Monitoring Tax Compliance by Multinationals Evidence from a Natural Experiment in Chile *

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Abstract

As the economy becomes increasingly globally integrated, a growing share of the global production comes from multinational firms. Taxing such corporations is particularly challenging, as they can shift their profits across borders towards subsidiaries in lower tax jurisdictions, thereby avoiding taxes in higher tax locations. To reduce such tax avoidance, international regulation based on OECD norms aims to increase monitoring of such profit shifting. This paper analyses the introduction of these norms in the case of Chile. We exploit administrative micro tax data containing information on the cross-border real and financial transactions conducted by Chilean firms. In 2011, Chile introduced the OECD norms, which considerably increased the reporting requirements and monitoring of intra-group transactions by firms with foreign affiliates. We employ a difference-in-differences event study approach to estimate the impacts of this reform. Preliminary results indicate that the reform led to a 1.1%(non-significant) increase in tax payments, significantly below government expectations.

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1 Introduction

How to tax multinational companies has been at the forefront of global policy debate in recent years. A body of evidence suggests that multinationals artificially shift a large fraction of their profits to low-tax locales. Half of the foreign profits of US firms, for example, are booked in Bermuda, Luxembourg, Switzerland, the Netherlands, Singapore, Ireland, and a handful of Caribbean islands (e.g., Clausing, 2011). By one estimate (Zucman, 2014), this shifting is on the rise and enables US firms to save about $130 billion a year on taxes in the countries where they have real activity—including the United States, large European countries, and developing countries. Multinationals from other regions have similar incentives, suggesting that the global revenue losses due to multinational corporate tax avoidance may be sizable. This issue is particularly salient in developing countries, for many of whom building tax capacity is a key policy goal, both to finance public infrastructure and services and to reduce distortions in the economy.

There is a lively debate on how to curb multinational tax avoidance. On the one hand, the OECD encourages governments to spend more resources enforcing the rules that currently govern the taxation of multinationals. According to these rules, which were invented in the 1920s, the Chilean and British affiliates of a given multinational group are taxed separately: whatever profit is made in Chile is taxable in Chile, whatever is made in the UK is taxable in the UK. To determine where profits have been made, transactions between subsidiaries must be conducted at arm's length, that is, as if the the subsidiaries were unrelated, using the market price of the goods and services exchanged. These rules are applied by the vast majority of countries but enforced with a great deal of heterogeneity. The OECD is in charge of providing guidance on how to make this system work; along with G20 countries it has launched an ambitious plan to strengthen it (Organization for Economic Co-operation and Development, 2015).

Critics argue that the OECD system is not adapted to today's world (e.g., Independent Commission for the Reform of International Corporate Taxation, 2015). A number of countries do not tax corporate profits; by manipulating the price of their intra-group transactions, firms can shift their profits to these havens and considerably reduce their global tax bill. It is difficult and costly for tax authorities to monitor intra-group transactions, and a growing number of such transactions (such as the sale of intangible capital) have no market price,

giving ample scope for firms to artificially shift their profits to tax havens. In that context, devoting extra resources to enforcing the OECD system might simply lead to a wasteful expenditure of resources by tax authorities and corporations, with little increase in tax collection and possibly lower welfare in the end. Avi-Yonah et al. (2007) and the Independent Commission for the Reform of International Corporate Taxation (2015), among others, thus call for a rethinking of the way governments tax multinational firms, for instance by starting from the consolidated profits of multinationals and apportioning them across countries using some formula, similar to the way US States tax corporate profits.

This paper asks a simple question: in today's globalized world with tax havens and growing intangible capital, does better enforcing the century-old way of taxing multinationals improve welfare, or does it lead to a wasteful expenditure of resources? This is one of the core debates in tax policy, with large implications for government revenue and inequality. It's an especially important question for developing countries, where foreign multinationals account for a large fraction of domestic economic activity—hence could generate sizable tax revenue—but where tax authorities have limited resources to monitor foreign firms and conduct audits.

Until now, it has proven difficult to shed light on what happens when governments try to better enforce the OECD system, mainly because of a lack of quasi-experimental sources of variation and appropriate micro-data. While national accounts data can help quantify the government revenue losses involved in corporate tax avoidance, they usually are not detailed enough to provide causal evidence on the effect of enforcement policies.

