC, SYR, TCA, TCD, TGO, THA, TJK, TKM, TLS, TON, TTO, TUN, TUR, TUV, TWN, TZA, UGA, UKR, UMI, URY, UVK, UZB, VCT, VEN, VIR, VNM, VUT, WLF, WSM, YEM, ZAF, ZMB, ZWE.

Table 3.A2 – Executive experience and FDIs: asymmetric effects

Column	(1)	(2)	(3)	(4)
	Exit		Entry	
Dependent variable	$EXIT_{i,c,t}$	$FDI_{i,c,t}$	$ENTRY_{i,c,t}$	$FDI_{i,c,t}$
$TREAT_{i,c,t}$	-0.006	0.011	0.009[a]	0.021[a]
	(0.005)	(0.009)	(0.002)	(0.005)
Firm-year FEs	Yes	Yes	Yes	Yes
Country-year FEs	Yes	Yes	Yes	Yes
Firm-country FEs	Yes	Yes	Yes	Yes
R^2	0.660	0.758	0.294	0.758
No. of obs.	187,765	4,072,458	3,915,822	4,072,458

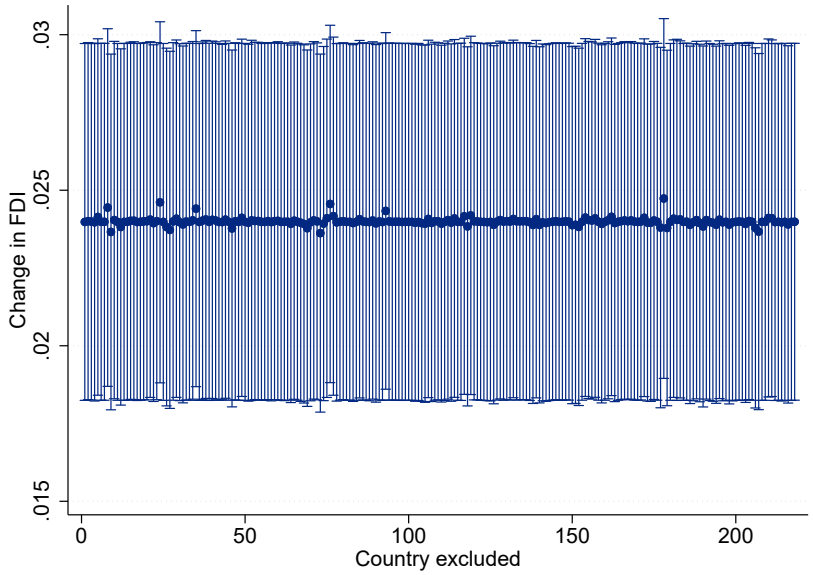
Notes: This table reports the regression results of equation (3.1), slightly modified to compare the effect of executive experience on entries and exits. $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm i has at least one subsidiary in country c in year t. $EXIT_{i,c,t}$ is a dummy variable equal to 0 if $FDI_{i,c,t}$ = 1 and equal to 1 if $FDI_{i,c,t}$ = 0 and $FDI_{i,c,t-1}$ = 1. $ENTRY_{i,c,t}$ is a dummy variable equal to 0 if $FDI_{i,c,t}$ = 0 and 1 if $FDI_{i,c,t}$ = 1 and $FDI_{i,c,t-1}$ = 0. In columns (1) and (3), $TREAT_{i,c,t}$ represents the number of executives working for firm i in year t and having already managed operations in country c before joining firm i. In column (2), $TREAT_{i,c,t}$ is a dummy variable equal to 1 if the number of executives working for firm i and having already managed operations in country c before joining firm i decreased between $t-1$ and t. In column (4), $TREAT_{i,c,t}$ is a dummy variable equal to 1 if the number of executives working for firm i and having already managed operations in country c before joining firm i increased between $t-1$ and t. Standard errors, in parentheses, are clustered at the firm-year level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

Table 3.A3 – Executive experience and FDIs: intensive margin of FDIs

Column	(1)	(2)
Dependent variable	$FDI_{i,c,t}$	$FDI_{i,c,t}$
$TREAT_{i,c,t}$	0.247^{a}	0.030^{a}
	(0.082)	(0.008)
Estimation technique	OLS	PPML
Firm-year FEs	Yes	Yes
Country-year FEs	Yes	Yes
Firm-country FEs	Yes	Yes
(Pseudo) R^2	0.784	0.541
No. of obs.	170,555	170,555

Notes: This table reports the regression results of equation (3.1), slightly modified to focus on the intensive margin of FDIs. $FDI_{i,c,t}$ is the number of subsidiaries reported by firm i in country c in year t. $TREAT_{i,c,t}$ represents the number of executives working for firm i in year t and having already managed operations in country c before joining firm i. In both columns, regressions are run conditional on $FDI_{i,c,t} > 0$. Column (1) reports OLS results while column (2) reports PPML results. Standard errors, in parentheses, are clustered at the firm-year level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

Figure 3.A2 – Executive experience and FDIs: dropping one country at a time



Notes: This figure depicts the regression results of equation (3.1) after removing one country at a time. $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm *i* has at least one subsidiary in country *c* in year *t*. The treatment variable $TREAT_{i,c,t}$ represents the number of executives working for firm *i* in year *t* and having already managed operations in country *c* before joining firm *i*. The 218 foreign countries are sorted alphabetically on the *x*-axis. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the firm-year level. See section 4 for more details.

Table 3.A4 – Executive experience and FDIs: robustness checks

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$
$TREAT_{i,c,t}$	0.026^{a}	0.048^{a}	0.342^{a}	0.194^{a}	0.019^{a}	0.024^{a}	0.024^{a}
	(0.004)	(0.009)	(0.007)	(0.008)	(0.003)	(0.003)	(0.003)
$origins_{i,c,t}$						0.006^{a}	0.004^{d}
						(0.002)	(0.002)
Firm-year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-country FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(Pseudo) R^2	0.758	0.669	0.611	0.603	0.827	0.758	0.758
No. of obs.	560,430	251,790	196,519	196,519	2,441,818	4,072,458	4,072,458

Notes: This table evaluates the robustness of the benchmark results and corresponds to the tests discussed in section 4.3. $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm i has at least one subsidiary in country c in year t. The treatment variable $TREAT_{i,c,t}$ represents the number of executives working for firm i in year t and having already managed operations in country c before joining firm i. $origins_{i,c,t}$ represents the number of executives working for firm i in year t and having a family name linked to country c. Standard errors, in parentheses, are clustered at the firm-year level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

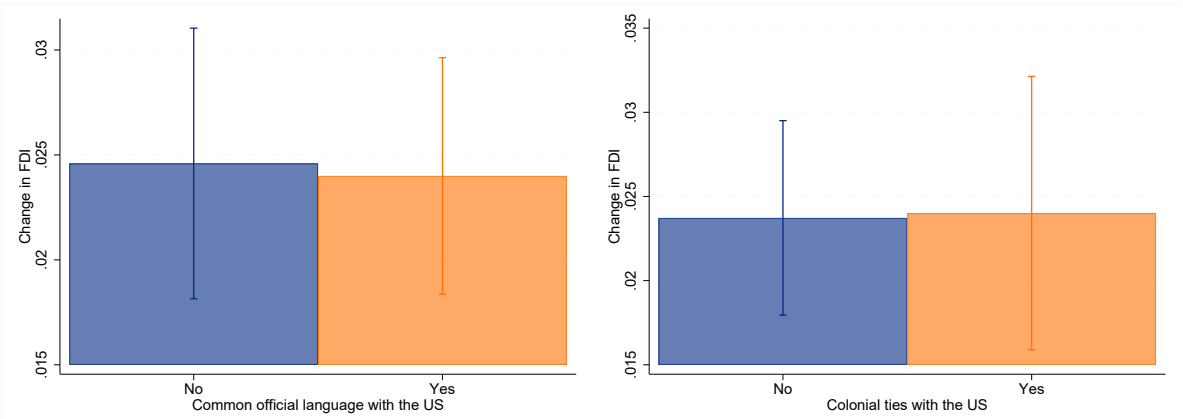
Table 3.A5 – Executive experience and FDIs: endogeneity concerns

Column	(1)	(2)	(3)	(4)
Dependent variable	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,c,t}$	$FDI_{i,t}$
$TREAT_{i,c,t}$	0.035^{b}	0.019^{d}	0.031^{a}	
	(0.017)	(0.013)	(0.004)	
$TPU_{i,j,t}$				0.289^{a}
				(0.081)
$TREAT_i \times TPU_{i,j,t}$				0.585^{d}
				(0.411)
Firm-year FEs	Yes	Yes	Yes	No
Country-year FEs	Yes	Yes	Yes	No
Firm-country FEs	Yes	Yes	Yes	No
Firm FEs	No	No	No	Yes
Year FEs	No	No	No	Yes
First-stage F-stat	198.485	541.708	2.3e5	
R^2 (for OLS regressions)				0.736
No. of obs.	2,448,358	4,072,458	4,072,458	4,302

Notes: This table addresses endogeneity concerns and corresponds to the tests discussed in section 4.4. $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm i has at least one subsidiary in country c in year t. The treatment variable $TREAT_{i,c,t}$ represents the number of executives working for firm i in year t and having already managed operations in country c before joining firm i. In column (4), $FDI_{i,t}$ is a dummy variable equal to 1 if firm i has at least one subsidiary located in China in year t. $TREAT_i$ represents the number of executives working for firm i in 1995 and having already managed operations in China before joining firm i. $TPU_{i,j,t}$ is equal to 0 from 1995 to 2000. As of 2001, $TPU_{i,j,t}$ is equal to the gap between the NNTR and NTR tariff rates in 1999 in industry j in which firm i mainly operates. Standard errors, in parentheses, are clustered at the firm-year level, except in column (4) where they are clustered at the firm level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

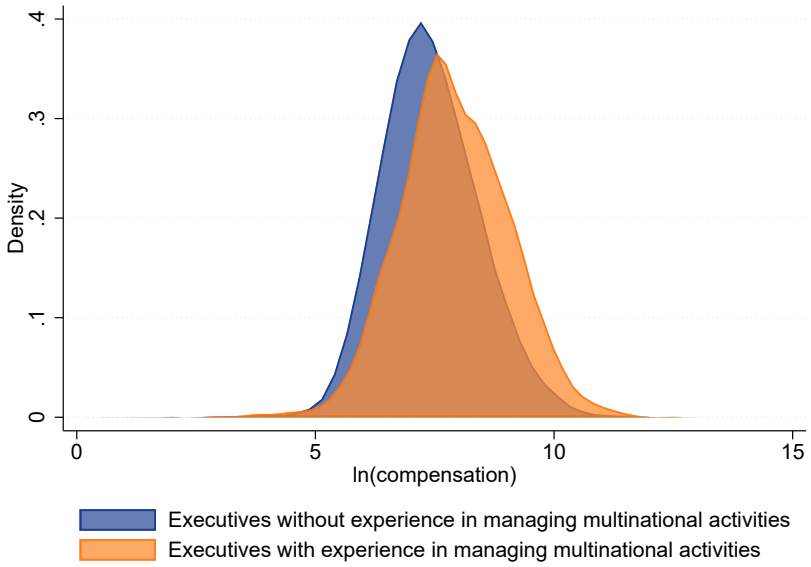
Figure 3.A3 – Executive experience and FDIs: the role of host countries (bis)

(a) Common official language (b) Colonial past relationship



Notes: $FDI_{i,c,t}$ is a dummy variable equal to 1 if firm *i* has at least one subsidiary in country *c* in year *t*. The treatment variable $TREAT_{i,c,t}$ represents the number of executives working for firm *i* in year *t* and having already managed operations in country *c* before joining firm *i*. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the firm-year level. The first subfigure (a) depicts the regression results of equation (3.1) after dividing the sample into two groups separating host countries sharing a common official language with the US (CEPII data). The regression is run once with an interaction term. The second subfigure (b) depicts the regression results of equation (3.1) after splitting host countries into two categories and separating host countries that had colonial linkages with the US (CEPII data). The regression is run once with an interaction term. See section 5 for more details.

Figure 3.A4 – Executive experience and executive compensation



Notes: This figure depicts the distribution of executives' compensations, expressed in thousands of US dollars. See section 5 for more details.

Supplementary Appendix

Executive mobility through the lens of media and official documents

In Appendix table 3.A5 columns (2) and (3), I investigate what triggers executive mobility using official documents, press releases, newswires, and newspapers (e.g., SEC and FBI reports, firms' websites, *Wall Street Journal*, *New York Times*, releases from Business Wire and PR Newswire). To fully understand the causes, the task is done manually on a sample of 165 randomly drawn executives (i.e., 5 percent of the pool of executives). Particular attention is paid to five scenarios: deaths, abrupt resignations, retirements, sudden layoffs, and resignations and layoffs preceded by legal investigations.

The key assumption for identification is that changes in $TREAT_{i,c,t}$ are exogenous under such circumstances. The change in the stock of experienced executives in firm i between years $t-1$ and t is assumed exogenous if executive e working for firm i dies in $t-1$ or t. In the same vein, the change is assumed exogenous if executive e abruptly resigns in $t-1$ or t. A resignation is deemed abrupt if the immediate replacement is not permanent, if it is due to personal reasons, or if it is to pursue other opportunities. Should this type of information be unavailable, the resignation is treated as abrupt if it is effective less than three months after its announcement. Sometimes, what could be accordingly defined as a sudden resignation is actually expected and initiated by firms. This is notably the case when firms perceive the financial performance as unsatisfactory and potentially "make" executives resign. That explains why I deviate from this standard definition in some cases, in light of the information at hand. The same logic applies to sudden/early layoffs, when executives are ousted a few months after their appointment. If there is no relevant information as to why executive e leaves the firm, I adopt a conservative approach and code the movement as endogenous. To illustrate how it is done in practice, I enumerate some examples below.

Example 1 "August 12, 1999 – DBT Online, Inc. announced that Ron Fournet, Chief Information & Technology Officer, has been named President and CEO, replacing Charles A. Lieppe, who resigned as an Officer and Director effective immediately due to personal reasons. *"A sudden illness in my immediate family made it impossible for me to devote my full attention to DBT,"* said Mr. Lieppe, who joined DBT as

President and CEO in 1997." (SEC Exhibit 99.1 Form, August 13, 1999)
→ The shock faced by DBT in 1999 is exogenous insofar as Charles A. Lieppe left suddenly and of his own volition.

Example 2 "Avon Products Inc. fired its vice chairman [Charles W. Cramb] in connection with probes into possible bribery overseas and improper disclosures to Wall Street analysts in the US." (*Wall Street Journal*, January 31, 2012)
→ The shock faced by Avon in 2012 is exogenous insofar as the departure of Charles W. Cramb results from an investigation.

Example 3 "Sears Holdings Corp. abruptly announced the departure of president and chief executive Aylwin B. Lewis on Monday, leaving a management void at the top of the department store chain. [...] W. Bruce Johnson was named interim CEO while the company looks for a permanent successor." (*Tampa Bay Times*, January 29, 2008)
→ The shock faced by Sears in 2008 is exogenous since the firm did not have time to find directly a permanent replacement.

Example 4 "Progress also announced that Charles F. Wagner, Jr., chief financial officer, will leave the company effective immediately. In the interim until a new Chief Financial Officer is appointed, Mr. Bhatt will assume Mr. Wagner's responsibilities as Chief Financial Officer." (release from Business Wire, March 28, 2012)
→ The shock faced by Progress in 2012 is exogenous for the same reason.

Example 5 "Progress Software Corporation, a leading software provider that enables enterprises to be operationally responsive, announced today the appointment of Charles "Charlie" F. Wagner as executive vice president, Finance & Administration and chief financial officer (CFO), reporting to Richard D. Reidy, president and chief executive officer. Richard D. Reidy said: *"We are delighted with the appointment of Charlie Wagner after a search process that considered a very strong field of candidates."*" (release from Market Wire, November 15, 2010)
→ The shock faced by Progress in 2010 is endogenous this time as the firm appointed Charles F. Wagner after a long process.

Example 6 "PictureTel taps WorldCom's [Bruce] Bond in a bid to boost company's sales." (Wall Street Journal, February 10, 1998)

→ The shock faced by PictureTel in 1998 is endogenous since the appointment is purely strategic.

Example 7 "Impax Laboratories Inc.'s board has elected Robert Burr chairman. Burr, who has been an independent director of the Hayward company since 2001, succeeds Charles Hsiao, co-founder of Impax's predecessor, IMPAX Pharmaceuticals Inc. Hsiao died in August." (*The Business Journals*, December 15, 2008)
→ The shock faced by IMPAX in 2008 is exogenous because it is attributable to the death of Charles Hsiao.

Importantly, it is possible to identify movements of executives related to M&A operations. For instance, ExecuComp records the departure of Arthur L. Swift from the company Cirrus Logic in 2000. In fact, his apparent departure stems from a series of M&A operations of Cirrus Logic, first with ISD Corporation and then with LynuxWorks:

— "Arthur L. Swift has served as our Chief Operating Officer since October 2000. From March 2000 to October 2000, Mr. Swift served as President and Chief Operating Officer of ISDCorp. From August 1999 to March 2000, Mr. Swift was Vice President and General Manager of the Magnetic Storage Division of CirrusLogic, a semiconductor company." (SEC Form S-1 of LynuxWorks filed in October 2000)
— "Cirrus Logic has hived off its graphics software business to ISD Corporation. Financial terms were undisclosed, but we assume that money flowed into Cirrus' coffers from ISD. Broad outlines of the outsourcing deal are in the public domain. ISD is to take on all the workers of the Cirrus Logic PC graphics software group, organizing the team as a standalone division. It will also handle all customer relationships and support agreements for Cirrus graphics software." (*The Register*, October 14, 1998)
— "LynuxWorks Inc. is ready to roll out the most recent version of its Linux-based operating system, and the first since its merger with ISD Corp." (*EE Times*, October 8, 2000)

4

Profit shifting, employee pay, and inequalities: Evidence from US-listed companies

Solo-authored paper [*]

Corporate tax avoidance is regularly blamed for aggravating income inequalities. However, systematic evidence in this direction is still lacking. The present study fills this void. It explores the effect of profit shifting on employee pay among S&P 1500 companies and shows that this effect indeed varies across occupations. Chief executive officers and chief financial officers receive higher compensations when their firm starts operating in tax havens. Non-executive employees, if anything, see their wages fall in the meantime. Furthermore, the inequality-deepening impact of firm entry into tax havens is driven by companies that reward executives on an after-tax basis and is more pronounced in intangible-intensive companies. These new findings document the distributional consequences of profit shifting. They also cast light on the evolution of income inequalities, public opinion about globalization, and ongoing debates on international tax reforms.

*. This chapter received the 2022 Young Researcher Award from the EU Tax Observatory. I would like to thank Micael Castanheira, Paola Conconi, Ronald B. Davies, Dhammika Dharmapala, Nicolas Gavoille, Stefanie Haller, Andreas Haufler, Valeria Merlo, Gaëtan Nicodème, Mathieu Parenti, Nadine Riedel, and participants at various conferences and workshops for valuable comments and insightful discussions. I would also like to thank Mai Nguyen for her help with the data. Funding from the F.R.S.-FNRS is gratefully acknowledged.

1 Introduction

The past decades have witnessed the emergence of multinational enterprises (MNEs), the digitalization of economic activities, and the development of offshore financial centers (OFCs).[2] All three have fueled corporate tax avoidance and contributed to the surge of profit shifting activities (Sikka, 2003; Argilés-Bosch, Somoza, Ravenda, and García-Blandón, 2020). MNEs exploit loopholes, mismatches in tax rules, and other legal technicalities to move income across borders and artificially book profits in low-tax jurisdictions. These practices are now under the glare of public spotlight due to the recent data leaks, the persistence of budget deficits in high-income countries, and the rise of income inequalities. The topic has become even more salient in the wake of the COVID-19 pandemic (Collier, Pirlot, and Vella, 2020). The methods employed by profit shifting MNEs are relatively well documented in the existing literature (Dharmapala, 2014; Riedel, 2018; Beer et al., 2020). They for instance involve transfer mispricing, debt shifting, corporate inversions, and treaty shopping. In total, public authorities of non-OFCs might lose up to $300 billion of tax revenues as a result of profit shifting (Garcia-Bernardo and Janskỳ, 2022). The consequences of profit shifting beyond tax revenues, however, are still largely ignored. In particular, our knowledge of the distributional impact of profit shifting remains limited.