In this paper, we draw on administrative micro-level tax and customs data to assess the impact of enforcing the core OECD rules in an emerging economy, using a difference-in-difference estimation strategy similar to that applied in Yagan (2015). Before 2011, firms in Chile did not have to report intra-group transactions, and there was no specialized tax unit within the tax authority to enforce compliance—as is still the case in most developing countries today. Starting in 2011, against the backdrop of its joining the OECD, Chile increased the reporting requirements of intra-group transactions, changed the burden of proof for the correct valuation of these transactions from the tax authority to the firm, strongly increased the monitoring of international transactions, and hired new tax auditors devoted to these tasks. Chile is an ideal laboratory to study the impact of such changes, because the tax authority collects detailed data on the cross-border real and financial transactions of all

firms. These data can be matched to corporate income tax statements, making it possible to have a comprehensive and direct view of the ways in which multinational firms shift profits to offshore tax havens. This is a key advantage relative to the accounting data used in the literature so far, which do not provide information on cross-border payments (hence do not allow to observe profit-shifting directly) and usually do not include information on taxable profits (but only on accounting profits). We use the Chilean administrative data to make two contributions.

First, we combine macro-economic national accounts and balance of payments with the administrative micro-data to document how Chilean firms use offshore tax havens. We describe the key patterns on the cross-border flows of goods, services, interest, royalty and dividend payments that involve Chilean firms, and relate them to their tax payments. To our knowledge, this is the first time that such an exercise has been conducted in any country.

Second, and more importantly, we analyze how the Chilean reform affected the use of tax havens and the taxes paid by Chilean firms. Our causal identification strategy is based on an event study approach, drawing on two different comparisons. First, we compare Chilean firms that belong to multinational groups with internationally-active Chilean firms that are not part of a multinational group. Second, we compare firms that are part of a multinational group to firms that are part of a network containing affiliates in known tax havens[1]. As we will demonstrate, both of these groups possess similar characteristics, which may be impacted by the reform in similar ways. The key distinction, however, being that any of the new regulation's aspects specific to profit shifting will have differentially changed the behavior of the firms affiliated with tax havens. We examine these patterns conducting a difference-in-difference analysis including three years prior to the reform and five years after.

The lessons drawn from Chile are likely to be informative for many other economies. A number of developing countries, in particular, have recently introduced regulations similar to Chile's, including Bangladesh (in 2014), Ghana (2012), and Uganda (2011), see Ernst and Young (2014). Others are considering doing so in the future, including Mozambique, and Myanmar. All of these countries face the same problem when trying to tax multinational firms—the artificial shifting of profits to low-tax locales through the manipulation of intra-group transactions.

This paper contributes to a growing literature that investigates the challenges of tax en-

[1]As defined by the Chilean tax authority, for details see Appendix B.

forcement in developing countries. Significant attention has been devoted to the challenges raised by informality and the lack of paper trails (e.g., Kopczuk and Slemrod (2006); Kleven et al. (2009); Gordon and Li (2009); Kleven et al. (2011); Besley and Persson (2013); Carrillo et al. (2012); Carillo et al. (forthcoming); Best et al. (2015); Pomeranz (2015)). Less attention has been paid to large multinational firms, from which a much larger chunk of corporate tax revenue originates. We also contribute to the literature on the taxation of multinational firms. A large body of work investigates the shifting of corporate profits to low-tax jurisdictions (see, e.g., Grubert and Mutti (1991); Hines and Rice (1994); Huizinga and Laeven (2008); Dharmapala (2014) provides a recent survey). Within this literature, our paper is closely related to the work by Lohse and Riedel (2013) that looks at whether transfer pricing legislation restrict shifting in a panel of European multinationals. The difference with our work is that we use a quasi-experimental source of variation, we are able to observe profit-shifting to offshore havens and corporate tax payments directly, and we work in a developing countries context using exhaustive administrative data.[2]

Section 2 begins by presenting our data and a number of summary statistics about the corporate profits, taxes, and cross-border activities of Chilean firms. In Section 3, we describe the 2011 Chilean reform and what could be expected from it. Section 4 presents our estimation strategy and data. Section 5.1 discusses our estimates of the impact of the reform. We conclude in Section 6 by outlining a number of steps we plan to investigate in the future.

2 The Use of Tax Havens by Chilean Firms

2.1 Data Sources: Administrative Customs and Tax Returns

For our analysis we combine several administrative databases from customs and tax filings. Customs data includes all imports and exports of goods as well as some services at the transaction-level, separated by each product category for each firm. Tax data includes annual corporate income tax returns (F22 Form), monthly VAT tax returns (F29 Form), and a number of specialized tax forms or affidavits related to international transactions of corporations. Among the latter, we mostly rely on data from the F50 Form, which is used to declare an "Additional Tax", accruing from a multitude of activities, including financial

[2]Other studies that look at the effectiveness of legislation which aim to limit profit-shifting include Buettner et al. (2012), Hebous et al. (2011) and Cristea and Nguyen (2013).

flows to affiliates abroad. Similarly, the affidavits as well record such activities. However, they are used to declare the transactions themselves instead of the tax liabilities stemming from them.[3] For all these sources, we have compiled data spanning the entire timespan subject to this study with the exception of Affidavit 1907, which was only introduced as part of the tax reform. The tax forms F22 and F50 may furthermore be amended by the firms after the initial filing. Hoping to distinguish genuine error corrections from belated compliance, we factor all amendments made within eight months from the initial filing into the aggregates that we analyze. All firms operating in Chile have to file corporate income tax and VAT returns; all branches of foreign firms need to be incorporated and file returns. Affidavits 1850, 1860, and later 1912 need to be filed by all firms conducting international transactions of dividends, interest, royalties and wages paid to firms abroad. Affidavit 1907 needs to be filed by all firms of at least medium size who have transactions with related foreign affiliates. The Chilean Tax Authority is known for the quality of its administrative tax records and the high qualifications and low levels corruption of its officials (Kaufmann et al., 2009).[4]

The Chilean data are unique in that they enable us to have a comprehensive and direct view of the ways in which firms artificially shift profits to tax havens. There are three main ways through which such shifting occurs (see, e.g., Heckemeyer and Overesch (2013) for a survey of papers evaluating their relative importance). The first involves loans: multinational firms locate their intra-group banks in low tax countries, or in countries where interest is not taxed much, such as Belgium. The banks then grant loans to Chilean firms, generating interest expenses in Chile that reduce the corporate tax base there. A second way involves transferring intangible assets—such as exploitation rights and patents—to holding companies located in zero-tax countries like Bermuda. Affiliates in Chile then pay royalties to the offshore holding in order to have the right to use the assets, which again reduces the tax base in Chile. Last, multinationals can manipulate transfer prices, the prices at which firms exchange goods and services internally. A Chilean copper producer, for instance, can sell

[3]In concrete terms, the following transactions are recorded on each affidavit: flows of dividends, interest, royalties and wages paid to firms abroad (Affidavit 1850, replaced by Affidavit 1912 after 2014), cross-border loans and fees with foreign financial institutions (Affidavit 1860), and real and financial transactions conducted with related foreign affiliates, as well as information about how prices for transactions with such affiliates are calculated (Affidavit 1907).

[4]The high confidence placed in Chilean data also enables us to consistently treat empty filings as explicit zero-declarations if any filing of the respective form has taken place in a given period and no other reason would imply obvious errors. This also corresponds to the legal interpretation by the Chilean tax authority.

copper to its Irish parent at artificially low prices, so as to make profits appear in Ireland, where the corporate tax rate lower than in Chile. Profit-shifting through intra-group loans and the offshoring of intangible involves financial transactions (payments of interest and royalties), while transfer mis-pricing involves real transactions (exports and imports).

2.2 Corporate Profits and Taxes: Basic Orders of Magnitude

We first start by describing the main patterns in the corporate profits, taxes paid, and the cross-border flows of goods, services, interest, royalty, and dividend payments of Chilean firms. Throughout this (at this stage incomplete) section, all monetary figures are reported in current US dollars using year-average market exchange rates.