This paper examines the effect of profit shifting on both employee pay and within-firm pay inequalities. Through the lens of a collective bargaining model, profit shifting exerts two opposite effects on wages. On the one hand, corporate income taxes dwindle and the overall surplus shared between the firm and its employees increases (positive effect, or tax rate effect). On the other hand, the relocation of profits gives the firm private information on profitability and thereby creates an information asymmetry that deteriorates the bargaining power of employees (negative effect, or secrecy effect). This harmful mechanism is less intuitive but strongly supported by anecdotal evidence. For example, both General Electric and McDonald's have recently been accused of minimizing earnings through profit shifting schemes to justify wage cuts or dampen wage revaluation.[3] The literature

2. "Offshore financial centers" and "tax havens" are used interchangeably. They refer to jurisdictions characterized by low corporate income taxes and financial opacity.

3. See among others: (i) https://www.bfmtv.com/economie/emploi/le-siege-de-mc-donald-s-france-fait-face-a-une-mc-manif-de-salaries_AN-201810230051.html, (ii) https://www.humanite.fr/social-eco/mcdonald-s/fraude-fiscale-de-mcdonald-s-l-origine-de-l-amende-d-125-milliard-d-euros-il-y-l-action-d-un-syndicat-754697, (iii)

predicts that the second effect dominates and that workers, as a consequence, should receive lower wages (Krautheim and Schmidt-Eisenlohr, 2016). A caveat is that workers are generally homogeneous in such models. Notably, no distinction is made between executive and non-executive employees. In this paper, I argue that the effect is most likely heterogeneous across workers. The adverse effect is less conceivable for chief executive officers (CEOs) and chief financial officers (CFOs). They have clear information about the profitability of the firm since they supervise economic and financial operations themselves. In addition, we know that some executives are compensated on an after-tax basis to alleviate the agency costs associated with moral hazard and adverse selection (Gaertner, 2014, and references therein). Accordingly, from a theoretical viewpoint, profit shifting should increase the compensation of top executives and especially of top executives paid on an after-tax basis. If anything, it should also decrease the wage of non-executive employees – who constitute the bulk of employees – and thus worsen income inequalities.

There is to date no study that confronts these predictions with data. The present paper is a first step in this direction. To test their empirical validity, I first compile a database on the financial statements, executives, and foreign subsidiaries of companies listed on the Standard & Poor's (S&P) 1500 index between 1993 and 2013. The data originate from three complementary sources: Compustat, ExecuComp, and Exhibit 21. Compustat provides access to balance sheets, income statements, and cash flows of all US-listed firms. ExecuComp, as the name hints, contains details about the function and compensation of executives working for S&P 1500 firms. Exhibit 21 reports annually filled by US-listed firms to the Securities and Exchange Commission (SEC) allow reconstructing the worldwide network of their subsidiaries. Armed with this rich database, I then quantify the impact of firm entry into tax havens on employee pay and separate CEOs and CFOs from non-executive employees. Entry into tax havens is seen as an intensification of profit shifting activities that reduces corporate income taxes, something for which I provide suggestive evidence. Furthermore, the effect of firm presence in OFCs on employee pay is purged of confounding factors thanks to a wide array of controls as well as executive, firm, and year fixed effects.

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https://www.lemonde.fr/economie/article/2022/05/31/le-site-de-belfort-detrousse-par-general-electric-l-intersyndicale-depose-plainte-pour-fraude-fiscale-devant-le-pnf_6128384_3234.html, and (iv) https://lexpansion.lexpress.fr/actualite-economique/mc-donald-s-general-electric-quand-les-salaries-sont-victimes-de-l-optimisation-fiscale_2175421.html.

The baseline results are in line with the aforementioned hypotheses. Compensations of CEOs and CFOs rise when their firm starts operating in OFCs. The increase is mainly driven by MNEs using after-tax compensation incentives. In these companies, I estimate an 8 percent increase post entry. It mostly takes the form of higher non-equity incentive plans, i.e., cash paid and tied to financial performance. The pattern contrasts with the one observed for non-executive employees. Overall payments to non-executive employees, if anything, slightly drop in the meantime. The drop amounts to 3 percent maximum and cannot be explained by a decline in total employment. Profit shifting therefore accentuates within-corporation income inequalities. Moreover, evidence attests that inequalities widen more remarkably among intangible-intensive MNEs. Again, this observation is consistent with earlier work revealing that a strategic management of intellectual property (IP) rights offers supplementary opportunities to route income through tax-friendly jurisdictions (e.g., Dischinger and Riedel, 2011; Karkinsky and Riedel, 2012; Griffith et al., 2014; Alstadsæter et al., 2018).

The inequality-deepening effect of profit shifting is corroborated by multiple sensitivity tests. It holds when scrutinizing more directly the executive-to-average-worker pay ratio and with alternative sets of tax havens. The benchmark exercise builds on Dyreng and Lindsey (2009) and categorizes 46 foreign jurisdictions as tax havens. Adopting the classification elaborated by Hines and Rice (1994) yields the same conclusions. The same conclusions are also reached after removing six tax havens, namely: Hong Kong, Ireland, Luxembourg, Malaysia, Singapore, and Switzerland. Workhorse international trade theories argue that foreign direct investments (FDIs) should be principally directed to large and central countries (e.g., Brainard, 1993; Head and Mayer, 2004; Helpman et al., 2004). Given that Hong Kong, Ireland, Luxembourg, Malaysia, Singapore, and Switzerland are relatively large and central, FDIs of S&P 1500 firms in these countries may very well be unrelated to tax avoidance. Conversely, it is fair to assume that investments in small and remote islands in the likes of the Bahamas have little economic substance and fall within the sole scope of profit shifting. I further verify that executive turnover prior to entry into tax havens and the potential reshuffling of activities to low-cost countries do not contaminate the results. Lastly, I confirm that employee pay does not depend on future profit shifting activities. The latter test certifies that no pre-existing trends are influencing the results, guarantees that entry into tax havens is uncorrelated with past (executive-)firm-year unobserved shocks, and greatly alleviates reverse causality concerns (Gaertner, 2014; Hsieh and Willis, 2015).

These findings are new and highly relevant for policymaking. First, they shed light on the evolution of income inequalities (Alvaredo, Chancel, Piketty, Saez, and Zucman, 2017; Hoffmann, Lee, and Lemieux, 2020). The average CEO-to-worker compensation ratio increased fivefold between 1989 and 2017 and the boom in executive compensation nurtured the growth of the top 1 percent incomes (Mishel and Wolfe, 2019). Corporate tax avoidance has often been accused of aggravating income inequalities [4] but systematic evidence on this topic is scant. The present paper fills this void. S&P 1500 firms comprise the most productive companies and profit shifting MNEs constitute a small subgroup of superstar firms able to drive macroeconomic aggregates (Guvenen et al., 2022). Their expansion in OFCs, together with a shift toward performance pay and intangible assets (Hsieh and Willis, 2015; Falato, Kadyrzhanova, Sim, and Steri, 2020; De Simone, McClure, and Stomberg, 2022), exacerbated global income inequality during the 1990s and 2000s. In a sense, the analysis also uncovers a new mechanism whereby globalization fosters income inequalities (Jaumotte, Lall, and Papageorgiou, 2013) and echoes the escalating hostility toward MNEs and globalization (Helpman, 2017; Rodrik, 2018; Walter, 2021). Second, the conclusions enrich ongoing discussions about the international taxation system. Both scholars and policymakers acknowledge that the current system, inherited from the early 20th century, is outdated. MNEs have the opportunity to transfer profits to low- or no-tax jurisdictions and avoid taxes. Reforms are discussed at the international level to deal with these issues and finally align the tax system with the way economic activities are carried out nowadays. Perhaps surprisingly, their impact assessments revolve around two outcomes: countries' tax revenues and attractiveness (e.g., OECD, 2020; UNCTAD, 2022). The paper focuses on a neglected dimension and asserts that such reforms could also be useful for curbing within-country income inequalities. They could fulfill Sustainable Development Goal 10 not only indirectly through the redistribution of (higher) tax revenues but also more directly through employee pay. Third, the findings of the paper add to those of Gaertner (2014) and Hsieh and Willis (2015) and suggest that the relationship between executive compensation and profit shifting is two-way. In this respect, limiting the implementation of after-tax incentives could lessen profit shifting *and* income inequalities.

4. See this European Parliament headline: `https://www.europarl.europa.eu/news/en/headlines/economy/20191213STO69020/corporate-taxes-meps-want-to-tackle-tax-avoidance-by-big-companies`, this Oxfam article: `https://www.oxfam.org/en/inequality-and-poverty-hidden-costs-tax-dodging`, and this column: `https://inequality.org/research/6-facts-corporate-tax-avoidance/`.

Literature and contributions The paper resonates with two strands of the literature. An old body of literature in public economics tackles the incidence of corporate income taxation and its effect on wages. The taxation of profits can theoretically affect wages through two channels: a direct one, through rent sharing (Arulampalam, Devereux, and Maffini, 2012; Azémar and Hubbard, 2015; Fuest, Peichl, and Siegloch, 2018), and an indirect one, through capital reallocation (Harberger, 1962; Clausing, 2013; Gravelle, 2013). On the one hand, corporate income taxes compress wages by undermining the quasi-rent over which workers and firms bargain. On the other hand, an increase in corporate income taxes results in capital outflows. Capital outflows, in turn, decrease the capital-labor ratio, labor marginal productivity, and wages. Hence, both channels entail that the burden is passed onto workers to some extent. The capital reallocation story is not pertinent in the context of profit shifting because facilities are rarely reorganized. Should we interpret profit shifting as a reduction in tax rates, rent sharing models would predict a positive effect of profit shifting on wages. Against this background, I show that profit shifting might in fact be detrimental for the vast majority of employees. It means that we cannot consider profit shifting as a simple tax cut through the lens of these models. The latter need to be revisited and extended. Although the size of the pie increases, most workers also have weaker bargaining power, and the proportion of the pie that they receive diminishes (Krautheim and Schmidt-Eisenlohr, 2016). The empirical findings bear out that this mechanism is pivotal when delving into the nexus between profit shifting and employee pay.

Another line of inquiry, nascent and fast-growing, studies the profit shifting activities of MNEs. It shows that MNEs locate their IP rights in tax havens, manipulate transfer prices, record sales in low-tax countries, and proceed with intra-firm loans, treaty shopping, and corporate inversions to minimize tax expenses (Dharmapala, 2014; Riedel, 2018; Beer et al., 2020). Numerous papers identify the techniques of profit shifting, but only a fistful of papers investigate its repercussions. They look at its consequences for firm value (Desai and Dharmapala, 2009; Blaufus et al., 2019; Hasan et al., 2021), risk (Cao et al., 2021), investment (Overesch, 2009; Goldbach, Nagengast, Steinmüller, and Wamser, 2019), innovation (Li et al., 2021), industry concentration (Martin et al., 2022), and macroeconomic statistics (Bricongne et al., 2021; Guvenen et al., 2022). The closest paper in this stream of research is the one of Krautheim and Schmidt-Eisenlohr (2016). The authors address the effect of profit shifting on wages from a theoretical perspective. The

present paper[5] complements theirs by allowing for heterogeneous workers and providing micro-data evidence.

The remainder of the paper is organized into four sections. In section 2, I propose a simple model to illustrate the channels whereby profit shifting can influence employee pay and formulate a couple of hypotheses. The two next sections explore their empirical validity. Section 3 introduces the data, while section 4 lays out the econometric approach and the results. Section 5 lastly concludes.

2 Theoretical background

I use a basic model of collective bargaining to examine how profit shifting can in theory affect employee pay. I then derive two hypotheses that will be empirically tested in the ensuing sections.

2.1 Conceptual framework

Consider the case of a single firm. The firm produces a good by employing L workers, each paid w. The firm makes a post-tax profit $\pi(w,t) = (1-t)(q-wL)$. q denotes its turnover and t represents its effective tax rate (ETR). Both q and L are taken as given.[6]

The firm and the workers bargain over the wage w. Let $\bar{\pi}$ be the outside option of the firm, i.e., the maximum profit it would receive if it unilaterally withdraws from the negotiations. Symmetrically, denote $u(.)$ the utility of workers and $\bar{w}$ their outside option. The Nash-bargaining wage w^* solves the problem:

$$\begin{aligned} \max_{w} \quad & \Big[L\left(u(w)-u(\bar{w})\right)\Big]^{\kappa}\left[\pi(w,t)-\bar{\pi}\right] \\ s.t. \quad & w \geq \bar{w} \\ & \pi(w,t) \geq \bar{\pi} \end{aligned}$$

$\kappa > 0$ symbolizes the relative bargaining power of workers and the inequalities

5. Two follow-up studies have been conducted along similar lines: Alstadsæter, Bjørkheim, Davies, and Scheuerer (2022) and López Forero (2022).

6. The impact of profit shifting on firm employment is beyond the scope of this paper. See for example Buettner et al. (2018), Suárez Serrato (2019), Bilicka, Qi, and Xing (2021), and López Forero (2022).

represent the participation constraints. Assume that the firm always participates, i.e., $\pi(\bar{w}, t) \geq \bar{\pi}$. The first-order condition for maximization gives:

$$\kappa \frac{u'(w)}{u(w) - u(\bar{w})} \left(\pi(w, t) - \bar{\pi}\right) - L = 0$$

Note that $u'(w)(w - \bar{w}) \approx u(w) - u(\bar{w})$. The solution w^* then verifies:

$$\begin{aligned} w^* &= \bar{w} + \kappa \frac{\left(\pi(w^*, t) - \bar{\pi}\right)}{L} \\ &= \bar{w} + \kappa S \quad \text{with } S = \frac{\left(\pi(w^*, t) - \bar{\pi}\right)}{L} \end{aligned} \tag{4.1}$$

Equation (4.1) says that the negotiated wage is equal to the non-cooperative payoff of workers $\bar{w}$ plus a share of the quasi-rent per worker S. This share increases with the bargaining power of workers κ.

Replacing $\pi(w^*, t)$ with $(1 - t)(q - w^* L)$ yields an alternative expression for w^*:

$$w^* = \frac{1}{1 + \kappa(1 - t)} \bar{w} + \frac{\kappa}{1 + \kappa(1 - t)} \frac{(1 - t)q - \bar{\pi}}{L}$$

w^* can be seen as a linear combination between the outside option of workers and the firm's surplus before the payment of wages. The weights are determined by the relative bargaining power of each counterpart. For clarity, the accent hereafter is on equation (4.1).

2.2 Predictions

Hypothesis 1: The effect of firm entry into tax havens on employee pay varies across occupations. Entry into tax havens erodes the wages of non-executive employees but improves the compensation of executives, especially that of executives paid on an after-tax basis.

Profit shifting increases the quasi-rent S in equation (4.1) via a reduction in the ETR t. Under perfect information and all other things being equal, it follows that profit shifting increases wages. Krautheim and Schmidt-Eisenlohr (2016) claim that S is not the only variable altered by profit shifting in equation (4.1). There is in fact another less intuitive force at play. Income shifting, besides reducing

the ETR (higher S), generates an informational rent for the firm that strengthens its bargaining power (lower κ). This is because profits are not perfectly observed by workers once they are shifted by the firm to a tax haven. It becomes optimal for workers not to put the firm at risk to prevent a situation in which there is no production and no surplus. As a result, they accept to retain a lower proportion of the surplus. I refer the reader to Krautheim and Schmidt-Eisenlohr (2016) for derivations and more details on the neutral bargaining solution.

Profit shifting thus triggers two conflicting effects. The surplus becomes larger, i.e., the size of the pie increases, but the bargaining power of workers deteriorates, i.e., the proportion of the pie that workers get decreases. Together, these effects stress the two main attributes of OFCs. The first effect is attributable to the tax-friendly environment offered by OFCs (tax effect), whereas the second one stems from their lack of transparency (secrecy effect).

Formally, changes in wages are equal to:

$$dw = \kappa \frac{\partial S}{\partial t} \frac{\partial t}{\partial PS} dPS + S \frac{\partial \kappa}{\partial PS} dPS \tag{4.2}$$

where dPS denotes the change in the profit shifting behavior of the company, $\partial S/\partial t < 0$, $\partial t/\partial PS < 0$, and $\partial \kappa/\partial PS < 0$. The first term is positive but the second term is negative. The total effect is ambiguous and ultimately hinges on the extent to which profit shifting weakens the bargaining power of workers. In their paper, Krautheim and Schmidt-Eisenlohr (2016) defend that the harmful effect dominates and wages go down as a consequence.

One limitation of their analysis is that they do not allow for heterogeneous workers. Assume that employees are actually divided into two groups: executive employees (indexed by e) and non-executive employees (indexed by n). Further assume that they do not form any "coalition" during the bargaining process. Equation (4.1) simply becomes:

$$\begin{cases} w_e^* = \bar{w}_e + \kappa_e \frac{\left(\pi(w_e^*, w_n^*, t) - \bar{\pi}\right)}{L_e} = \bar{w}_e + \kappa_e S_e & \text{for executive employees} \\ w_n^* = \bar{w}_n + \kappa_n \frac{\left(\pi(w_e^*, w_n^*, t) - \bar{\pi}\right)}{L_n} = \bar{w}_n + \kappa_n S_n & \text{for non-executive employees} \end{cases}$$

Equation (4.2) carries through with analogous notations.

In this context, the mechanism of Krautheim and Schmidt-Eisenlohr (2016) remains plausible and potentially dominant for non-executive employees, as suggested by recent anecdotal evidence (see footnote 3):

$$\frac{\partial \kappa_n}{\partial PS} < 0 \quad \text{and} \quad dw_n \leq 0$$

However, the secrecy effect is improbable for executive employees. Executives occupy the highest positions and oversee business and financial operations. As such, they have very good visibility of the profits of the firm irrespective of their location. This means that income transfers toward OFCs should not have any harmful impact on their bargaining power:[7]

$$\frac{\partial \kappa_e}{\partial PS} = 0 \quad \Rightarrow \quad dw_e \geq 0$$

We thus expect uneven effects of profit shifting on employee pay. Non-executive employees should see their wages fall when their firm engages in profit shifting and discloses fictitious income in OFCs. Executive employees should, on the contrary, see their compensation rise. In this regard, it is worth bearing in mind that some executives are paid on an after-tax basis to align their interests to those of the firm. Variable pay presumably represents a larger share of total pay among these individuals (higher κ_e). Hence, the positive effect of profit shifting on wages might vary within the subset of executives and be stronger for those receiving after-tax incentives. Denote executives paid on an after-tax basis with an exponent *after-tax*. We obtain:

$$\kappa_e^{\text{after-tax}} \geq \kappa_e \quad \Rightarrow \quad dw_e^{\text{after-tax}} \geq dw_e$$

Hypothesis 2: The inequality-deepening effect of entry into tax havens is amplified in intangible-intensive MNEs.

MNEs employ various techniques to artificially move profits toward no- or low-tax countries (e.g., transfer mispricing, debt shifting, corporate inversions, see Dharmapala, 2014; Riedel, 2018; Beer et al., 2020). A very well-known method used by profit shifting MNEs involves intangible assets. Research and development activities are conducted in some countries. IP rights are then transferred to tax-friendly jurisdictions. This way, profits initially generated in high-tax countries

7. A more conservative assumption $\partial \kappa_e / \partial PS \geq 0$ would still lead to $dw_e \geq 0$. The induced increase in executive compensation would simply be larger.

can be recorded in OFCs thanks to royalty payments and licensing fees, and the average ETR of MNEs shrinks.

There is compelling evidence of the existence of IP-related profit shifting schemes (Dischinger and Riedel, 2011; Karkinsky and Riedel, 2012; Griffith et al., 2014; Alstadsæter et al., 2018). Prior research also documents that IP is one of the most important profit shifting channels (Beer and Loeprick, 2015; Heckemeyer and Overesch, 2017; Barrios and d'Andria, 2020). There are at least two reasons why intangible assets particularly fuel profit shifting. They are highly mobile by nature. Furthermore, transfer pricing rules are hardly enforceable for IP-related transactions. The prices at which transactions between related parties take place are regulated in most countries. They should be in line with the arm's length principle. It means that the price paid by one party to another related party should be identical to the price that would have been set between unrelated parties to guarantee that transfer prices are based on market values. Yet, establishing a benchmark price for IP-related transactions between related parties is a difficult exercise for the regulator because there are very few similar IP-related transactions that occur between unrelated parties and can be used for comparison.