Chilean firms are overall highly profitable. National accounts data show that the capital share of corporate value-added (that is, gross corporate profits divided by gross corporate value-added) averaged 58% over the 2008-2013 period, a high figure by international standard, and one that is more typical of lower-income countries than Chile. About a quarter of Chilean domestic corporate profits accrue to foreign owners (either paid abroad in the form of dividends or retained locally by Chilean subsidiaries of foreign multinationals).

2.3 Where do Chilean Corporate Profits Go?

Figure 1 provides a decomposition of payments by Chilean firms to firms abroad by type of affiliation in our final sample. "Controllers" is defined as firms (or natural persons) abroad that have any type of control over the firm in Chile (either managerial or ownership control), controlled are firms that are under the control of the firm in Chile, and "third party" are foreign firms (or natural persons) that posses a common controller with the firm in Chile.

As expected, a large proportion of copyright goes to affiliates abroad, but this also holds for professional services and payments classified as "others" [5]. On the other hand, interests are mostly paid to non-related firms. A big part of payments because of insurance and reinsurance went to affiliates before the reform, and it decreases in 2011; however, this change may be related to some legal changes that allow Chilean firms to get better reinsurance deals. Transport and leasing is another group of payments abroad with an interesting pattern, however, the amount of pay seems irrelevant.

[5] "other payments" are any other type of unprecisely defined payment abroad considered in the Chilean law, we are working on having a more precise economic characterization and definition of these payments

3 The Chilean Tax Reform of 2011

Starting in 2011, Chile made a number of fundamental changes to its tax enforcement policy of multinational firms. The reform was designed to address all the potential sources of profit-shifting, whether through financial or real transactions. Prior to the reform, the tax authority had only limited information on the activities of multinational companies. Hence the tax authority did not try to enforce any sets of particular rules on how intra-group transactions should be conducted. In 2010, Chile became the first South American country to join the OECD. As part of the accession process, it committed to implementing the OECD rules on the pricing of intra-group transactions. According to these rules, transactions between subsidiaries of a multinational company should be conducted at arm's length, at the market price of the goods and services traded, as if the subsidiaries were unrelated.

The Chilean reform involved an increase in the resources devoted to enforcing taxes on multinational firms, changes to the law, and an expansion of the data collected by the tax authority. First, in 2011 the tax authority significantly expanded the resources it devotes to trying to enforce taxes on multinational companies. It hired new tax auditors devoted to these tasks. Second, in 2011 Chile started preparing a reform of its tax law which passed by Congress in 2012. The new law introduced new reporting requirements for transactions with related firms and defined what "related parties" are. It follows the OECD (2010) guidelines as to how cross-border transactions between related parties should be valued. The tax authority introduced a new transfer pricing information return, Affidavit1907. In Affidavit1907, affiliates of multinational companies have to report all transactions they conduct with related parties abroad, both real (exports and imports of goods and services) and financial (payments of interest, dividends, and royalties). Affidavit 1907 requires firms to provide detailed information on the methods they use to price their intra group transactions.

Whether better monitoring of intra-group transactions significantly improves tax collection (or welfare) is not obvious on a priori grounds. Firms have incentives to manipulate transfer prices. Enforcing arm's length rules surely has the potential to limit blatant abuses, but because there are millions of intra-group transactions every year, tax authorities cannot check that all (or even most) of them are correctly priced. There is evidence of significant transfer mis-pricing even in countries with large resources devoted to monitoring intra-group transactions, such as the United States. Clausing (2003), for instance, finds that controlling

for other variables that affect trade, lower foreign tax rates are associated with lower US intra-firm export prices and higher import prices. In addition, a growing number of intra-group transactions, such as the sale of proprietary trademarks, logos, and algorithms, are not replicated between third-parties. In these cases, there is no market price that tax authorities can refer to, leaving considerable leeway for firms to pick the price that will minimize their taxes. In this context, devoting extra resources to monitoring transfer pricing might trigger significant expenditures for both tax authorities and firms (in the form of tax and accounting advice) without increasing in tax collection–thus lowering welfare.