An intangible-intensive technology in the model above can be perceived as an instrument that allows companies to shift more profits following entry into OFCs (larger dPS). It implies that the inequality-deepening effect of entry into OFCs is exacerbated in intangible-intensive corporations.

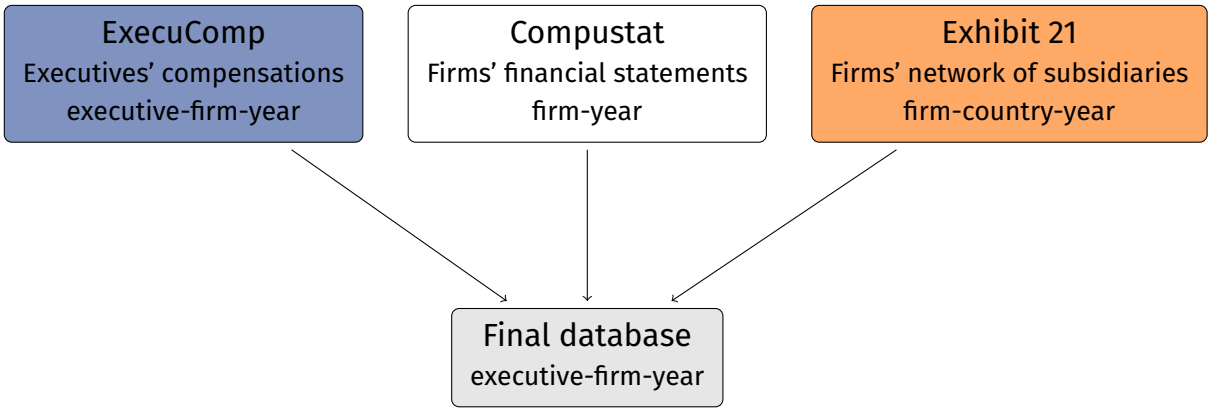
3 Data

We now turn to the empirical analysis. To confront hypotheses 1 and 2 with data, I first construct a database on the executives, financial statements, and foreign subsidiaries of S&P 1500 companies between 1993 and 2013. This section explains where the data come from and outlines a set of facts on firm presence in OFCs.

3.1 Sources

The data originate from three distinct sources: ExecuComp, Compustat, and Exhibit 21 filings (see figure 4.1).

Figure 4.1 – Construction of the database



ExecuComp ExecuComp comprises executives of S&P 1500 companies. It couples personal (e.g., age and gender) with professional (e.g., title and compensation) information. Because these firms make up approximately 90 percent of US market capitalization, the dataset allows us to track executives over time and across the largest US publicly listed firms. This feature proves useful because listed enterprises are the most likely to engage in tax haven FDIs and profit shifting. The international trade literature acknowledges that becoming multinational is a costly process that merely the largest and most productive firms can initiate (Helpman et al., 2004). The same logic applies to profit shifting. Moving profits across borders for tax saving purposes requires an in-depth knowledge of tax codes and regulations. Evidence shows that MNEs must recruit expensive experts to exploit legal technicalities and build income shifting schemes. [8] For this reason, only the largest MNEs can find it profitable to pay these costs and undertake such activities through tax haven subsidiaries (Krautheim and Schmidt-Eisenlohr, 2011; Langenmayr, 2015; Gumpert et al., 2016; Jones et al., 2018; Bilicka et al., 2020). [9]

Compustat The second source, Compustat, consists of balance sheets, income statements, and cash flows of publicly held corporations in North America. Its coverage and richness make it frequent in accounting, economics, finance, international business, and management. The data are consolidated at the firm level. I

8. It is for instance worth recalling that Caterpillar paid PricewaterhouseCoopers $55 million for developing its tax dodging strategy (US Senate Permanent Subcommittee on Investigations, 2014).

9. On the other side of the spectrum, small and medium-sized enterprises (SMEs) are more prone to turn to informality and *evade* taxes. Tax evasion differs from tax avoidance insofar as it is always illegal. It requires little knowledge of the tax code, while tax avoidance is precisely about taking advantage of legal technicalities (e.g., loopholes and mismatches between tax systems in the specific case of profit shifting).

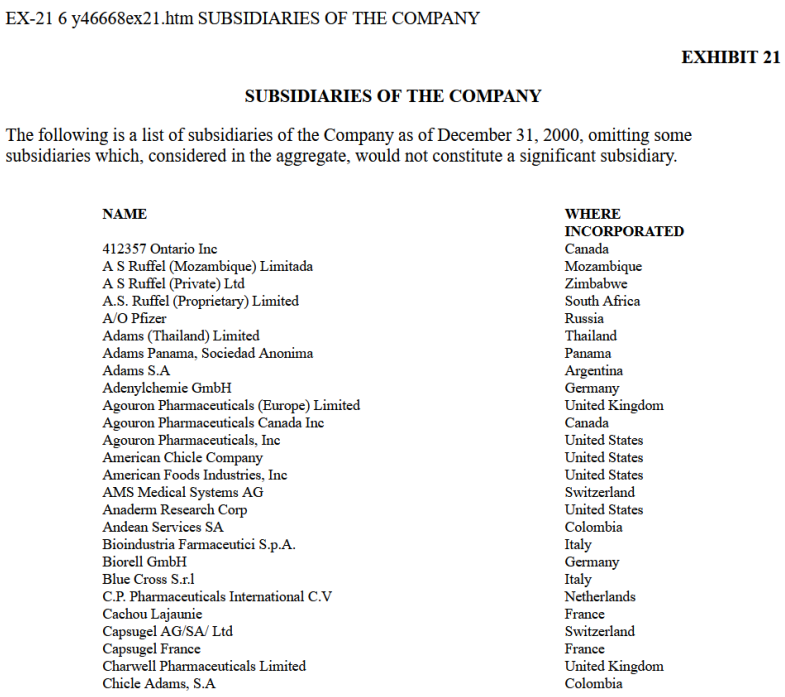
extract from Compustat S&P 1500 companies' total employment, labor expenses, and income taxes. I also retain their global assets, sales, and pre-tax income, all of which gauge firms' economic activities worldwide and will be used as control variables in the econometric exercise.

Exhibit 21 I merge ExecuComp and Compustat data with Exhibit 21 filings to have an overview of the location of S&P 1500 firms' subsidiaries. The SEC obliges US-listed corporations to divulge every year in Exhibit 21 of Form 10-K a list of their significant subsidiaries, be they inside or outside the US. A subsidiary is significant if its assets represent at least 10 percent of all assets or if its income exceeds 10 percent of consolidated income. Moreover, any subsidiary is significant if by combining all undisclosed subsidiaries into one composite subsidiary, the latter accounts for at least 10 percent of assets or revenues. Therefore, Exhibit 21 filings include subsidiaries where at least 90 percent of firms' consolidated assets and revenues are recorded and give a faithful picture of the worldwide network of US-listed companies' subsidiaries. The reports are electronically filed since 1993 and are publicly available on the Electronic Data Gathering, Analysis, and Retrieval (EDGAR) platform of the SEC (see figure 4.2 for an example). In this paper, I leverage an updated version of the database produced by Dyreng and Lindsey (2009) that spans the 1993-2013 period.

Once assembled, the final database contains 31,978 executives linked to 3,665 enterprises listed on the S&P 1500 index between 1993 and 2013. 46 foreign jurisdictions are treated as tax havens (see table 4.1). A jurisdiction is defined as a tax haven if it appears on the list elaborated by Dyreng and Lindsey (2009). The authors cross the classifications of the Organization for Economic Cooperation and Development (OECD), International Monetary Fund (IMF), the US Stop Tax Havens Abuse Act, and the Tax Research Organization (TRO) for 2008. They label a country as a tax haven if it appears at least twice.

One caveat is that firms may have incentives to under-report tax haven subsidiaries in Exhibit 21. Dyreng et al. (2020) assert that most disclosures in Exhibit 21 are accurate, even for OFCs. Another shortcoming of the data pertains to the fact that, due to the reporting threshold, what seems to be a new entry into an OFC could actually be an existing subsidiary reaching the threshold. Insofar as companies are not obliged to uncover financial information at the subsidiary level, this is not something that can be checked. Note, however, that entry into OFCs does not necessarily

Figure 4.2 – Subsidiaries reported by PFIZER INC



EX-21 6 y46668ex21.htm SUBSIDIARIES OF THE COMPANY

EXHIBIT 21

SUBSIDIARIES OF THE COMPANY

The following is a list of subsidiaries of the Company as of December 31, 2000, omitting some subsidiaries which, considered in the aggregate, would not constitute a significant subsidiary.

NAME	WHERE INCORPORATED
412357 Ontario Inc	Canada
A S Ruffel (Mozambique) Limitada	Mozambique
A S Ruffel (Private) Ltd	Zimbabwe
A.S. Ruffel (Proprietary) Limited	South Africa
A/O Pfizer	Russia
Adams (Thailand) Limited	Thailand
Adams Panama, Sociedad Anonima	Panama
Adams S.A	Argentina
Adenylchemie GmbH	Germany
Agouron Pharmaceuticals (Europe) Limited	United Kingdom
Agouron Pharmaceuticals Canada Inc	Canada
Agouron Pharmaceuticals, Inc	United States
American Chicle Company	United States
American Foods Industries, Inc	United States
AMS Medical Systems AG	Switzerland
Anaderm Research Corp	United States
Andean Services SA	Colombia
Bioindustria Farmaceutici S.p.A.	Italy
Biorell GmbH	Germany
Blue Cross S.r.l	Italy
C.P. Pharmaceuticals International C.V	Netherlands
Cachou Lajaunie	France
Capsugel AG/SA/ Ltd	Switzerland
Capsugel France	France
Charwell Pharmaceuticals Limited	United Kingdom
Chicle Adams, S.A	Colombia

Notes: This snapshot is a non-exhaustive list of the significant subsidiaries reported by PFIZER INC in Exhibit 21 in December 2000.

mean that companies start profit shifting activities. Companies can still move profits between non-OFCs for tax saving purposes. That is why entry into OFCs does not exactly reflect the extensive margin of profit shifting. Rather, entry into OFCs in this paper should be seen as an intensification of profit shifting activities. A third limitation is that some firms physically present in tax havens might not be involved in profit shifting. Given that most tax havens are tiny jurisdictions (see table 4.1 and stylized fact 1 below), such subsidiaries are unlikely to appear due to the 10 percent threshold. In addition, we will see that firms established in OFCs systematically pay lower corporate income taxes than their peers (see stylized fact 5 below) and that the findings are robust to the elimination of the largest OFCs (Hong Kong, Ireland, Luxembourg, Malaysia, Singapore, and Switzerland).

3.2 Stylized facts

The database described above reveals various patterns. Not surprisingly, the stylized facts highlighted by Souillard (2022b) on a broader set of US-listed firms carry over to the restricted case of S&P 1500 firms.

Table 4.1 – List of tax havens (Dyreng and Lindsey, 2009)

Andorra, Anguilla, Antigua and Barbuda, Aruba, Bahamas, Bahrain, Barbados, Belize, Bermuda, Cayman Islands, Cook Islands, Costa Rica, Cyprus, Dominica, Gibraltar, Grenada, Guernsey, Hong Kong, Ireland, Isle of Man, Jersey, Lebanon, Liberia, Liechtenstein, Luxembourg, Macau, Malaysia, Malta, Marshall Islands, Mauritius, Monaco, Montserrat, Nauru, Netherlands Antilles, Niue, Panama, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Seychelles, Singapore, Switzerland, Turks and Caicos Islands, Vanuatu.

Stylized fact 1: OFCs concentrate a high number of S&P 1500 companies despite their small size and isolation.

Typical international trade theories predict that large and central[10] countries should attract more FDIs than their counterparts (Brainard, 1993; Head and Mayer, 2004; Helpman et al., 2004). We thus expect S&P 1500 corporations to be mostly located in large and central countries. Figure 4.3a plots the relationship between countries' attractiveness (y-axis), size (x-axis), and connectedness (bubble size). The correlation between attractiveness, size, and connectedness is clearer after taking into account corporate income taxation and distinguishing tax havens (in orange) from the rest (in blue). Among non-haven countries, attractiveness seems to go hand in hand with size and connectedness. The fact that OFCs host more S&P 1500 firms than non-haven countries of comparable size and connectedness suggests that the unique opportunities they provide for tax dodging (low corporate income tax rates and financial secrecy) are key to grasping the geography of FDIs.

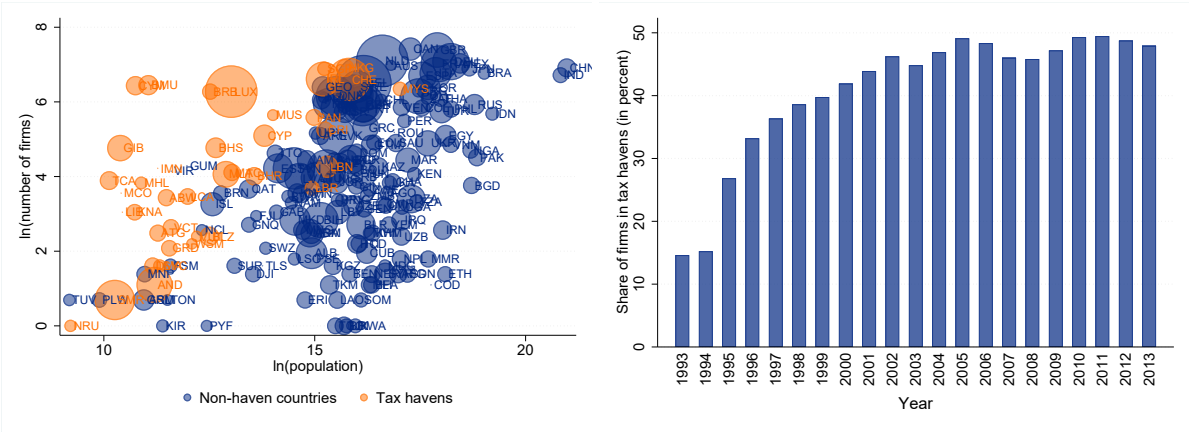
Stylized fact 2: The number of S&P 1500 companies in OFCs is growing over time, and these firms are on average larger and more productive.

Out of the 3,665 firms that constitute the sample, 420 companies always had at least one tax haven subsidiary. 1,441 firms entered OFCs for the first time at some point between 1993 and 2013, and 1,724 enterprises never disclosed any physical presence in tax havens.[11] In total, the share of firms operating in OFCs increased

10. In these models, a country is perceived as central if it is surrounded by many large countries.

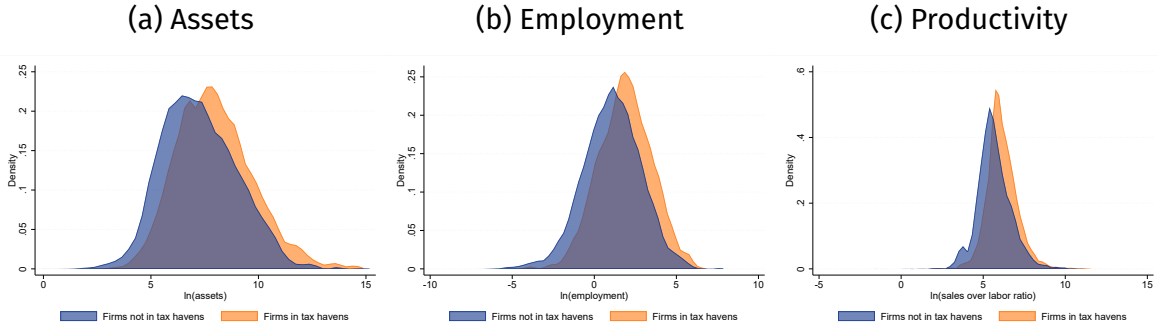
11. The remaining 80 companies were first implanted in OFCs and then exited. Among the 1,441 firms that entered tax havens for the first time between 1993 and 2013, 74 firms left tax havens at a later stage, and the status changed multiple times for 46 firms. Reasons behind such switching are unknown, but the reporting threshold could a priori play a role. Importantly, the findings of this paper are not affected by these outliers. More details are available upon request.

Figure 4.3 – Presence of S&P 1500 companies in foreign countries



Notes: In subfigure (a), population size data are from 2003 and come from the World Bank. Bubble size for country c is proportional to $\sum_j GDP_{j,2003}/dist_{jc}$ after standardization of the two components (data from CEPII). See section 3 for more details.

Figure 4.4 – Distribution of firm size and productivity



Notes: This figure plots the distribution of firm size (as measured by assets and employment) and firm productivity (as measured by the sales over labor ratio). In Compustat, assets are given by the variable denoted *AT*, employment is given by the variable denoted *EMP*, and sales are given by the variable denoted *SALE*. Employment is expressed in thousands, while assets and sales are measured in million US dollars. See section 3 for more details.

Figure 4.5 – Distribution of employee pay

Notes: This figure plots the distribution of executive and non-executive employee pay. Executive compensation and total payments to non-executive employees are in million US dollars. The average wage of non-executive employees is obtained after dividing total payments to non-executive employees by employment (in thousands and labeled *EMP* in Compustat). See section 3 for more details.

threefold, passing from 15 percent in 1993 to 48 percent in 2013 (see figure 4.3b). The soaring activity in OFCs concurs with the view that profit shifting practices of US MNEs escalated in the 1990s and 2000s, partly due to the introduction of the "check-the-box" (CTB) regulations in 1997 (Grubert, 2012; Klassen and Laplante, 2012). The CTB regulations were originally intended to simplify the entity classification process but had the unintended consequence of facilitating tax avoidance of US MNEs through hybrid entities. The expansion of S&P 1500 companies in tax havens also proves useful for the present analysis. It will allow us to scrutinize and compare the evolution of wages in two types of firms: those entering tax havens for the first time between 1993 and 2013, and those whose presence in OFCs remained constant.

Moreover, S&P 1500 corporations declaring subsidiaries in tax havens are on average larger in terms of assets and employment. They are more productive, too (see figure 4.4). The correlation between firm size/productivity and presence in OFCs directly echoes with the profit shifting literature, according to which only the largest and most productive MNEs engage in aggressive tax planning and tax-motivated income shifting (Krautheim and Schmidt-Eisenlohr, 2011; Langenmayr, 2015). They form an inner circle of superstar firms big enough to generate a sizable proportion of overall profits, artificially shift profits across borders, and drive macroeconomic aggregates (Bricongne et al., 2021; Guvenen et al., 2022).

Stylized fact 3: S&P 1500 companies implanted in tax havens pay higher wages on average.

Figure 4.5 brings employee pay into the picture. It visualizes three distributions: the compensation of executives, total payments to non-executive employees, and the average pay of non-executives. The *TDC*1 variable in ExecuComp offers a full overview of executive compensation as it encompasses salaries, bonuses, stock and option awards, non-equity incentive plans, pensions, and other pay.[12] Total payments to non-executive employees are pinned down after taking the difference between all payments to employees (variable *XLR* in Compustat) and compensations received by executives in the same year. Denote $compensation_{e,i,t}$ the compensation of executive e working for firm i in year t. Payments to non-executive employees in firm i and year t correspond to:

$$payments_{i,t} = XLR_{i,t} - \sum_{e} compensation_{e,i,t} = XLR_{i,t} - \sum_{e} TDC1_{e,i,t}$$

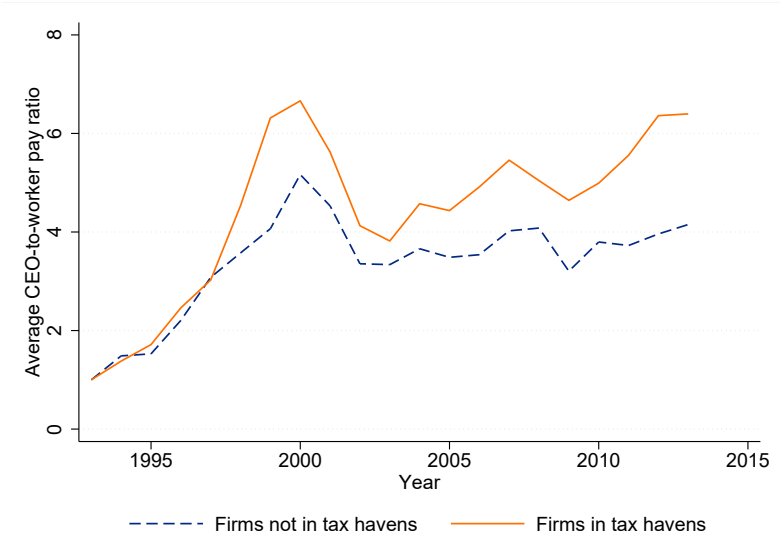
Primary evidence in figure 4.5 is mixed. Together, the graphs exhibit a positive correlation between presence in tax havens and employee pay. The correlation between presence in OFCs and executive compensation coincides with hypothesis 1. On the contrary, the fact that payments to non-executive employees are higher in firms implanted in tax havens is at first sight not consistent with hypothesis 1. The correlation may simply be spurious. Firms in tax havens are larger and more productive (see stylized fact 2), and it is well known that the most productive firms pay higher wages (e.g., Oi and Idson, 1999; Helpman, Itskhoki, Muendler, and Redding, 2017). Hence, the correlation may have nothing to do with profit shifting per se and the effect of profit shifting on employee pay requires further investigation.

Stylized fact 4: The gap between the average CEO compensation and the average pay of non-executive employees substantially widened between 1993 and 2013, in particular among S&P 1500 companies present in OFCs.

A graph recurrently displayed in policy reports and newspapers juxtaposes the average compensation of CEOs and the average wage of employees. Figure 4.6 replicates such analysis after separating firms declaring a tax haven subsidiary

12. The calculation method of *TDC*1 changed in 2006 subsequent to the promulgation of Financial Accounting Statement 123R. The variable is corrected accordingly with the procedure described in Gabaix et al. (2014).

Figure 4.6 – Average CEO-to-worker pay ratio



Notes: The *y*-axis represents the evolution of the ratio dividing the average CEO compensation by the average pay of non-executive employees. For both series, the ratio is normalized to 1 in 1993 to enhance readability. See section 3 for more details.

at some point between 1993 and 2013 and firms absent from OFCs. Two striking features emerge. First, and in line with Mishel and Wolfe (2019), the average compensation of CEOs increased five times faster than the average pay of non-executive employees over the period. Within-firm pay inequalities thus greatly increased during the 1990s and 2000s. Second, the ratio rose to a much larger degree among firms implanted in OFCs. The gap between the two curves widened during economic growth episodes (1993-2000, 2002-2007, 2010-2013) and narrowed in case of economic turmoil (e.g., 2001, 2008-2009). These patterns might stem from four phenomena: (i) the global boom of CEO compensation, (ii) the acceleration of S&P 1500 companies' offshore activities (see figure 4.3b), (iii) the general shift away from fixed pay toward performance pay (De Simone et al., 2022), and (iv) the surge of intangibles (Falato et al., 2020). The theoretical model in section 2 indeed hints that profit shifting aggravates income inequalities, especially if executive compensation hinges on performance, economic conditions are favorable, and firms intensively use intangibles.

Stylized fact 5: Firms with low ETRs pay higher wages to executive and non-executive employees.

Before moving to the next step of the analysis, we still need to verify a couple of issues to guarantee that the theoretical mechanisms formulated in section 2 can rationalize the future results. First, we must check that low-ETR firms pay higher wages than their peers. If corporate income taxes reduce the surplus shared between the firm and its workers, then ETRs should exert a negative impact on compensations and total payments to non-executive employees. Two equations are regressed to this end:

$$ln(compensation_{e,i,t}) = \alpha ETR_{i,t} + \lambda X_{e,i,t} + \upsilon_e + \phi_i + \psi_t + \epsilon_{e,i,t} \quad (4.3)$$

$$ln(payments_{i,t}) = \zeta ETR_{i,t} + \lambda X_{i,t} + \phi_i + \psi_t + \epsilon_{i,t} \quad (4.4)$$

$ETR_{i,t}$ is the ETR reported by firm i in year t.[13] X is a vector of controls whose objective is to clean the effect from confounding factors and to make sure that we are comparing firms which, albeit having different ETRs, have a similar profile (more details in the next section). The results are attached in Appendix table 4.A1 and confirm that employee pay is inversely related to ETRs.

Stylized fact 6: Entry into tax havens leads to a decrease in ETRs.

Another crucial element that needs to be validated to support the toy model in section 2 is that profit shifting translates into a decline in ETRs. If establishing a physical presence in OFCs does not allow the firm to alleviate its tax burden, then profit shifting can in theory affect wages only negatively and indirectly through a change in the relative bargaining of workers. Perhaps more importantly, the profit shifting variable would be hard to interpret since it would suggest that the presence of S&P 1500 companies in OFCs does not generally fall within the scope of profit shifting. In the same spirit of Souillard (2022b), I regress firm-year level ETRs on the tax haven dummy variable, controlling for firms' sales, assets, pre-tax income, number of subsidiaries in non-OFCs, and tax loss carryforward. Reassuringly, the regressions in Appendix table 4.A2 reveal that entry into tax havens leads to a drop in ETRs.

13. *ETR* is constructed with the variables labeled *TXT* (tax expenses), *PI* (pre-tax income), and *SPI* (special items) in Compustat. Alternative ETRs (e.g., cash ETRs) deliver concordant results and more details are available upon request.

4 Causal effect of profit shifting on employee pay and within-firm pay inequalities

Section 4 goes from correlation to causation to evaluate the empirical validity of hypotheses 1 and 2. I start by assessing the average effect of profit shifting on executive and non-executive pay (hypothesis 1). Next, I study the role of intangible assets (hypothesis 2).

4.1 Hypothesis 1: the inequality-deepening effect of profit shifting

4.1.1 Identification strategy

I quantify the average effect of profit shifting on employee pay with two equations. Executives are separated from non-executive employees.

Equation for executives The first equation concerns executive employees and is regressed at the individual level:

$$\begin{aligned} ln(compensation_{e,i,t}) = \; & \alpha TH_{i,t} + \beta \mathbb{1}_{e,i,t}^{CEO/CFO} \times TH_{i,t} \\ & + \gamma \mathbb{1}_{e,i,t}^{CEO/CFO,\ after\text{-}tax} \times TH_{i,t} + \lambda X_{e,i,t} + \upsilon_e + \phi_i + \psi_t + \epsilon_{e,i,t} \end{aligned} \tag{4.5}$$

The left-hand side variable $compensation_{e,i,t}$ is the compensation of executive e working for S&P 1500 company i in year t. On the right-hand side, $TH_{i,t}$ is a dummy variable equal to 1 if firm i has at least one tax haven subsidiary in year t. $\mathbb{1}_{e,i,t}^{CEO/CFO}$ is a binary variable equal to 1 if executive e is the CEO or the CFO of firm i in year t. The focus is on these C-level executives in the rest of the paper because CEOs and CFOs are the highest-ranking executives setting the "tone at the top" (Dyreng et al., 2010). $\mathbb{1}_{e,i,t}^{CEO/CFO,\ after\text{-}tax}$ interacts the previous variable with a (time-invariant) dichotomous equal to 1 if firm i compensates its executives on an after-tax basis. As explained in section 2, these executives might be rewarded to a higher degree as activities carried out in tax havens precisely aim at lightening the tax burden. A caveat is that after-tax incentives are not directly observable. Drawing on Gaertner (2014), firms paying their executives on an after-tax basis are identified based on the firm-specific sensitivity of executive compensation to total income tax expense conditional on pre-tax income. Firms whose sensitivity is negative and statistically

significant at the 5 percent level are coded as after-tax incentive firms.[14]

A battery of controls and fixed effects are inserted to minimize endogeneity. $X_{e,i,t}$ is a vector composed of executive- and firm-year-specific variables. It comprises executives' age and within-firm experience, two CEO and CFO dummies, as well as firms' assets, sales, pre-tax income (in logarithm), and number of foreign subsidiaries in non-OFCs.[15] The latter variable captures the effect induced by the (simultaneous) expansion of MNEs in non-OFCs. The executive fixed effects υ_e absorb fixed characteristics of executives like education. More crucially, they embed characteristics that might influence both executive pay and firm entry into OFCs, such as narcissism, overconfidence, and tax aggressiveness (e.g., Humphery-Jenner, Lisic, Nanda, and Silveri, 2016; Olsen and Stekelberg, 2016; Kubick and Lockhart, 2017; Hsieh et al., 2018). Last but not least, the firm fixed effects ϕ_i neutralize systematic differences in compensations across companies, and the year fixed effects ψ_t correct for global trends in compensations and macroeconomic shocks.

The coefficients of interest are α, β, and γ. They represent changes in compensations (in percentage) subsequent to firm entry into tax havens. Their estimation requires variation in $TH_{i,t}$, i.e., switching firms. Take two executives e and e' having common attributes and working respectively for firms i and i', comparable too such that $X_{e,i,t} - X_{e,i,t-1} \approx X_{e',i',t} - X_{e',i',t-1}$. Assume that firm i had no tax haven subsidiary in year $t-1$ but enters tax havens in year t, while the tax haven status of firm i' remains untouched. The identification rests on the assumption that absent firm i's entry into tax havens in year t, the compensations of executives e and e' would have evolved similarly between years $t-1$ and t.

Equation for non-executives I investigate the impact of firm entry into tax havens on non-executive employee pay with the following model:

$$ln(payments_{i,t}) = \zeta TH_{i,t} + \lambda X_{i,t} + \phi_i + \psi_t + \epsilon_{i,t} \tag{4.6}$$

The dependent variable $payments_{i,t}$ stands for overall payments made by firm i in year t to non-executive employees. The independent variables mirror those introduced in equation (4.5). The only exception is $X_{i,t}$, which includes only firm-specific controls this time since the analysis is performed at the firm-year level.

14. Modifying the significance threshold is innocuous. More details are available upon request.
15. Loss-making firms are ruled out by construction. Nevertheless, the results are preserved if assets, sales, and pre-tax income are integrated without the logarithm transformation.

4.1.2 Results

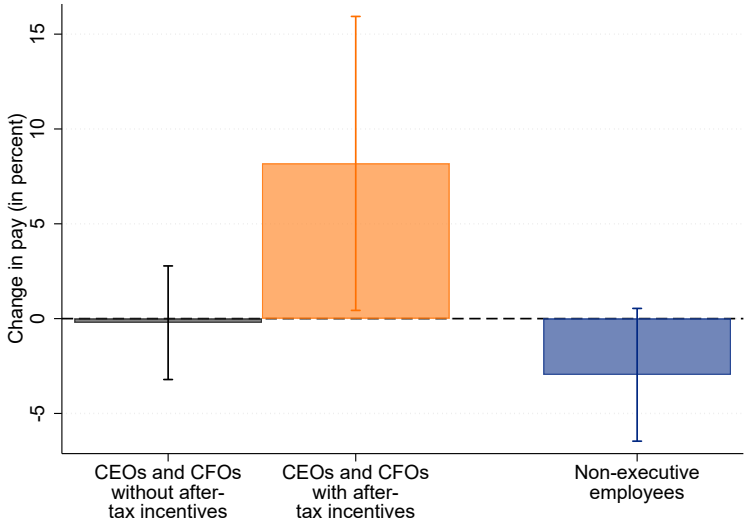
Baseline results The results of equations (4.5) and (4.6), fully reported in Appendix table 4.A3, are best summarized by figure 4.7. They lend credence to hypothesis 1. The left part of the graph outlines the effect of firm entry into tax havens on the compensation of CEOs and CFOs paid on an after-tax basis ($\hat{\alpha} + \hat{\beta} + \hat{\gamma}$, second bar) and CEOs and CFOs not receiving after-tax incentives ($\hat{\alpha} + \hat{\beta}$, first bar). The compensation of CEOs and CFOs in after-tax incentive firms grows by 8 percent when these firms establish a physical presence in tax havens. The point estimate is statistically significant at the 5 percent level. Appendix figure 4.A1 goes a step further and zooms in on seven subcomponents: salary, bonuses, non-equity incentive plans, pensions, option awards, stock awards, and other pay. Non-equity incentive plans seem to be the key factor behind the rise of CEOs' and CFOs' compensations in after-tax incentive firms.[16] This pattern further strengthens the surplus sharing story in section 2. By contrast, compensations of other CEOs and CFOs hardly vary. As for the remaining executives, the downward shift in Appendix table 4.A3 should be interpreted with caution insofar as their function is poorly reported in ExecuComp and $\hat{\alpha}$ is statistically significant only at the 10 percent level.

The right part of figure 4.7 ($\hat{\zeta}$, third bar) reveals that payments to non-executive employees fall by 3 percent in the meantime. The coefficient is significant at the 10 percent level too. In Appendix table 4.A4, I show that total employment (labeled *EMP* in Compustat) rises by 2 percent post entry into tax havens. Consequently, the decline in total payments to non-executive employees cannot be explained by job cuts, and the average wage, if anything, decreases by around 5 percent (= $0.97/1.02$). The employment effect of firm entry into OFCs resonates and somehow concurs with Buettner et al. (2018), Suárez Serrato (2019), and Bilicka et al. (2021), who all show that anti profit shifting measures might reduce employment.

It is also worth noting that the coefficients obtained for the covariates coincide with our expectations. For example, the results validate the existence of a compensation premium for top C-level executives. The premium amounts to 43 and 21 percent respectively for CEOs and CFOs. In addition, we notice a positive relationship between firms' activities worldwide broadly defined and employee pay.

16. In ExecuComp, non-equity incentive plans are disclosed in the year that the compensation was earned, are contingent on achieving performance targets (as opposed to bonuses), and exclude stock-based pay (as opposed to long-term incentive plans).

Figure 4.7 – Average effect of firm entry into OFCs on employee pay: baseline results



Notes: The figure depicts the effect of firm entry into OFCs on employee pay, see equations (4.5) and (4.6). The first bar depicts the regression result for $\hat{\alpha} + \hat{\beta}$, the second bar for $\hat{\alpha} + \hat{\beta} + \hat{\gamma}$, and the third bar for $\hat{\zeta}$. Point estimates with 95 percent confidence intervals. The full results are given in Appendix table 4.A3 and standard errors are clustered at the firm level. See section 4 for more details.

Alternative dependent variables Six distinct exercises, reviewed hereafter, gauge and support the robustness of the findings. First, I re-estimate equation (4.5) by writing executives' earnings as a ratio of their firm's average wage. Although such an equation does not reflect the effect of firm entry into tax havens on the level of employee pay, looking at the gap between executives and other employees enables us to explore the impact on within-firm pay inequalities more directly. Combining the regression results above implies a 14 percent increase (= 1.08/0.95) in the pay gap between CEOs and CFOs and non-executive employees in after-tax incentive companies. The results of the new equation, to be found in Appendix table 4.A5 column (1), report an effect of comparable magnitude. They show that the relative compensation of CEOs and CFOs in after-tax incentive companies increases by 18 percent post entry. This increase is statistically significant at the 5 percent level. In the same vein, overall payments to non-executive employees in equation (4.6) are replaced by the average wage of non-executives in Appendix table 4.A5 column (2). The average wage of non-executives is equal to $payments_{i,t}/employment_{i,t}$. The results slightly diverge from the benchmark ones. They signal that the average wage of non-executive employees does not significantly fluctuate post entry into

tax havens. They thus suggest that the benchmark results should be considered as a lower bound. The impact of profit shifting on non-executive pay is negative or insignificantly different from zero depending on the model's specification. This notwithstanding, they do not query the inequality-deepening effect of profit shifting between executive and non-executive employees.

Alternative tax haven classifications Another series of tests revises the group of tax havens. There is to date no unique definition of tax havens.[17] Having a low statutory corporate income tax rate is a necessary condition to be treated as a tax haven but not a sufficient one. Other criteria are determinant (e.g., minimal reporting of information, lack of transparency obligations, few effective exchanges of information), and since they are sometimes difficult to assess, characterizing a country as a tax haven can be more or less arbitrary. That is why I reproduce the results when adopting the classification proposed by Hines and Rice (1994).[18] A complementary exercise eliminates six major tax havens, as in Souillard (2022b). Hong Kong, Ireland, Luxembourg, Malaysia, Singapore, and Switzerland are large and well connected to the rest of the world compared to other OFCs. Therefore, FDIs of US-listed firms in these jurisdictions do not necessarily reflect tax avoiding strategies. On the opposite, FDIs in small and isolated jurisdictions such as the Marshall Islands are more prone to be utterly motivated by tax purposes. These OFCs attract a high number of companies that is indeed disproportionate to what international trade theories would normally predict (see stylized fact 1). The results are displayed in Appendix figure 4.A2 and attached in Appendix tables 4.A8 and 4.A9. They globally match the benchmark ones. Hence, the inequality-deepening effect of profit shifting on employee pay is robust across tax haven classifications.

Missing values Next, I cope with missing data. The number of observations is rather low in equation (4.6)/figure 4.7 (third bar)/Appendix table 4.A3 because only 16 percent of companies in the sample disclose total staff expenses. To overcome this shortcoming inherent to Compustat, I calculate industry-year averages of the total labor costs to employment ratio and impute missing values by multiplying these averages with firm-level employment. The employment variable being well filled, this methodology borrowed from Donangelo, Gourio, Kehrig, and Palacios

17. See Janskỳ (2020) for a list of existing classifications.

18. The two lists share 37 tax havens in common. Unlike Dyreng and Lindsey (2009), Hines and Rice (1994) integrate the British Virgin Islands, Jordan, Maldives, and Saint Martin. Nonetheless, they do not integrate Aruba, Costa Rica, Malaysia, Mauritius, Nauru, Niue, Samoa, San Marino, and Seychelles.

(2019) allows increasing the size of the sample fivefold. The regression results are visible in Appendix table 4.A6 and concur with the reference ones. They corroborate that the (potentially) negative impact of firm entry into tax havens on non-executive pay cannot be attributed to a selection bias.

Relocation to low-cost countries For some companies, entry into OFCs might be concomitant with a relocation of activities to low-cost countries. The treatment variable could partly capture this and thereby reduce $\hat{\zeta}$. In Appendix table 4.A7, I extend equation (4.6) to better adjust for labor cost differentials across countries. I retrieve data on gross monthly minimum wages from the International Labour Organization (ILO) and compute a proxy for the average cost of labor faced by firm i in year t:

$$average\ cost_{i,t} = \frac{\sum_c FDI_{i,c,t} \times minwage_{c,t}}{\sum_c FDI_{i,c,t}}$$

$FDI_{i,c,t}$ represents the number of firm i's subsidiaries in country c and year t. After controlling for the average value of labor costs and total employment, the point estimate is similar to the benchmark one and more importantly never significantly positive. The conclusion is intact if GDP per capita (World Bank), more exhaustive, is used instead of the minimum wage.[19]

Executive turnover Another threat to identification, specific to equation (4.5) this time, pertains to executive turnover. Some firms may strategically recruit executives expert in tax dodging before entering OFCs. The findings of Souillard (2022a) tend to suggest that firms appoint executives used to pilot operations in OFCs to step up their tax planning activities. They further show that these executives receive higher compensations all other things being equal. The increase in executive compensation detected post firm entry into tax havens could then arise from the fact that firms hire experienced executives right before entering OFCs. To alleviate this problem, equation (4.5) is regressed on the subsample of executives who stayed in the firm during the five years preceding entry into tax havens. The results are to be seen in Appendix figure 4.A3 and align with the ones reported thus far. They attest that endogenous executive mobility is unlikely to drive the main results.

19. Many countries are missing in the ILO database. Among others, Mexico is not covered and data prior to 2015 for Germany are unavailable. As a consequence, both countries are dropped in the computation of $average\ cost_{i,t}$. Moreover, note that the correlation between $minwage_{c,t}$ and $GDP\ per\ capita_{c,t}$, both in US dollars, is equal to 0.93.