4 Data and Estimation Strategy

4.1 Sample

We have access to information on the universe of internationally active Chilean firms, that is, those which have made at least one international transaction (whether real or financial) between 2007 and 2015. Within this sample, we concentrate our analysis on those firms that were affected by the adapted transfer pricing legislation due to having declared either an affiliate relationship abroad or any financial transaction with tax havens on one of the Affidavits at any point in time.[6] This is done in order to concentrate our analysis on that section of our vast study universe where profit shifting is ex ante most likely to occur. Moreover, these firms account for the majority of employment, sales, profits, and taxes paid by Chilean firms. This raw sample contains 5,445 unique tax IDs. From that starting point, we restrict the sample to firms that have filed a corporate income tax form at least once both before and after the reform in 2010 (4,240 firms). Furthermore, we exclude all firms that are classified as natural persons, and we include only medium and large firms [7] firms with possitive costs and labor costs very year (2,753 firms). In a second step, among these firms 1,606 are identified as tax haven affiliates[8]. We focus on comparing the 2,753 firms with affiliates with a group of 11,331 domestic firms that accomplish the previous criteria. We also compare tax haven affiliates and non-tax haven affiliates within the set of firms affected by the reform to study whether the reform has greater impact among firms operating in tax

[6]This specific definition was chosen to most closely follow the legal criteria employed by the Chilean tax authority in order to designate the set of firms subjected to the legal obligations regarding profit shifting introduced in 2011.

[7]according to the classification of the Chilean Tax Authority

[8]As defined by the Chilean tax authority, for details see Appendix B.

havens, compared to firms also affected by the reform but not active in tax havens.

The reason for the concentration of sales in affiliates is that affiliates of multinational firms are on average larger than internationally-active non-affiliates. They sell more, trade more, have higher profits, assets, and pay more taxes. This raises the following problem: imagine that the reform has no impact on corporate taxes paid, but that all firms are growing at the same rate post-reform. Then a naive difference-in-difference estimation of the causal impact of the reform on the amounts of corporate taxes paid would find a spurious, positive effect—even if control and treated firms were following parallel trends pre-reform.

4.2 Estimation Strategy

Our identification assumption is that, absent the reform, both tax haven affiliates and other affiliates would have evolved similarly. One way to test this assumption is to investigate whether they indeed evolved similarly before the reform, i.e.over the 2007-2010 period. This is analyzed using a set of balance variables including: domestic sales, corporate tax paid, earnings before interests and taxes (EBIT) as well as payments abroad for interest, services, and royalties. Another way of checking our identification assumption is to analyze the reform's effect on an outcome that should not be differentially impacted in tax haven affiliates and other affiliates. We use domestic sales as our "placebo" outcome to further corroborate our identification strategy.

After these checks, we investigate the impact of the reform on key fiscal traces of corporate activity: Corporate taxes paid, EBIT, import & export prices, and payments abroad. Interest, services, and copyrihts abroad are some of the main channels through which the reform may have affected corporate profit shifting.

To estimate the impact of the reform on an outcome y, we run the following regressions on our sample of those firms affected by the reform:

$$\frac{y_{i,t}}{p_{i,t}} = \alpha_0 + \alpha_1 \mathrm{D}_t + \alpha_2 \mathrm{D}_t \times \mathrm{Treated}_i + \alpha 3 \mathrm{Treated}_i + \alpha_4 \times \mathrm{X} + \epsilon_{it} \tag{1}$$

where $y_{i,t}$ denotes our variables of interest—e.g., taxes paid—by firm i in year t, this variable is divided by the contemporary payroll of the firm , $p_{i,t}$. $\mathrm{Treated}_i$ is a dummy equal to 1 if i has an affiliate firm abroad and zero otherwise, D_t a dummy equal to 1 if year t is

2011 or larger. In Equation (1), we also include fixed effect by year, fixed effect by firm and the following controlls: size × year, sector × year, and technology × year [9]. Error are clustered at the firm level and the evaluated period cover the pre treatment years 2007 to 2009 (plus 2010 as placebo year) and the port-treatment years 2011 to 2014. The coefficient of interest is α_2, the difference-in-differences estimator. Equation (1) is estimated using OLS. We also estimates the effect comparing firms with connections in tax haven countries to other multinational firms, in that case, Treated_i is a dummy equal to 1 if i report an affiliation to a firm in a tax haven countri and zero if only report affiliation in tax haven countries.