Parallel trends In equations (4.7) and (4.8), I scrutinize the evolution of employee pay prior to firm entry into tax havens. An issue hitherto glossed over is that the benchmark results could be ascribable to pre-existing trends. To check that this is not the case, leading values are inserted into equations (4.5) and (4.6):

$$\begin{aligned} ln(compensation_{e,i,t}) &= \sum_{k=0}^{5} \alpha_k TH_{i,t}^{t+k} + \sum_{k=0}^{5} \beta_k \mathbb{1}_{e,i,t}^{CEO/CFO} \times TH_{i,t}^{t+k} \\ &+ \sum_{k=0}^{5} \gamma_k \mathbb{1}_{e,i,t}^{CEO/CFO,\ after\text{-}tax} \times TH_{i,t}^{t+k} + \lambda X_{e,i,t} + \upsilon_e + \phi_i + \psi_t + \epsilon_{e,i,t} \end{aligned} \tag{4.7}$$

$$ln(payments_{i,t}) = \sum_{k=0}^{5} \zeta_k TH_{i,t}^{t+k} + \lambda X_{i,t} + \phi_i + \psi_t + \epsilon_{i,t} \tag{4.8}$$

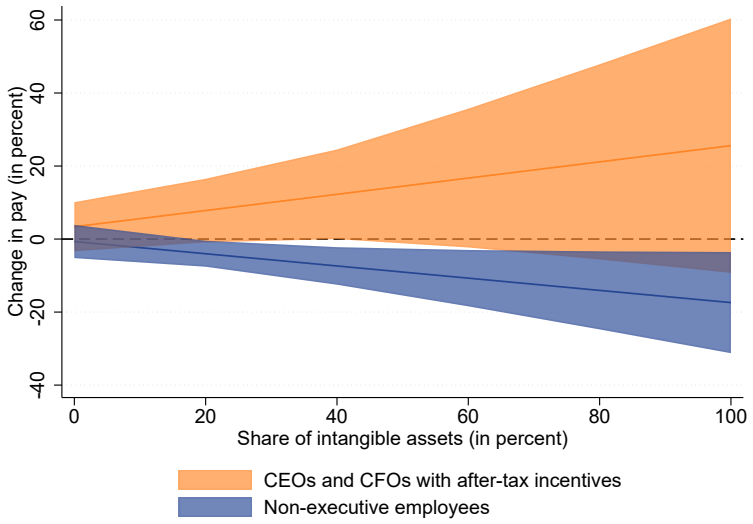
$TH_{i,t}^{t+k}$ ($k \in \{0, ..., 5\}$) is a dichotomous variable equal to 1 in year t if firm i has at least one subsidiary incorporated in a tax haven in year $t + k$. The variables serve as a placebo test. If the coefficients associated with the $TH_{i,t}^{t+k}(k \geq 1)$ variables are not statistically different from zero, then the evolution of employee pay does not depend on future profit shifting activities. The regression results point in this direction. None of the $\{\alpha_k, \beta_k, \gamma_k, \zeta_k, k \in \{1, ..., 5\}\}$ coefficients is significant at the 5 percent level (see Appendix figures 4.A4 and 4.A5) and the p-values of the joint significance tests are equal to 25 and 54 percent respectively. The absence of pre-trends is preserved if we expand or narrow the five-year window and confirms that employee pay does not systematically change before entry into OFCs. It also confirms that the treatment variable does not pick up the effect of unobserved (executive-)firm-year shocks and more generally mitigates endogeneity concerns.

4.2 Hypothesis 2: the role of intangible assets

Before concluding, I examine whether intangible assets exacerbate the impact of firm presence in OFCs on employee pay and inequalities (hypothesis 2). I interact in equations (4.5) and (4.6) the treatment variables with a variable $INTANGIBLES_{i,t}$ denoting the firm-level intangibles (*INTAN* in Compustat) to total assets ratio (*AT* in Compustat).[20] The regression results laid out in figure 4.8 and Appendix table 4.A10 show that the effect of entry into OFCs is magnified in intangible-intensive firms as expected.

20. The first quartile corresponds to 1 percent, the median to 8 percent, the third quartile to 26 percent, and the maximum value is 93 percent.

Figure 4.8 – Effect of firm entry into OFCs on employee pay according to firm intensity in intangible assets



Notes: The figure depicts the change in employee pay following firm entry into tax havens according to the firm's intensity in intangible assets. Firm intensity in intangible assets is obtained by dividing intangible assets by total assets as reported in Compustat. Point estimates with 95 percent confidence intervals. The full results are given in Appendix table 4.A10 and standard errors are clustered at the firm level. See section 4 for more details.

Take two firms i and i' entering OFCs at some point and paying their executives on an after-tax basis. Assume that i is in the first quartile of the intangible intensity distribution (i.e., $INTANGIBLES_{i,t} \approx 1$ percent) and that i' is in the third quartile of the intangible intensity distribution (i.e., $INTANGIBLES_{i,t} \approx 26$ percent). The point estimates reveal that total payments to non-executive employees would remain almost the same in firm i post entry into OFCs, while non-executive employees in firm i' would experience a 5 percent loss in terms of total payments. Furthermore, the compensations of the CEO and CFO would grow by 4 percent in firm i and by 9 percent in firm i'.

5 Conclusion

The effect of profit shifting on employee pay has been studied merely from a theoretical perspective in the existing literature (Krautheim and Schmidt-Eisenlohr, 2016). The present paper bridges the gap between theory and data and empirically investigates the impact of profit shifting on both employee pay and within-firm

pay inequalities. I first outline a toy model to clarify the potential mechanisms at play. On this basis, I derive two testable hypotheses and assess their validity using data on S&P 1500 firms. The results are threefold. First, compensations of CEOs and CFOs remunerated on an after-tax basis rise when their firm establishes subsidiaries in tax havens. Second, wages of non-executive employees, if anything, slightly decline in the meantime. Third, the inequality-deepening effect of firm entry into OFCs is more pronounced in intangible-intensive firms.

The findings are in line with our predictions and carry policy-relevant implications. Because they indicate that profit shifting widens within-firm pay inequalities, they suggest that the development of profit shifting partly explains the rise of income inequalities observed during the last decades. At the same time, they unveil a new mechanism whereby globalization fosters income inequalities and justify the implementation of anti profit shifting reforms to curb income inequalities.

More work is needed in this direction. Ascertaining the validity of the results with alternative databases would be a valuable and useful exercise. Opening the category of non-executive employees is another promising task for future research. Owing to data limitations, it is not possible to distinguish low- and high-skilled non-executive employees in this analysis. Leveraging employer-employee data could shed more light on this and help us better fathom the distributional consequences of profit shifting.

Appendix

Table 4.A1 – ETRs and employee pay

Column Dependent variable	(1) $ln\left(compensation_{e,i,t}\right)$	(2) $ln\left(payments_{i,t}\right)$
$ETR_{i,t}$	-0.05^{c} (0.03)	-0.05^{c} (0.03)
Controls	Yes	Yes
Executive FEs	Yes	No
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
R^2	0.83	0.98
No. of obs.	89,116	4,116

Notes: Regression results of equations (4.3) and (4.4). As is customary in the literature, values of $ETR_{i,t}$ outside the [0,1] interval are omitted. Controls include firms' assets, sales, and profits (in logarithm), and the number of subsidiaries in non-OFCs. In column (1), they also include a CEO dummy, a CFO dummy, as well as executives' age and within-firm experience. Standard errors, in parentheses, are clustered at the firm level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See stylized fact 4 and section 3 for more details.

Table 4.A2 – ETRs and presence in tax havens

Dependent variable	$ETR_{i,t}$
$TH_{i,t}$	-0.05^{a}
	(0.01)
Controls	Yes
Firm FEs	Yes
Year FEs	Yes
R^2	0.20
No. of obs.	17,746

Notes: As is customary in the literature, values of $ETR_{i,t}$ outside the [0,1] interval are omitted. Controls include firms' assets, sales, and profits (in logarithm), the number of subsidiaries in non-OFCs, and a dichotomous variable for tax loss carryforward. Standard errors, in parentheses, are clustered at the firm level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See stylized fact 6 and section 3 for more details.

Table 4.A3 – Average effect of firm entry into OFCs on employee pay: baseline results (full table)

Column	(1)	(2)
Dependent variable	$ln(compensation_{e,i,t})$	$ln(payments_{i,t})$
$TH_{i,t}$	-0.03^{c}	-0.03^{c}
	(0.01)	(0.02)
$\mathbb{1}_{e,i,t}^{CEO/CFO} \times TH_{i,t}$	0.02	
	(0.02)	
$\mathbb{1}_{e,i,t}^{CEO/CFO,\ after\text{-}tax} \times TH_{i,t}$	0.08^{c}	
	(0.05)	
$ln(assets_{i,t})$	0.12^{a}	0.20^{a}
	(0.02)	(0.04)
$ln(sales_{i,t})$	0.08^{a}	0.74^{a}
	(0.03)	(0.05)
$ln(pre\text{-}tax\ income_{i,t})$	0.11^{a}	-0.03^{a}
	(6.59e-3)	(7.29e-3)
$Subsidiaries\ in\ non\text{-}OFCs_{i,t}$	2.50e-4^{b}	6.78e-5
	(1.16e-4)	(5.59e-5)
$age_{e,t}$	1.95e-3	
	(8.03e-3)	
$experience_{e,i,t}$	3.04e-4	
	(8.41e-4)	
$CEO_{e,i,t}$	0.43^{a}	
	(0.02)	
$CFO_{e,i,t}$	0.21^{a}	
	(0.02)	
Executive FEs	Yes	No
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
R^2	0.83	0.99
No. of obs.	101,232	5,248

Notes: Regression results of equations (4.5) and (4.6). Standard errors, in parentheses, are clustered at the firm level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

Figure 4.A1 – Average effect of firm entry into OFCs on employee pay: results by compensation subcomponent

Notes: Effect of firm entry into OFCs on seven compensation subcomponents (for CEOs and CFOs in after-tax incentive firms). The coefficients are obtained by replacing the dependent variable from equation (4.5) with the corresponding subcomponent. The dependent variables are in million US dollars. Point estimates with 90 percent confidence intervals. Standard errors are clustered at the firm level. See section 4 for more details.

Table 4.A4 – Employment effect of firm entry into OFCs

Dependent variable	$ln(employment_{i,t})$
$TH_{i,t}$	0.02^{b}
	(0.01)
$ln(assets_{i,t})$	0.29^{a}
	(0.02)
$ln(sales_{i,t})$	0.62^{a}
	(0.03)
$ln(pre\text{-}tax\ income_{i,t})$	-0.04^{a}
	(4.23e-3)
$Subsidiaries\ in\ non\text{-}OFCs_{i,t}$	6.78e-5
	(1.16e-4)
Firm FEs	Yes
Year FEs	Yes
R^2	0.98
No. of obs.	30,261

Notes: Regression results obtained after replacing the dependent variable from equation (4.6) with the employment variable. Standard errors, in parentheses, are clustered at the firm level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

Table 4.A5 – Average effect of firm entry into OFCs on within-firm inequalities and on the average wage of non-executive employees

Column	(1)	(2)
Dependent variable	$ln\left(\frac{compensation_{e,i,t}}{total\ payments\ to\ employees_{i,t}/employment_{i,t}}\right)$	$ln\left(\frac{payments_{i,t}}{employment_{i,t}}\right)$
$TH_{i,t}$	-0.09^{c}	4.29e-3
	(0.05)	(0.17)
$\mathbb{1}_{e,i,t}^{CEO/CFO} \times TH_{i,t}$	0.21^{a}	
	(0.03)	
$\mathbb{1}_{e,i,t}^{CEO/CFO,\ after\text{-}tax} \times TH_{i,t}$	0.05	
	(0.08)	
$ln(assets_{i,t})$	0.06	-0.11^{a}
	(0.07)	(0.03)
$ln(sales_{i,t})$	0.05	0.20^{a}
	(0.08)	(0.04)
$ln(pre\text{-}tax\ income_{i,t})$	0.11^{a}	-4.68e-3
	(0.02)	(5.83e-3)
$Subsidiaries\ in\ non\text{-}OFCs_{i,t}$	3.64e-06	-1.11e-4^{c}
	(3.06e-4)	(5.67e-5)
$age_{e,t}$	-0.01	
	(0.01)	
$experience_{e,i,t}$	2.80e-3	
	(2.01e-3)	
$CEO_{e,i,t}$	0.43^{a}	
	(0.04)	
$CFO_{e,i,t}$	0.22^{a}	
	(0.04)	
Executive FEs	Yes	No
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
R^2	0.85	0.95
No. of obs.	17,700	5,073

Notes: Regression results obtained after replacing in column (1) the dependent variable from equation (4.5) with the executive-to-average-worker pay ratio and in column (2) the dependent variable from equation (4.6) with the average wage. Standard errors, in parentheses, are clustered at the firm level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

Table 4.A6 – Average effect of firm entry into OFCs on employee pay: imputing labor costs

Dependent variable	$ln\left(\widetilde{payments}_{i,t}\right)$
$TH_{i,t}$	-0.03^{c}
	(0.02)
$ln(assets_{i,t})$	0.29^{a}
	(0.04)
$ln(sales_{i,t})$	0.67^{a}
	(0.05)
$ln(pre\text{-}tax\ income_{i,t})$	-0.06^{a}
	(7.43e-3)
$Subsidiaries\ in\ non\text{-}OFCs_{i,t}$	2.96e-04^{b}
	(1.54e-4)
Firm FEs	Yes
Year FEs	Yes
R^2	0.94
No. of obs.	25,458

Notes: Regression results of equation (4.6) obtained after imputing missing values of the dependent variable. Standard errors, in parentheses, are clustered at the firm level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

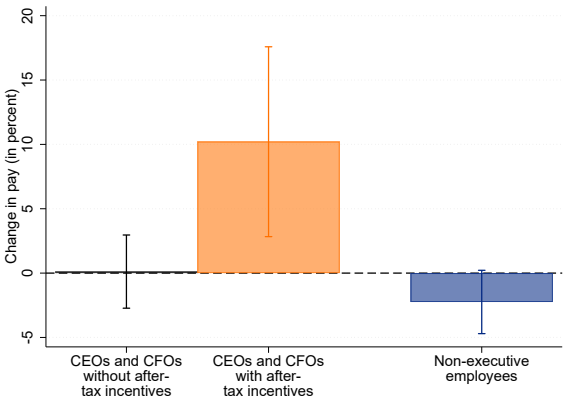
Table 4.A7 – Average effect of firm entry into OFCs on employee pay: adjusting for relocation effects

Column	(1)	(2)
Dependent variable	$ln(payments_{i,t})$	$ln(payments_{i,t})$
$TH_{i,t}$	-0.04^{b}	-0.03^{c}
	(0.02)	(0.02)
$ln(assets_{i,t})$	0.20^{a}	0.22^{a}
	(0.03)	(0.04)
$ln(sales_{i,t})$	0.74^{a}	0.71^{a}
	(0.04)	(0.05)
$ln(pre\text{-}tax\ income_{i,t})$	-0.03^{a}	-0.03^{a}
	(6.66e-3)	(7.16e-3)
$Subsidiaries\ in\ non\text{-}OFCs_{i,t}$	2.38e-5	1.64e-5
	(6.43e-5)	(6.44e-5)
$ln(employment_{i,t})$	0.49^{a}	0.49^{a}
	(0.04)	(0.04)
$average\ cost\ (ILO)_{i,t}$	-2.02e-5	
	(2.32e-5)	
$average\ cost\ (World\ Bank)_{i,t}$		6.25e-7
		(4.57e-7)
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
R^2	0.99	0.99
No. of obs.	4,798	5,059

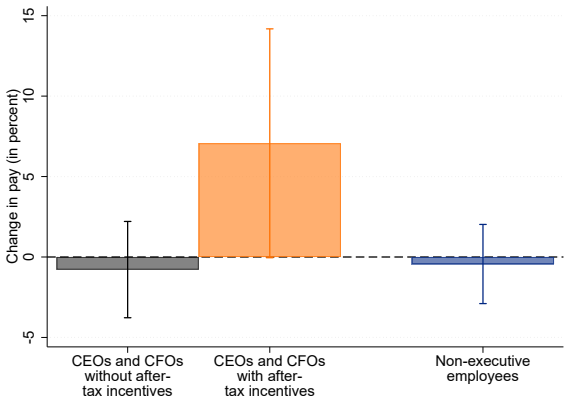
Notes: Regression results of equation (4.6) obtained after controlling for disparities in labor costs across countries. Standard errors, in parentheses, are clustered at the firm level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

Figure 4.A2 – Average effect of firm entry into OFCs on employee pay: alternative tax haven classifications

(a) List of Hines and Rice (1994)



(b) Exclusion of six tax havens



Notes: Regression results for $\hat{\alpha}$ + $\hat{\beta}$ (equation (4.5), first bar), $\hat{\alpha}$ + $\hat{\beta}$ + $\hat{\gamma}$ (equation (4.5), second bar), and $\hat{\zeta}$ (equation (4.6), third bar) when the OFC classification is modified. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the firm level. The full results are given in Appendix tables 4.A8 and 4.A9. See section 4 for more details.

Table 4.A8 – Average effect of firm entry into OFCs on employee pay: list of Hines and Rice (1994) (full table)

Column	(1)	(2)
Dependent variable	$ln(compensation_{e,i,t})$	$ln(payments_{i,t})$
$TH_{i,t}$	-0.02[d]	-0.02[d]
	(0.01)	(0.02)
$\mathbb{1}_{e,i,t}^{CEO/CFO} \times TH_{i,t}$	0.03	
	(0.02)	
$\mathbb{1}_{e,i,t}^{CEO/CFO,\ after\text{-}tax} \times TH_{i,t}$	0.10[b]	
	(0.05)	
$ln(assets_{i,t})$	0.12[a]	0.20[a]
	(0.02)	(0.04)
$ln(sales_{i,t})$	0.08[a]	0.74[a]
	(0.03)	(0.05)
$ln(pre\text{-}tax\ income_{i,t})$	0.11[a]	-0.03[a]
	(6.59e-3)	(7.28e-3)
$Subsidiaries\ in\ non\text{-}OFCs_{i,t}$	2.31e-4[c]	6.55e-5
	(1.20e-4)	(5.39e-5)
$age_{e,t}$	1.93e-3	
	(8.03e-3)	
$experience_{e,i,t}$	2.42e-4	
	(9.06e-4)	
$CEO_{e,i,t}$	0.43[a]	
	(0.02)	
$CFO_{e,i,t}$	0.20[a]	
	(0.02)	
Executive FEs	Yes	No
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
R^2	0.83	0.99
No. of obs.	101,232	5,248

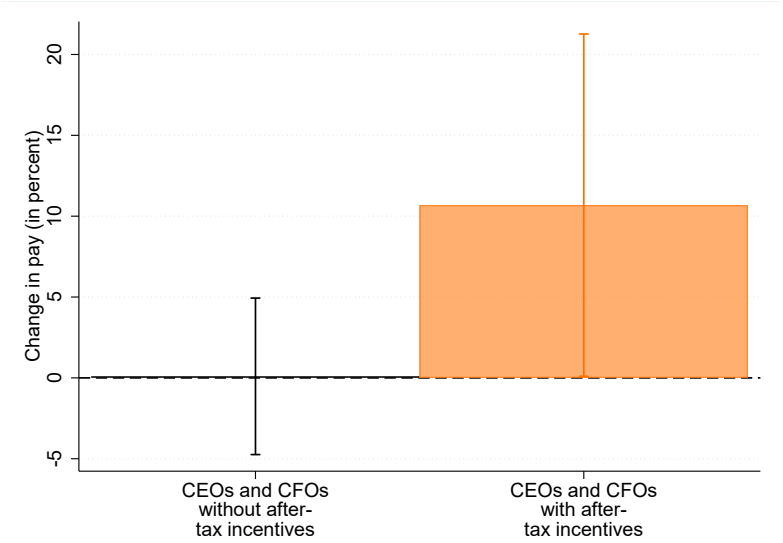
Notes: Regression results of equations (4.5) and (4.6) when the OFC classification is modified. Standard errors, in parentheses, are clustered at the firm level. [d] $p < 0.15$, [c] $p < 0.10$, [b] $p < 0.05$, [a] $p < 0.01$. See section 4 for more details.

Table 4.A9 – Average effect of firm entry into OFCs on employee pay: exclusion of six tax havens (full table)

Column	(1)	(2)
Dependent variable	$ln(compensation_{e,i,t})$	$ln(payments_{i,t})$
$TH_{i,t}$	-0.01	-4.35e-3
	(0.02)	(1.85e-2)
$\mathbb{1}_{e,i,t}^{CEO/CFO} \times TH_{i,t}$	4.76e-3	
	(0.02)	
$\mathbb{1}_{e,i,t}^{CEO/CFO,\ after\text{-}tax} \times TH_{i,t}$	0.08[c]	
	(0.04)	
$ln(assets_{i,t})$	0.12[a]	0.20[a]
	(0.02)	(0.04)
$ln(sales_{i,t})$	0.08[a]	0.74[a]
	(0.03)	(0.05)
$ln(pre\text{-}tax\ income_{i,t})$	0.11[a]	-0.03[a]
	(6.59e-3)	(7.25e-3)
$Subsidiaries\ in\ non\text{-}OFCs_{i,t}$	1.94e-4[d]	4.58e-5
	(1.20e-4)	(5.08e-5)
$age_{e,t}$	1.88e-3	
	(8.01e-3)	
$experience_{e,i,t}$	5.63e-4	
	(8.33e-4)	
$CEO_{e,i,t}$	0.44[a]	
	(0.02)	
$CFO_{e,i,t}$	0.22[a]	
	(0.02)	
Executive FEs	Yes	No
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
R^2	0.83	0.99
No. of obs.	101,232	5,248

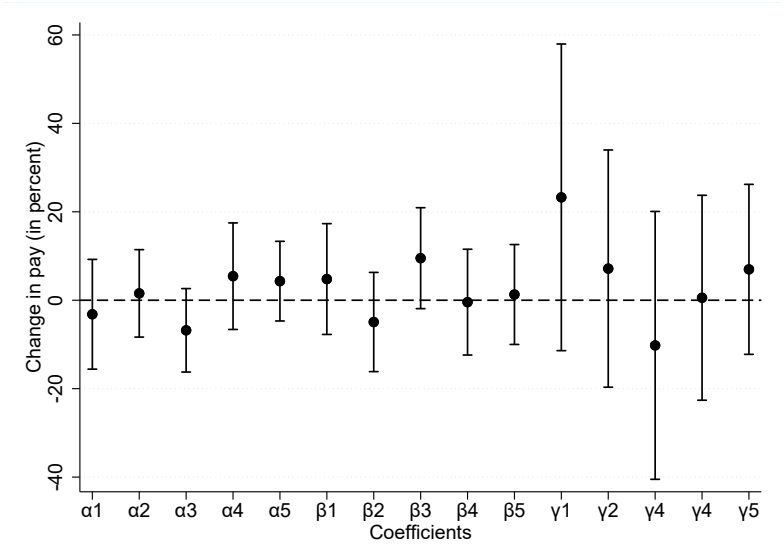
Notes: Regression results of equations (4.5) and (4.6) when the OFC classification is modified. Standard errors, in parentheses, are clustered at the firm level. [d]$p < 0.15$, [c]$p < 0.10$, [b]$p < 0.05$, [a]$p < 0.01$. See section 4 for more details.

Figure 4.A3 – Average effect of firm entry into OFCs on employee pay: endogenous executive mobility



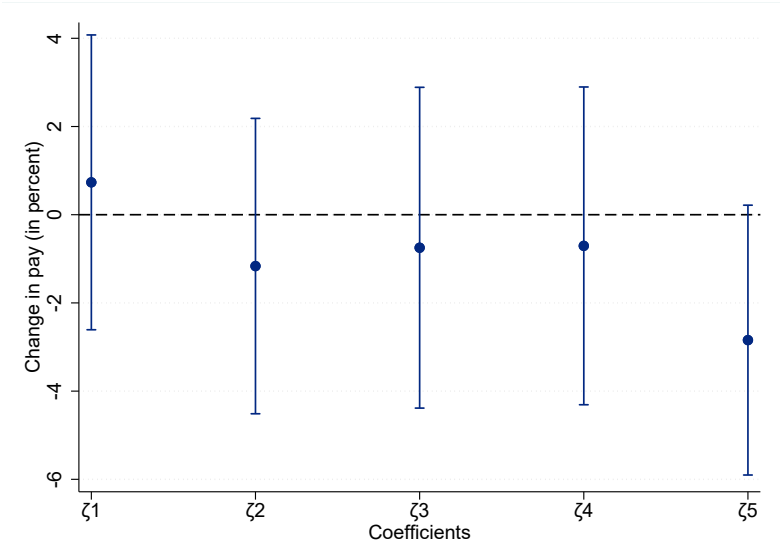
Notes: Regression results for equation (4.5) when only executives with at least a five-year experience within the company are retained. The first bar depicts $\hat{\alpha} + \hat{\beta}$, while the second bar depicts $\hat{\alpha} + \hat{\beta} + \hat{\gamma}$. Point estimates with 95 percent confidence intervals. Standard errors are clustered at the firm level. See section 4 for more details.

Figure 4.A4 – Average effect of firm entry into OFCs on employee pay: pre-trends in equation (4.7)



Notes: Regression results for $\hat{\alpha}_k$, $\hat{\beta}_k$, and $\hat{\gamma}_k$, $k \in \{1, ..., 5\}$ in equation (4.7). Point estimates with 95 percent confidence intervals. Standard errors are clustered at the firm level. See section 4 for more details.

Figure 4.A5 – Average effect of firm entry into OFCs on employee pay: pre-trends in equation (4.8)



Notes: Regression results for $\hat{\zeta}_k, k \in \{1, ..., 5\}$ in equation (4.8). Point estimates with 95 percent confidence intervals. Standard errors are clustered at the firm level. See section 4 for more details.

Table 4.A10 – Effect of firm entry into OFCs on employee pay according to firm intensity in intangible assets (full table)

Column	(1)	(2)
Dependent variable	$ln(compensation_{e,i,t})$	$ln(payments_{i,t})$
$TH_{i,t}$	-0.01	-0.01
	(0.02)	(0.02)
$TH_{i,t} \times INTANGIBLES_{i,t}$	-0.14^{b}	-0.17^{b}
	(0.06)	(0.08)
$\mathbb{1}_{e,i,t}^{CEO/CFO} \times TH_{i,t}$	0.01	
	(0.02)	
$\mathbb{1}_{e,i,t}^{CEO/CFO} \times TH_{i,t} \times INTANGIBLES_{i,t}$	0.12^{c}	
	(0.07)	
$\mathbb{1}_{e,i,t}^{CEO/CFO,\ after\text{-}tax} \times TH_{i,t}$	0.03	
	(0.06)	
$\mathbb{1}_{e,i,t}^{CEO/CFO,\ after\text{-}tax} \times TH_{i,t} \times INTANGIBLES_{i,t}$	0.25	
	(0.22)	
$ln(assets_{i,t})$	0.11^{a}	0.21^{a}
	(0.03)	(0.04)
$ln(sales_{i,t})$	0.09^{a}	0.74^{a}
	(0.03)	(0.05)
$ln(pre\text{-}tax\ income_{i,t})$	0.10^{a}	-0.03^{a}
	(6.88e-3)	(7.41e-3)
$Subsidiaries\ in\ non\text{-}OFCs_{i,t}$	2.45e-4^{b}	8.05e-5
	(1.16e-4)	(5.67e-5)
$age_{e,t}$	3.97e-3	
	(7.83e-3)	
$experience_{e,i,t}$	1.38e-3^{c}	
	(7.81e-4)	
$CEO_{e,i,t}$	0.44^{a}	
	(0.02)	
$CFO_{e,i,t}$	0.21^{a}	
	(0.02)	
Executive FEs	Yes	No
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
R^2	0.83	0.99
No. of obs.	94,793	4,869

Notes: Regression results of equations (4.5) and (4.6) when interacting the treatment variable with the firm-level intensity in intangible assets. Standard errors, in parentheses, are clustered at the firm level. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

General conclusion

The present dissertation uses US firm-level data and interdisciplinary approaches to enrich our understanding of the causes and consequences of profit shifting. In what follows, I briefly recapitulate the main findings and discuss their policy relevance. I then explain where we could go from there and propose potential avenues for future research.

1 Summary and policy implications

In chapter 1, I explore the impact of competition on tax avoidance and profit shifting. The effect is theoretically unclear. Whereas Marrelli and Martina (1988) predict that competition should inhibit tax avoidance, Goerke and Runkel (2011) argue that competition should on the contrary fuel tax avoidance. I clarify this with an empirical analysis. On the one hand, I exploit financial statements of US-listed firms and draw on the accounting literature to measure corporate tax avoidance. On the other hand, I use the surge of Chinese exports during the 2000s as a competition shock. The granting of Permanent Normal Trade Relations status in late 2000 provides exogenous variation in Chinese import competition and allows a causal interpretation of the results. The latter are strongly reminiscent of profit shifting. They reveal that competition only fosters the tax avoidance activities of MNEs and more remarkably those of MNEs with tax haven subsidiaries. Interestingly, MNEs did not enlarge their network of subsidiaries in OFCs in response to the China shock. They massively invested in intangible assets to differentiate from competitors and thereby limit losses in sales and profits, which is in line with the conclusions drawn by Bloom et al. (2016), Gutiérrez and Philippon (2017), and Hombert and Matray (2018). At the same time, these intangible assets facilitated the income shifting activities of MNEs already implanted in OFCs. The findings uncover a new channel whereby competition can increase tax avoidance and carry important implications. First, they shed light on the decline of US-listed companies' ETR (Dyreng et al., 2017). In absence of the China shock, the average

ETR of US-listed manufacturing corporations would have been 1.5 percentage point higher in 2005. Second, the chapter highlights a controversial side of globalization and trade-induced competition. It indicates that the pro-competitive effect caused by globalization can indirectly accentuate the tax dodging activities of MNEs. In this respect, the result might help interpret the ongoing backlash against large firms and globalization (Helpman, 2017; Walter, 2021). Finally, the paper shows that import competition and corporate income taxes are closely connected. The international taxation architecture has been built a long time ago and is no longer in phase with the way economic activities are carried out nowadays. It offers MNEs the opportunity to take advantage of loopholes and other legal technicalities for tax saving purposes. In this regard, the results support recent calls for reform of the international tax system and reaffirm the need to better coordinate fiscal and trade policies.

Chapter 2 also examines how interactions between companies shape profit shifting activities but with a different perspective this time. It explores the existence of intra-industry profit shifting spillovers. Prior research shows that firms connected to low-tax firms pay lower taxes all other things being equal (Cen et al., 2017; Gallemore et al., 2019; Barrios and Gallemore, 2021), and evidence hints that comparable enterprises adopt similar tax avoidance strategies (Bauckloh et al., 2021). In this paper, I delve into this with an accent on profit shifting, tax haven FDIs, and within-industry spillovers. I leverage data from the SEC to construct a rich database at the firm-country-year level that tracks the subsidiaries of US-listed corporations worldwide. An event study shows that a company is more likely to start operating in a tax haven if another company from the same sector owns subsidiaries in this tax haven. The spillover effects are sizable, robust, and suggestive of a gradual learning process. Furthermore, they are heterogeneous. They vary over time, across sectors, and between tax havens. Consistently with the view that profit shifting has developed in the last decades (Grubert, 2012; Klassen and Laplante, 2012), I find that spillover effects are bigger in the most recent subperiod. They are more pronounced in finance and services, which coincides with the fact that intangible-intensive sectors are more inclined to engage in profit shifting (Gumpert et al., 2016; Merz and Overesch, 2016; Barrios and d'Andria, 2020). Lastly, spillovers are more intense for the most aggressive tax havens, where corporate income tax rates are the lowest and lie near zero. These findings confirm that MNEs tend to reproduce the profit shifting schemes of their peers and cast light on the escalation of profit shifting witnessed in the 1990s and 2000s.

From a policy viewpoint, it means that paying more attention to these sectors and tax havens could enable public authorities to hinder profit shifting more efficiently.

Chapter 3 accompanies chapter 2 and investigates *how* tax haven FDIs spread across MNEs. It emphasizes the role played by executive mobility in the dissemination of profit shifting strategies. Anecdotal evidence asserts that employees working in tax departments gain expertise in very particular tax schemes, but there is little systematic evidence along these lines. The analysis conducted by Barrios and Gallemore (2021) is perhaps the only exception. They prove that the turnover of employees working in tax departments contributes to the diffusion of tax avoidance activities. They observe that firms recruiting tax-related employees from other low-ETR firms pay fewer taxes holding other things constant. Chapter 3 corroborates and supplements this result. I use a unique database that is granular enough to follow both the network of subsidiaries of US-listed firms and the movements of executives across these firms. I demonstrate that executives are key elements for understanding the expansion of MNEs in foreign countries, be they tax havens or non-havens. They help their current company broaden its network of subsidiaries in the countries where the companies they previously worked for had subsidiaries themselves. It means that they acquire country-specific knowledge while working for MNEs. This knowledge is rare, valuable, and solicited by MNEs because it helps them implement and scale up their activities in specific jurisdictions. In the context of profit shifting, the findings notably resonate with the work of Dyreng et al. (2010). They reiterate the need to go beyond the typical black-box conception of the firm to have a better grasp of profit shifting. Because top executives assimilate the profit shifting schemes used by their firm and replicate them later in different firms, inspecting the movements of executives across firms could prove useful for deterring tax dodging.

The last chapter of the thesis is distinct from the rest. Instead of studying the determinants of profit shifting, chapter 4 looks at the repercussions of profit shifting in terms of employee pay and income inequalities. Existing research is relatively silent about the incidence of profit shifting, and the impact of profit shifting on wages has been examined only from a theoretical perspective (Krautheim and Schmidt-Eisenlohr, 2016). Two opposite forces occur. On the one hand, profit shifting increases the surplus shared between the MNE and its workers (positive effect, or tax rate effect). On the other hand, the relocation of profits to OFCs generates an information asymmetry in favor of the MNE that alters the relative bargaining power of

workers (negative effect, or secrecy effect). My analysis confronts theory and data. The empirical exercise shows that, if anything, entry of US-listed corporations into tax havens deteriorates the wages received by non-executive employees. However, the reverse happens for senior executives. CEOs and CFOs see their compensation increase when MNEs engage in OFCs. Therefore, profit shifting widens within-firm pay inequalities. In addition, the inequality-deepening effect of firm entry into tax havens is amplified in intangible-intensive firms. This pattern again aligns with the profit shifting literature. Given the progression of profit shifting during the last decades, the findings might partly explain the rapid growth of the CEO-to-worker compensation ratio (Mishel and Wolfe, 2019) and public hostility toward MNEs and globalization (Helpman, 2017; Walter, 2021). They might nurture current policy discussions too. There is now an international consensus on the need to curb base erosion and profit shifting (BEPS). The global minimum tax agreed in late 2021 by nearly 140 countries under the OECD/G20 inclusive framework on BEPS perfectly illustrates this. Perhaps surprisingly, most of the debates revolve around countries' tax revenues and attractiveness. Within-country income inequalities are for their part largely glossed over. Against this background, chapter 4 shows that putting an end to profit shifting could reduce pay inequalities. Anti profit shifting rules could thus support the fulfillment of the Sustainable Development Goals not just indirectly through the redistribution of higher tax revenues but also more directly.

2 Research agenda

The research presented in this dissertation can be extended in different ways. With respect to chapter 1, it would be insightful to identify new channels whereby competition can affect profit shifting. Due to data limitations, the focus is on intangible assets. The reallocation of debt across affiliates might as well be influenced by the degree of competition. Additional work is also required to fully fathom the channels through which profit shifting strategies disseminate across MNEs. In the same vein as chapter 3, research at the intersection of corporate tax avoidance, international business, labor economics, and management could examine the effect of other executives' attributes. One could for example study whether the universities/schools MNEs' executives graduated from are determinant, i.e., whether knowledge on particular profit shifting schemes is achieved in some specific universities/schools. It is worth recalling that profit shifters are among the largest companies. Information about their executives is easily accessible. Details about the academic background of these individuals can be

retrieved from social networks such as LinkedIn through web scraping. Moreover, the fast-growing literature on top managers and corporate tax avoidance has already highlighted the role of many characteristics (see general introduction). It would be useful to integrate them all into the same exercise to classify them and see whether some of them are redundant. Concerning chapter 4, the data exploited so far do not enable us to differentiate non-executive employees. The shortcoming is important. This category of employees is very broad and highly heterogeneous, and we might expect low-skilled workers to be the greatest losers of profit shifting. Therefore, leveraging employer-employee data or alternative sources would certainly improve our knowledge of the issue.

Many other avenues, far beyond the scope of this dissertation, are also worth exploring. More efforts are needed to quantify profit shifting in a consistent manner. The most recent estimates signal that the amount of profits artificially booked in OFCs ranges from $300 billion to $1 trillion (see general introduction). Hence, it would be helpful to reconcile existing methods within a unifying framework. Reconciling the divergences observed between micro-level and macro-level estimates is another challenging task for subsequent research. Then, taking country-level profit shifting estimates as given, it would be valuable to bilateralize (at the host country-tax haven level or the parent-tax haven level) and trilateralize (at the parent-host country-tax haven level) profit shifting flows. Visualizing more clearly the geography of profit shifting is crucial to improving the design and implementation of anti profit shifting measures. In this regard, note that interactions between tax havens are still understudied. Profit shifting flows between a non-haven country and a tax haven only depend on the characteristics of these two jurisdictions in standard models (see general introduction). In reality however, they might be affected by other OFCs (e.g., tax competition among OFCs). Last but not least, the consequences of profit shifting are largely ignored to this date. Future research should be undertaken in this direction.

Bibliography

Acemoglu, D., D. Autor, D. Dorn, G. H. Hanson, and B. Price (2016): "Import competition and the great US employment sag of the 2000s," *Journal of Labor Economics*, 34, 141–198.

Ajili, H. and H. Khlif (2020): "Political connections, joint audit and tax avoidance: Evidence from Islamic banking industry," *Journal of Financial Crime*, 27, 155–171.

Al-Hadi, A., G. Taylor, and G. Richardson (2021): "Are corruption and corporate tax avoidance in the United States related?" *Review of Accounting Studies*, 1–46.

Alm, J. (2019): "What motivates tax compliance?" *Journal of Economic Surveys*, 33, 353–388.

Alstadsæter, A., S. Barrios, G. Nicodème, A. M. Skonieczna, and A. Vezzani (2018): "Patent boxes design, patents location, and local R&D," *Economic Policy*, 33, 131–177.

Alstadsæter, A., J. B. Bjørkheim, R. B. Davies, and J. Scheuerer (2022): "Pennies from haven: Wages and profit shifting," *CESifo Working Papers*, 9590.

Alvaredo, F., L. Chancel, T. Piketty, E. Saez, and G. Zucman (2017): "Global inequality dynamics: New findings from WID.world," *American Economic Review*, 107, 404–09.

Amiti, M., M. Dai, R. C. Feenstra, and J. Romalis (2020): "How did China's WTO entry affect US prices?" *Journal of International Economics*, 126, 103339.

Andrews, I., J. H. Stock, and L. Sun (2019): "Weak instruments in instrumental variables regression: Theory and practice," *Annual Review of Economics*, 11, 727–753.

Angrist, J. D. and J.-S. Pischke (2009): *Mostly harmless econometrics: An empiricist's companion*, Princeton University Press.

Antràs, P. and S. R. Yeaple (2014): "Multinational firms and the structure of international trade," in *Handbook of International Economics*, Elsevier, vol. 4, 55–130.

Arellano, M. and S. Bond (1991): "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations," *Review of Economic Studies*, 58, 277–297.

Argilés-Bosch, J. M., A. Somoza, D. Ravenda, and J. García-Blandón (2020): "An empirical examination of the influence of e-commerce on tax avoidance in Europe," *Journal of International Accounting, Auditing and Taxation*, 41, 100339.

Armstrong, C. S., J. L. Blouin, A. D. Jagolinzer, and D. F. Larcker (2015): "Corporate governance, incentives, and tax avoidance," *Journal of Accounting and Economics*, 60, 1–17.

Armstrong, C. S., J. L. Blouin, and D. F. Larcker (2012): "The incentives for tax planning," *Journal of Accounting and Economics*, 53, 391–411.

Arulampalam, W., M. P. Devereux, and G. Maffini (2012): "The direct incidence of corporate income tax on wages," *European Economic Review*, 56, 1038–1054.

Asker, J., J. Farre-Mensa, and A. Ljungqvist (2014): "Corporate investment and stock market listing: A puzzle?" *Review of Financial Studies*, 28, 342–390.

Ateş, L., A. Cobham, M. Harari, P. Janskỳ, M. Meinzer, L. Millán, and M. Palanskỳ (2021): "The corporate tax haven index: A new geography of profit shifting," in *Combatting Fiscal Fraud and Empowering Regulators*, ed. by B. Unger, L. Russel, and J. Ferwerda, Oxford University Press.

Autor, D., D. Dorn, and G. H. Hanson (2013): "The China Syndrome: Local labor market effects of import competition in the United States," *American Economic Review*, 103, 2121–68.

Azémar, C. and R. G. Hubbard (2015): "Country characteristics and the incidence of capital income taxation on wages: An empirical assessment," *Canadian Journal of Economics/Revue Canadienne d'Économique*, 48, 1762–1802.

Badertscher, B. A., S. P. Katz, S. O. Rego, and R. J. Wilson (2019): "Conforming tax avoidance and capital market pressure," *Accounting Review*, 94, 1–30.

Bai, L. and S. Stumpner (2019): "Estimating US consumer gains from Chinese imports," *American Economic Review: Insights*, 1, 209–224.

Balsvik, R. (2011): "Is labor mobility a channel for spillovers from multinationals? Evidence from Norwegian manufacturing," *Review of Economics and Statistics*, 93, 285–297.

Barrios, J. M. and J. Gallemore (2021): "Tax-related human capital: Evidence from employee movements," *NBER Working Papers*, 28775.

Barrios, S. and D. d'Andria (2020): "Profit shifting and industrial heterogeneity," *CESifo Economic Studies*, 66, 134–156.

Battey, H., D. Cox, and M. Jackson (2019): "On the linear in probability model for binary data," *Royal Society Open Science*, 6, 190067.

Bauckloh, T., I. Hardeck, P. U. Wittenstein, and B. Zwergel (2021): "Spillover effects of tax avoidance on peers' firm value," *Accounting Review*, 96, 51–79.

Beer, S., R. de Mooij, and L. Liu (2020): "International corporate tax avoidance: A review of the channels, magnitudes, and blind spots," *Journal of Economic Surveys*, 34, 660–688.

Beer, S. and J. Loeprick (2015): "Profit shifting: Drivers of transfer (mis)pricing and the potential of countermeasures," *International Tax and Public Finance*, 22, 426–451.

Bennedsen, M., F. Pérez-González, and D. Wolfenzon (2020): "Do CEOs matter? Evidence from hospitalization events," *Journal of Finance*, 75, 1877–1911.

Bilicka, K. and A. Seidel (2020): "Profit shifting and corruption," *International Tax and Public Finance*, 27, 1051–1080.

Bilicka, K. R., M. Devereux, and I. Guceri (2020): "Optimization frictions and fixed costs of profit shifting," *mimeo*.

Bilicka, K. R., Y. Qi, and J. Xing (2021): "Real responses to anti-tax avoidance: Evidence from the UK worldwide debt cap," *SSRN Working Papers*, 3846158.

Bisztray, M., M. Koren, and A. Szeidl (2018): "Learning to import from your peers," *Journal of International Economics*, 115, 242–258.

Blaufus, K., A. Möhlmann, and A. N. Schwäbe (2019): "Stock price reactions to news about corporate tax avoidance and evasion," *Journal of Economic Psychology*, 72, 278–292.

Blonigen, B. A. and J. Piger (2014): "Determinants of foreign direct investment," *Canadian Journal of Economics/Revue Canadienne d'Économique*, 47, 775–812.

Bloom, N., M. Draca, and J. Van Reenen (2016): "Trade induced technical change? The impact of Chinese imports on innovation, IT and productivity," *Review of Economic Studies*, 83, 87–117.

Blundell, R. and S. Bond (1998): "Initial conditions and moment restrictions in dynamic panel data models," *Journal of Econometrics*, 87, 115–143.

Boermans, M. A. and H. Roelfsema (2013): "The effects of managerial capabilities on export, FDI and innovation: Evidence from Indian firms," *Asian Business & Management*, 12, 387–408.

Bolwijn, R., B. Casella, and D. Rigo (2018): "An FDI-driven approach to measuring the scale and economic impact of BEPS," *Transnational Corporations*, 25, 107–144.

Bradbury, D., T. Hanappi, and A. Moore (2018): "Estimating the fiscal effects of base erosion and profit shifting: Data availability and analytical issues," *Transnational Corporations*, 25, 91–106.

Brainard, S. L. (1993): "A simple theory of multinational corporations and trade with a trade-off between proximity and concentration," *NBER Working Papers*, 4269.

Brandt, L., D. Ma, and T. G. Rawski (2014): "From divergence to convergence: Reevaluating the history behind China's economic boom," *Journal of Economic Literature*, 52, 45–123.

Bricongne, J.-C., S. Delpeuch, and M. L. Forero (2021): "Productivity slowdown, tax havens and MNEs' intangibles: Where is measured value creation?" *Banque de France Working Papers*, 835.

Buettner, T., M. Overesch, U. Schreiber, and G. Wamser (2012): "The impact of thin-capitalization rules on the capital structure of multinational firms," *Journal of Public Economics*, 96, 930–938.

Buettner, T., M. Overesch, and G. Wamser (2018): "Anti profit-shifting rules and foreign direct investment," *International Tax and Public Finance*, 25, 553–580.

Buettner, T. and G. Wamser (2013): "Internal debt and multinational profit shifting: Empirical evidence from firm-level panel data," *National Tax Journal*, 66, 63–97.

Cai, H. and Q. Liu (2009): "Competition and corporate tax avoidance: Evidence from Chinese industrial firms," *Economic Journal*, 119, 764–795.

Cao, Y., Z. Feng, M. Lu, and Y. Shan (2021): "Tax avoidance and firm risk: Evidence from China," *Accounting & Finance*, 61, 4967–5000.

Casella, B. and B. Souillard (2022): "A new framework to assess the fiscal impact of a global minimum tax on FDI," *Transnational Corporations*, forthcoming.

Cen, L., E. L. Maydew, L. Zhang, and L. Zuo (2017): "Customer-supplier relationships and corporate tax avoidance," *Journal of Financial Economics*, 123, 377–394.

Chakraborty, P. and M. Henry (2019): "Chinese competition and product variety of Indian firms," *Journal of Comparative Economics*, 47, 367–395.

Chen, C. and C. Steinwender (2021): "Import competition, heterogeneous preferences of managers, and productivity," *Journal of International Economics*, 133, 103533.

Chen, S., X. Chen, Q. Cheng, and T. Shevlin (2010): "Are family firms more tax aggressive than non-family firms?" *Journal of Financial Economics*, 95, 41–61.

Chhaochharia, V. and Y. Grinstein (2009): "CEO compensation and board structure," *Journal of Finance*, 64, 231–261.

Choi, S., D. Furceri, and C. Yoon (2021): "Policy uncertainty and foreign direct investment," *Review of International Economics*, 29, 195–227.

Choquette, E. and P. Meinen (2015): "Export spillovers: Opening the black box," *The World Economy*, 38, 1912–1946.

Christensen, D. M., D. S. Dhaliwal, S. Boivie, and S. D. Graffin (2015): "Top management conservatism and corporate risk strategies: Evidence from managers' personal political orientation and corporate tax avoidance," *Strategic Management Journal*, 36, 1918–1938.

Clausing, K. (2016): "The effect of profit shifting on the corporate tax base in the United States and beyond," *National Tax Journal*, 69, 905–934.

Clausing, K. A. (2003): "Tax-motivated transfer pricing and US intrafirm trade prices," *Journal of Public Economics*, 87, 2207–2223.

——— (2013): "Who pays the corporate tax in a global economy?" *National Tax Journal*, 66, 151–184.

Clifford, S. (2019): "Taxing multinationals beyond borders: Financial and locational responses to CFC rules," *Journal of Public Economics*, 173, 44–71.

Cobham, A., J. Garcia-Bernardo, P. Janskỳ, and M. Palansky (2021): "Statistical measurement of illicit financial flows in sustainable development goals: Tax avoidance by multinational corporations," *IES Working Papers*, 24.

Cobham, A. and P. Janskỳ (2018): "Global distribution of revenue loss from corporate tax avoidance: Re-estimation and country results," *Journal of International Development*, 30, 206–232.

——— (2019): "Measuring misalignment: The location of US multinationals' economic activity versus the location of their profits," *Development Policy Review*, 37, 91–110.

Collier, R., A. Pirlot, and J. Vella (2020): "COVID-19 and fiscal policies: Tax policy and the COVID-19 crisis," *Intertax*, 48.

Conconi, P., A. Sapir, and M. Zanardi (2016): "The internationalization process of firms: From exports to FDI," *Journal of International Economics*, 99, 16–30.

Cristea, A. D. and D. X. Nguyen (2016): "Transfer pricing by multinational firms: New evidence from foreign firm ownerships," *American Economic Journal: Economic Policy*, 8, 170–202.

Crivelli, E., R. De Mooij, and M. Keen (2016): "Base erosion, profit shifting and developing countries," *FinanzArchiv: Public Finance Analysis*, 72, 268–301.

Cui, L., Y. Li, K. E. Meyer, and Z. Li (2015): "Leadership experience meets ownership structure: Returnee managers and internationalization of emerging economy firms," *Management International Review*, 55, 355–387.

Dabla-Norris, E., M. Gradstein, and G. Inchauste (2008): "What causes firms to hide output? The determinants of informality," *Journal of Development Economics*, 85, 1–27.

Davies, R. B., R. Desbordes, and A. Ray (2018a): "Greenfield versus merger and acquisition FDI: Same wine, different bottles?" *Canadian Journal of Economics/Revue Canadienne d'Économique*, 51, 1151–1190.

Davies, R. B., J. Martin, M. Parenti, and F. Toubal (2018b): "Knocking on tax haven's door: Multinational firms and transfer pricing," *Review of Economics and Statistics*, 100, 120–134.

Davies, R. B., I. Siedschlag, and Z. Studnicka (2021): "The impact of taxes on the extensive and intensive margins of FDI," *International Tax and Public Finance*, 28, 434–464.

De Chaisemartin, C. and X. D'Haultfœuille (2020): "Two-way fixed effects estimators with heterogeneous treatment effects," *American Economic Review*, 110, 2964–2996.

De Paula, A. and J. A. Scheinkman (2011): "The informal sector: An equilibrium model and some empirical evidence from Brazil," *Review of Income and Wealth*, 57, S8–S26.

De Simone, L., C. McClure, and B. Stomberg (2022): "Examining the effects of the TCJA on executive compensation," *Contemporary Accounting Research*, forthcoming.

De Simone, L., J. Nickerson, J. K. Seidman, and B. Stomberg (2020): "How reliably do empirical tests identify tax avoidance?" *Contemporary Accounting Research*, 37, 1536–1561.

Demena, B. A. and P. A. van Bergeijk (2017): "A meta-analysis of FDI and productivity spillovers in developing countries," *Journal of Economic Surveys*, 31, 546–571.

Desai, M. A. and D. Dharmapala (2009): "Corporate tax avoidance and firm value," *Review of Economics and Statistics*, 91, 537–546.

Desai, M. A., C. F. Foley, and J. R. Hines (2004): "A multinational perspective on capital structure choice and internal capital markets," *Journal of Finance*, 59, 2451–2487.

Desai, M. A. and J. R. Hines (2002): "Expectations and expatriations: Tracing the causes and consequences of corporate inversions," *National Tax Journal*, 55, 409–440.

Devereux, M. P. and R. Griffith (2002): "The impact of corporate taxation on the location of capital: A review," *Swedish Economic Policy Review*, 9, 79–106.

——— (2003): "Evaluating tax policy for location decisions," *International Tax and Public Finance*, 10, 107–126.

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

Dischinger, M. and N. Riedel (2011): "Corporate taxes and the location of intangible assets within multinational firms," *Journal of Public Economics*, 95, 691–707.

Donangelo, A., F. Gourio, M. Kehrig, and M. Palacios (2019): "The cross-section of labor leverage and equity returns," *Journal of Financial Economics*, 132, 497–518.

Donohoe, M. P. (2015): "The economic effects of financial derivatives on corporate tax avoidance," *Journal of Accounting and Economics*, 59, 1–24.

Dowd, T., P. Landefeld, and A. Moore (2017): "Profit shifting of US multinationals," *Journal of Public Economics*, 148, 1–13.

Drucker, J. (2007): "Inside Wal-Mart's bid to slash state taxes – Ernst & Young devises complex strategies; California pushes back," *Wall Street Journal*, October 23.

Dudar, O., K. Nicolay, and H. Nusser (2016): "On the interdependency of profit shifting channels and the effectiveness of anti-avoidance legislation," *Proceedings – Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association*, 19, 1–17.

Dyreng, S., J. L. Hoopes, P. Langetieg, and J. H. Wilde (2020): "Strategic subsidiary disclosure," *Journal of Accounting Research*, 58, 643–692.

Dyreng, S. D., M. Hanlon, and E. L. Maydew (2008): "Long-run corporate tax avoidance," *Accounting Review*, 83, 61–82.

——— (2010): "The effects of executives on corporate tax avoidance," *Accounting Review*, 85, 1163–1189.

Dyreng, S. D., M. Hanlon, E. L. Maydew, and J. R. Thornock (2017): "Changes in corporate effective tax rates over the past 25 years," *Journal of Financial Economics*, 124, 441–463.

Dyreng, S. D. and B. P. Lindsey (2009): "Using financial accounting data to examine the effect of foreign operations located in tax havens and other countries on US multinational firms' tax rates," *Journal of Accounting Research*, 47, 1283–1316.

Egger, P., W. Eggert, C. Keuschnigg, and H. Winner (2010a): "Corporate taxation, debt financing and foreign-plant ownership," *European Economic Review*, 54, 96–107.

Egger, P., W. Eggert, and H. Winner (2010b): "Saving taxes through foreign plant ownership," *Journal of International Economics*, 81, 99–108.

Egger, P., S. Loretz, M. Pfaffermayr, and H. Winner (2009): "Firm-specific forward-looking effective tax rates," *International Tax and Public Finance*, 16, 850–870.

Egger, P. H. and G. Wamser (2015): "The impact of controlled foreign company legislation on real investments abroad. A multi-dimensional regression discontinuity design," *Journal of Public Economics*, 129, 77–91.

Eisfeldt, A. L. and D. Papanikolaou (2014): "The value and ownership of intangible capital," *American Economic Review*, 104, 189–94.

Falato, A., D. Kadyrzhanova, J. Sim, and R. Steri (2020): "Rising intangible capital, shrinking debt capacity, and the US corporate savings glut," *Journal of Finance*, forthcoming.

Faulkender, M. and J. Yang (2010): "Inside the black box: The role and composition of compensation peer groups," *Journal of Financial Economics*, 96, 257–270.

Feld, L. P. and J. H. Heckemeyer (2011): "FDI and taxation: A meta-study," *Journal of Economic Surveys*, 25, 233–272.

Ferrantino, M. J., X. Liu, and Z. Wang (2012): "Evasion behaviors of exporters and importers: Evidence from the US-China trade data discrepancy," *Journal of International Economics*, 86, 141–157.

Frank, M. M., L. J. Lynch, and S. O. Rego (2009): "Tax reporting aggressiveness and its relation to aggressive financial reporting," *Accounting Review*, 84, 467–496.

Fuest, C., S. Hebous, and N. Riedel (2011): "International debt shifting and multinational firms in developing economies," *Economics Letters*, 113, 135–138.

Fuest, C., A. Peichl, and S. Siegloch (2018): "Do higher corporate taxes reduce wages? Micro evidence from Germany," *American Economic Review*, 108, 393–418.

Gabaix, X. and A. Landier (2008): "Why has CEO pay increased so much?" *Quarterly Journal of Economics*, 123, 49–100.

Gabaix, X., A. Landier, and J. Sauvagnat (2014): "CEO pay and firm size: An update after the crisis," *Economic Journal*, 124, F40–F59.

Gaertner, F. B. (2014): "CEO after-tax compensation incentives and corporate tax avoidance," *Contemporary Accounting Research*, 31, 1077–1102.

Galiani, S. and F. Weinschelbaum (2012): "Modeling informality formally: Households and firms," *Economic Inquiry*, 50, 821–838.

Gallemore, J., B. Gipper, and E. Maydew (2019): "Banks as tax planning intermediaries," *Journal of Accounting Research*, 57, 169–209.

Garcia-Bernardo, J. and P. Janskỳ (2022): "Profit shifting of multinational corporations worldwide," *mimeo*.

Goerke, L. and M. Runkel (2011): "Tax evasion and competition," *Scottish Journal of Political Economy*, 58, 711–736.

Gokalp, O. N., S.-H. Lee, and M. W. Peng (2017): "Competition and corporate tax evasion: An institution-based view," *Journal of World Business*, 52, 258–269.

Goldbach, S., A. J. Nagengast, E. Steinmüller, and G. Wamser (2019): "The effect of investing abroad on investment at home: On the role of technology, tax savings, and internal capital markets," *Journal of International Economics*, 116, 58–73.

Gomila, R. (2021a): "Logistic or linear? Estimating causal effects of experimental treatments on binary outcomes using regression analysis," *Journal of Experimental Psychology: General*, 150, 700–709.

——— (2021b): "Logistic or linear? Estimating causal effects of experimental treatments on binary outcomes using regression analysis," *Journal of Experimental Psychology: General*, 150, 700–709.

Graham, J. R., S. Li, and J. Qiu (2012): "Managerial attributes and executive compensation," *Review of Financial Studies*, 25, 144–186.

Gravelle, J. (2013): "Corporate tax incidence: Review of general equilibrium estimates and analysis," *National Tax Journal*, 66, 185–215.

Greenaway, D. and R. Kneller (2007): "Firm heterogeneity, exporting and foreign direct investment," *Economic Journal*, 117, F134–F161.

Greenland, A., M. Ion, J. Lopresti, and P. Schott (2020): "Using equity market reactions to infer exposure to trade liberalization," *NBER Working Papers*, 27510.

Grieser, W., J. LeSage, and M. Zekhnini (2021): "Industry networks and the geography of firm behavior," *Management Science*.

Griffith, R., H. Miller, and M. O'Connell (2014): "Ownership of intellectual property and corporate taxation," *Journal of Public Economics*, 112, 12–23.

Grubert, H. (2003): "Intangible income, intercompany transactions, income shifting, and the choice of location," *National Tax Journal*, 56, 221–242.

——— (2012): "Foreign taxes and the growing share of US multinational company income abroad: Profits, not sales, are being globalized," *National Tax Journal*, 65, 247–282.

Guenther, D. (2014): "Measuring corporate tax avoidance: Effective tax rates and book-tax differences," *SSRN Working Papers*, 2478952.

Gulen, H. and M. Ion (2016): "Policy uncertainty and corporate investment," *Review of Financial Studies*, 29, 523–564.

Gumpert, A., J. R. Hines, and M. Schnitzer (2016): "Multinational firms and tax havens," *Review of Economics and Statistics*, 98, 713–727.

Gutiérrez, G. and T. Philippon (2017): "Declining competition and investment in the US," *NBER Working Papers*, 23583.

Guvenen, F., R. J. Mataloni, D. G. Rassier, and K. J. Ruhl (2022): "Offshore profit shifting and aggregate measurement: Balance of payments, foreign investment, productivity, and the labor share," *American Economic Review*, 112, 1848–84.

Haberly, D. and D. Wójcik (2015): "Tax havens and the production of offshore FDI: An empirical analysis," *Journal of Economic Geography*, 15, 75–101.

Hamori, M. and B. Koyuncu (2015): "Experience matters? The impact of prior CEO experience on firm performance," *Human Resource Management*, 54, 23–44.

Handley, K. and N. Limão (2017): "Policy uncertainty, trade, and welfare: Theory and evidence for China and the United States," *American Economic Review*, 107, 2731–83.

Hanlon, M. (2003): "What can we infer about a firm's taxable income from its financial statements?" *National Tax Journal*, 56, 831–863.

Hanlon, M. and S. Heitzman (2010): "A review of tax research," *Journal of Accounting and Economics*, 50, 127–178.

Harberger, A. C. (1962): "The incidence of the corporation income tax," *Journal of Political Economy*, 70, 215–240.

Hasan, M. M., G. J. Lobo, and B. Qiu (2021): "Organizational capital, corporate tax avoidance, and firm value," *Journal of Corporate Finance*, 70, 102050.

Haufler, A., M. Mardan, and D. Schindler (2018): "Double tax discrimination to attract FDI and fight profit shifting: The role of CFC rules," *Journal of International Economics*, 114, 25–43.

Head, K. and T. Mayer (2004): "Market potential and the location of Japanese investment in the European Union," *Review of Economics and Statistics*, 86, 959–972.

Hebous, S. and N. Johannesen (2021): "At your service! The role of tax havens in international trade with services," *European Economic Review*, 135, 103737.

Heckemeyer, J. H. and M. Overesch (2017): "Multinationals' profit response to tax differentials: Effect size and shifting channels," *Canadian Journal of Economics/Revue Canadienne d'Économique*, 50, 965–994.

Helpman, E. (2017): "Globalisation and wage inequality," *Journal of the British Academy*, 5, 125–162.

Helpman, E., O. Itskhoki, M.-A. Muendler, and S. J. Redding (2017): "Trade and inequality: From theory to estimation," *Review of Economic Studies*, 84, 357–405.

Helpman, E., M. J. Melitz, and S. R. Yeaple (2004): "Export versus FDI with heterogeneous firms," *American Economic Review*, 94, 300–316.

Henry, E. and R. Sansing (2018): "Corporate tax avoidance: Data truncation and loss firms," *Review of Accounting Studies*, 23, 1042–1070.

Herrmann, P. and D. K. Datta (2006): "CEO experiences: Effects on the choice of FDI entry mode," *Journal of Management Studies*, 43, 755–778.

Higgins, D., T. C. Omer, and J. D. Phillips (2015): "The influence of a firm's business strategy on its tax aggressiveness," *Contemporary Accounting Research*, 32, 674–702.

Hines, J. R. and E. M. Rice (1994): "Fiscal paradise: Foreign tax havens and American business," *Quarterly Journal of Economics*, 109, 149–182.

Hinz, J., A. Stammann, and J. Wanner (2020): "State dependence and unobserved heterogeneity in the extensive margin of trade," *mimeo*.

Hoffmann, F., D. S. Lee, and T. Lemieux (2020): "Growing income inequality in the United States and other advanced economies," *Journal of Economic Perspectives*, 34, 52–78.

Hoi, C. K., Q. Wu, and H. Zhang (2013): "Is corporate social responsibility (CSR) associated with tax avoidance? Evidence from irresponsible CSR activities," *Accounting Review*, 88, 2025–2059.

Hombert, J. and A. Matray (2018): "Can innovation help US manufacturing firms escape import competition from China?" *Journal of Finance*, 73, 2003–2039.

Hong, S. (2018): "Tax treaties and foreign direct investment: A network approach," *International Tax and Public Finance*, 25, 1277–1320.

Hoopes, J. L., D. Mescall, and J. A. Pittman (2012): "Do IRS audits deter corporate tax avoidance?" *Accounting Review*, 87, 1603–1639.

Horrace, W. C. and R. L. Oaxaca (2006): "Results on the bias and inconsistency of ordinary least squares for the linear probability model," *Economics Letters*, 90, 321–327.

Hsieh, C. and V. F. Willis (2015): "Executive compensation and tax haven subsidiaries," *Journal of Accounting and Finance*, 15, 11–22.

Hsieh, T.-S., Z. Wang, and S. Demirkan (2018): "Overconfidence and tax avoidance: The role of CEO and CFO interaction," *Journal of Accounting and Public Policy*, 37, 241–253.

Hsu, P.-H., J. A. Moore, and D. O. Neubaum (2018): "Tax avoidance, financial experts on the audit committee, and business strategy," *Journal of Business Finance & Accounting*, 45, 1293–1321.

Huizinga, H. and L. Laeven (2008): "International profit shifting within multinationals: A multi-country perspective," *Journal of Public Economics*, 92, 1164–1182.

Huizinga, H., L. Laeven, and G. Nicodème (2008): "Capital structure and international debt shifting," *Journal of Financial Economics*, 88, 80–118.

Humphery-Jenner, M., L. L. Lisic, V. Nanda, and S. D. Silveri (2016): "Executive overconfidence and compensation structure," *Journal of Financial Economics*, 119, 533–558.

Iacovone, L., F. Rauch, and L. A. Winters (2013): "Trade as an engine of creative destruction: Mexican experience with Chinese competition," *Journal of International Economics*, 89, 379–392.

Jacob, M. (2022): "Real effects of corporate taxation: A review," *European Accounting Review*, 31, 1–28.

Janskỳ, P. (2020): "European banks and tax havens: Evidence from country-by-country reporting," *Applied Economics*, 52, 5967–5985.

Janskỳ, P., M. Meinzer, and M. Palanskỳ (2021): "Is Panama really your tax haven? Secrecy jurisdictions and the countries they harm," *Regulation & Governance*.

Janskỳ, P. and M. Palanskỳ (2019): "Estimating the scale of profit shifting and tax revenue losses related to foreign direct investment," *International Tax and Public Finance*, 26, 1048–1103.

Jaumotte, F., S. Lall, and C. Papageorgiou (2013): "Rising income inequality: Technology, or trade and financial globalization?" *IMF Economic Review*, 61, 271–309.

Johannesen, N., T. Tørsløv, and L. Wier (2020): "Are less developed countries more exposed to multinational tax avoidance? Method and evidence from micro-data," *World Bank Economic Review*, 34, 790–809.

Johansson, A., O. B. Skeie, S. Sorbe, and C. Menon (2017): "Tax planning by multinational firms: Firm-level evidence from a cross-country database," *OECD Economics Department Working Papers*, 1355.

Jones, C. and Y. Temouri (2016): "The determinants of tax haven FDI," *Journal of World Business*, 51, 237–250.

Jones, C., Y. Temouri, and A. Cobham (2018): "Tax haven networks and the role of the Big 4 accountancy firms," *Journal of World Business*, 53, 177–193.

Karkinsky, T. and N. Riedel (2012): "Corporate taxation and the choice of patent location within multinational firms," *Journal of International Economics*, 88, 176–185.

Khan, M., S. Srinivasan, and L. Tan (2016): "Institutional ownership and corporate tax avoidance: New evidence," *Accounting Review*, 92, 101–122.

Kim, C. and L. Zhang (2016): "Corporate political connections and tax aggressiveness," *Contemporary Accounting Research*, 33, 78–114.

Kim, J.-B., Y. Li, and L. Zhang (2011): "Corporate tax avoidance and stock price crash risk: Firm-level analysis," *Journal of Financial Economics*, 100, 639–662.

Kimura, F. and K. Kiyota (2006): "Exports, FDI, and productivity: Dynamic evidence from Japanese firms," *Review of World Economics*, 142, 695–719.

Klassen, K. J. and S. K. Laplante (2012): "Are US multinational corporations becoming more aggressive income shifters?" *Journal of Accounting Research*, 50, 1245–1285.

Kovermann, J. and P. Velte (2019): "The impact of corporate governance on corporate tax avoidance: A literature review," *Journal of International Accounting, Auditing and Taxation*, 36, 100270.

Krautheim, S. and T. Schmidt-Eisenlohr (2011): "Heterogeneous firms, 'profit shifting' FDI and international tax competition," *Journal of Public Economics*, 95, 122–133.

——— (2016): "Wages and international tax competition," *Review of International Economics*, 24, 893–923.

Kubick, T. R. and G. B. Lockhart (2017): "Overconfidence, CEO awards, and corporate tax aggressiveness," *Journal of Business Finance & Accounting*, 44, 728–754.

Laffitte, S., J. Martin, M. Parenti, B. Souillard, and F. Toubal (2021): "Taxation of multinationals: Design and quantification," *Focus du Conseil d'Analyse Économique*, 64, 1–13.

Laffitte, S. and F. Toubal (2021): "Multinationals' sales and profit shifting in tax havens," *American Economic Journal: Economic Policy*, forthcoming.

Langenmayr, D. (2015): "Limiting profit shifting in a model with heterogeneous firm productivity," *BE Journal of Economic Analysis & Policy*, 15, 1657–1677.

Lanis, R. and G. Richardson (2011): "The effect of board of director composition on corporate tax aggressiveness," *Journal of Accounting and Public Policy*, 30, 50–70.

Lanz, R. and S. Miroudot (2011): "Intra-firm trade: Patterns, determinants and policy implications," *OECD Trade Policy Papers*, 114.

Law, K. K. and L. F. Mills (2017): "Military experience and corporate tax avoidance," *Review of Accounting Studies*, 22, 141–184.

Lawless, M., D. McCoy, E. L. Morgenroth, and C. M. O" Toole (2018): "Corporate tax and location choice for multinational firms," *Applied Economics*, 50, 2920–2931.

Le, S. and M. Kroll (2017): "CEO international experience: Effects on strategic change and firm performance," *Journal of International Business Studies*, 48, 573–595.

Lenoir, C. and B. Patault (2019): "Sales managers, poaching and network transmission in international markets," *mimeo*.

Lev, B. and D. Nissim (2004): "Taxable income, future earnings, and equity values," *Accounting Review*, 79, 1039–1074.

Li, M. and P. C. Patel (2019): "Jack of all, master of all? CEO generalist experience and firm performance," *The Leadership Quarterly*, 30, 320–334.

Li, Q., M. S. Ma, and T. Shevlin (2021): "The effect of tax avoidance crackdown on corporate innovation," *Journal of Accounting and Economics*, 71, 101382.

Lim, C. Y., T. J. Shevlin, K. Wang, and Y. Xu (2018): "Tax knowledge diffusion through individual auditor network ties: Evidence from China," *SSRN Working Papers*, 3229564.

Liu, L., T. Schmidt-Eisenlohr, and D. Guo (2020): "International transfer pricing and tax avoidance: Evidence from linked trade-tax statistics in the United Kingdom," *Review of Economics and Statistics*, 102, 766–778.

Lohse, T. and N. Riedel (2013): "Do transfer pricing laws limit international income shifting? Evidence from European multinationals," *CESifo Working Papers*, 4404.

Lööf, H. and I. Viklund-Ros (2020): "Board of directors and export spillovers: What is the impact on extensive margins of trade?" *The World Economy*, 43, 1188–1215.

López Forero, M. (2022): "Aggregate labor share and tax havens: Things are not always what they seem," *mimeo*.

Marchal, L. and C. Nedoncelle (2019): "Immigrants, occupations and firm export performance," *Review of International Economics*, 27, 1480–1509.

Marques, M. and C. Pinho (2016): "Is transfer pricing strictness deterring profit shifting within multinationals? Empirical evidence from Europe," *Accounting and Business Research*, 46, 703–730.

Marrelli, M. and R. Martina (1988): "Tax evasion and strategic behaviour of the firms," *Journal of Public Economics*, 37, 55–69.

Martin, J., M. Parenti, and F. Toubal (2022): "Corporate tax avoidance and sales: Micro evidence and aggregate implications," *mimeo*.

McGuire, S. T., D. Wang, and R. J. Wilson (2014): "Dual class ownership and tax avoidance," *Accounting Review*, 89, 1487–1516.

Meinen, P., P. Parrotta, D. Sala, and E. Yalcin (2018): "Managers as knowledge carriers – Explaining firms' internationalization success with manager mobility," *CESifo Working Papers*, 7126.

Merlo, V., N. Riedel, and G. Wamser (2020): "The impact of thin-capitalization rules on the location of multinational firms' foreign affiliates," *Review of International Economics*, 28, 35–61.

Merz, J. and M. Overesch (2016): "Profit shifting and tax response of multinational banks," *Journal of Banking & Finance*, 68, 57–68.

Mion, G. and L. D. Opromolla (2014): "Managers' mobility, trade performance, and wages," *Journal of International Economics*, 94, 85–101.

Mion, G., L. D. Opromolla, and A. Sforza (2019): "The diffusion of knowledge via managers' mobility," *mimeo*.

Mion, G. and L. Zhu (2013): "Import competition from and offshoring to China: A curse or blessing for firms?" *Journal of International Economics*, 89, 202–215.

Mishel, L. and J. Wolfe (2019): "CEO compensation has grown 940% since 1978," *Economic Policy Institute*, August 14.

Moriconi, S., G. Peri, and D. Pozzoli (2020): "The role of institutions and immigrant networks in firms' offshoring decisions," *Canadian Journal of Economics/Revue Canadienne d'Économique*, 53, 1745–1792.

Na, K. and W. Yan (2021): "Languages and corporate tax avoidance," *Review of Accounting Studies*, 1–37.

Nakamoto, T., O. Rouhban, and Y. Ikeda (2020): "Location-sector analysis of international profit shifting on a multilayer ownership-tax network," *Evolutionary and Institutional Economics Review*, 17, 219–241.

Nielsen, S. B., P. Raimondos-Møller, and G. Schjelderup (2010): "Company taxation and tax spillovers: Separate accounting versus formula apportionment," *European Economic Review*, 54, 121–132.

OCDE (2015): *Measuring and monitoring BEPS, Action 11 - 2015 Final Report*, OECD Paris.

OECD (2020): *Tax challenges arising from digitalisation – Economic impact assessment: Inclusive Framework on BEPS*, OECD Paris.

Ogle, V. (2020): "'Funk Money': The end of empires, the expansion of tax havens, and decolonization as an economic and financial event," *Past & Present*, 249, 213–249.

Oi, W. Y. and T. L. Idson (1999): "Firm size and wages," in *Handbook of Labor Economics*, Elsevier, vol. 3, 2165–2214.

Olsen, K. J. and J. Stekelberg (2016): "CEO narcissism and corporate tax sheltering," *Journal of the American Taxation Association*, 38, 1–22.

Overesch, M. (2009): "The effects of multinationals' profit shifting activities on real investments," *National Tax Journal*, 62, 5–23.

Overesch, M. and G. Wamser (2010): "Corporate tax planning and thin-capitalization rules: Evidence from a quasi-experiment," *Applied Economics*, 42, 563–573.

Overesch, M. and H. Wolff (2021): "Financial transparency to the rescue: Effects of public Country-by-Country Reporting in the European Union banking sector on tax avoidance," *Contemporary Accounting Research*, 38, 1616–1642.

Parrotta, P., D. Pozzoli, and D. Sala (2016): "Ethnic diversity and firms' export behavior," *European Economic Review*, 89, 248–263.

Peters, R. H. and L. A. Taylor (2017): "Intangible capital and the investment-q relation," *Journal of Financial Economics*, 123, 251–272.

Pierce, J. R. and P. K. Schott (2016): "The surprisingly swift decline of US manufacturing employment," *American Economic Review*, 106, 1632–62.

Prettl, A. and D. von Hagen (2022): "Multinational ownership patterns and anti-tax avoidance legislation," *International Tax and Public Finance*, 1–70.

Rathke, A. A., A. J. Rezende, and C. Watrin (2021): "The impact of countries' transfer pricing rules on profit shifting," *Journal of Applied Accounting Research*, 21, 22–49.

Ravallion, M. (2018): "Inequality and globalization: A review essay," *Journal of Economic Literature*, 56, 620–42.

Rego, S. O. and R. Wilson (2012): "Equity risk incentives and corporate tax aggressiveness," *Journal of Accounting Research*, 50, 775–810.

Reiter, F., D. Langenmayr, and S. Holtmann (2021): "Avoiding taxes: Banks' use of internal debt," *International Tax and Public Finance*, 28, 717–745.

Richardson, G., B. Wang, and X. Zhang (2016): "Ownership structure and corporate tax avoidance: Evidence from publicly listed private firms in China," *Journal of Contemporary Accounting & Economics*, 12, 141–158.

Riedel, N. (2018): "Quantifying international tax avoidance: A review of the academic literature," *Review of Economics*, 69, 169–181.

Rodrik, D. (2018): "Populism and the economics of globalization," *Journal of International Business Policy*, 1, 1–22.

Sala, D. and E. Yalcin (2015): "Export experience of managers and the internationalisation of firms," *The World Economy*, 38, 1064–1089.

Saunders-Scott, M. J. (2015): "Substitution across methods of profit shifting," *National Tax Journal*, 68, 1099–1119.

Sauvagnat, J. and F. Schivardi (2020): "Are executives in short supply? Evidence from death events," *CEPR Working Papers*, 14334.

Schjelderup, G. (2016): "Secrecy jurisdictions," *International Tax and Public Finance*, 23, 168–189.

Schott, P. K. (2008): "The relative sophistication of Chinese exports," *Economic Policy*, 23, 6–49.

Shen, Y., D. Gao, D. Bu, L. Yan, and P. Chen (2019): "CEO hometown ties and tax avoidance - Evidence from China's listed firms," *Accounting & Finance*, 58, 1549–1580.

Shevlin, T., L. Shivakumar, and O. Urcan (2019): "Macroeconomic effects of corporate tax policy," *Journal of Accounting and Economics*, 68, 101233.

Sikka, P. (2003): "The role of offshore financial centres in globalization," *Accounting Forum*, 27, 365–399.

Skidmore, D. and W. Gates (1997): "After Tiananmen: The struggle over US policy toward China in the Bush administration," *Presidential Studies Quarterly*, 27, 514–539.

Souillard, B. (2022a): "Executive experience and expansion strategies of multinational firms," *SSRN Working Papers*, 3700932.

——— (2022b): "Intra-industry spillovers of profit shifting and tax haven FDIs," *SSRN Working Papers*, 3796015.

Stock, J. and M. Yogo (2005): "Testing for weak instruments in linear IV regression," in *Identification and Inference for Econometric Models*, ed. by D. W. Andrews, Cambridge University Press, 80–108.

Suárez Serrato, J. C. (2019): "Unintended consequences of eliminating tax havens," *NBER Working Papers*, 24850.

Swenson, D. L. (2001): "Tax reforms and evidence of transfer pricing," *National Tax Journal*, 54, 7–25.

Taylor, G. and G. Richardson (2014): "Incentives for corporate tax planning and reporting: Empirical evidence from Australia," *Journal of Contemporary Accounting & Economics*, 10, 1–15.

Todtenhaupt, M. and J. Voget (2021): "International taxation and productivity effects of M&As," *Journal of International Economics*, 131, 103438.

Tørsløv, T. R., L. S. Wier, and G. Zucman (2021): "The missing profits of nations," *NBER Working Papers*, 24701.

UNCTAD (2022): "World Investment Report 2022: International tax reforms and sustainable investment," UNCTAD – United Nations Publication.

US Senate Permanent Subcommittee on Investigations (2014): "Caterpillar's offshore tax strategy," *technical report*.

Utar, H. (2014): "When the floodgates open: Northern firms' response to removal of trade quotas on Chinese goods," *American Economic Journal: Applied Economics*, 6, 226–50.

Utar, H. and L. B. T. Ruiz (2013): "International competition and industrial evolution: Evidence from the impact of Chinese competition on Mexican maquiladoras," *Journal of Development Economics*, 105, 267–287.

Walter, S. (2021): "The backlash against globalization," *Annual Review of Political Science*, 24, 421–442.

Wamser, G. (2014): "The impact of thin-capitalization rules on external debt usage: A propensity score matching approach," *Oxford Bulletin of Economics and Statistics*, 76, 764–781.

Wang, F., S. Xu, J. Sun, and C. P. Cullinan (2020): "Corporate tax avoidance: A literature review and research agenda," *Journal of Economic Surveys*, 34, 793–811.

Weichenrieder, A. J. (2009): "Profit shifting in the EU: Evidence from Germany," *International Tax and Public Finance*, 16, 281–297.

Weidner, M. and T. Zylkin (2021): "Bias and consistency in three-way gravity models," *Journal of International Economics*, 132, 103513.

Wu, J. G., J. Zhang, Y. Wu, and D. Kong (2020): "When to go abroad: Economic policy uncertainty and Chinese firms' overseas investment," *Accounting & Finance*, 60, 1435–1470.