For each of our outcomes of interest y, we investigate the impact of the 2011 reform on the winsorization (at the 99th percentile) of the outcome divided by payroll. Winsorizing removes the influence of large outliers. Dividing the outcome by payroll allow us to scale the outcome, this is required given that treated firms are notoriously larger than control firms (as ilustrated in 1) and any differential change between larger and smaller firms may create spurious results otherwise.

In addition to regression tables, we provide graphical representation of the time pattern of the impacts using event-study style graphs, similar to e.g. Greenstone et al. (2010). These figures display the evolution of the difference in outcomes between treated and control firms relative to the year 2009, using the same specifications as Equation 1, but instead of using the variable D_t, we interact Treated_i dummy variables for each year between 2007 and 2015.

5 Preliminary Results

5.1 Validity Tests

To test the validity of the identification strategy, we analyze two aspects. First we test whether the main outcome variables evolve along parallel trends in the treatment and comparison groups during the pre-treatment period. Second, we conduct a placebo test, analyzing the impacts on domestic sales, where we do not expect major effects of the reform.

Regarding the placebo test, Figure 2 shows that for both comparisons there is a parallel trend in domestic sales, both pre- and post-treatment. In addition, Figure 3 and 4 show

[9] Size is the pre-treatment average sales of the firm, technology is defined as pre-treatment sales over payroll and pre-treatment sales over assets. These variables are winsorized at the top 99th percentile and we use years 2007 to 2009 as pre-treatment years. Sector is a adapted version of the ISIC classification at the first level.

that there are parallel pre-treatment trends in the main outcomes that we study: tax paid and EBIT (a measure of profits), when we scale these outcomes by contemporary payroll.

5.2 Impact on Corporate Income Tax and Reported Profits

Figure 3 and 4 show that there is not an statistically significant impact of the reform on tax paid and profits, in either of the two comparisons. Figure 5 replicates figure 3a and displays a benchmarking exercise. In this figure, the green line and bars display the point estimate and confidence interval of the impact of the reform obtained from a difference-in-difference analysis that pools the data into just two periods, pre-treatment and post-treatment. In addition, the bright red line shows the size of the effect that the Government of Chile predicted, and dotted red lines show the lower and upper predictions of the impact given by the tax consulting industry. Our estimate is significantly below these predictions.

6 Next Steps

For our next steps, will be looking at the effect of the reform in export, imports and financial payments abroad. We have some preliminary analysis that suggests no effect on most of the payments, but compensation effect between subgroups. However, this analysis require more robustness check to make conclusions. We also will evaluate intra-firm changes in line-items, like comparing payments to affiliate firms with payments to non-affiliate firms.

We will also focus on analyzing amendment behavior of firms. Thereby, we would like to answer questions such as: Do firms amend their filings more often following the tax reform? If they did amend, which line items were they updating most often and by what quantities? A pattern in this data could reveal if firms reacted to the reform by rectifying previous filings and thereby increased tax compliance. We have access to this amendment behavior data for both the corporate income tax form as well as the form for declaring international transactions.

We will also make an estimation of how much taxes would be collected if we implement a policy that close the gap between tax paid by multinational firms and local firms generated by the amount of international profit shifting. This would be an interesting excersice to evaluate whether the expectation on the Chilean tax authority were high or not.

Furthermore, the tax authority has conducted a series of targeted transfer pricing tax

audits using the new dedicated unit. We hope that in those cases, policy changes mandated by the reform have been made particularly salient. In this context, we will be analyzing the impact of such specialized audits on a series of key outcomes, including corporate income taxes paid and various foreign transfers declared by the firms.

Another promising approach to be taken consists of combining our information about transfer pricing audits with our detailed data on import and export prices. Here we expect to uncover the most diverse set of reaction strategy used by firms in our joint sample. For example, we will be checking whether an audit led firms to focus on trading different types of goods with their affiliates in tax havens or elsewhere respectively.

Lastly, the regulation of transfer prices entails large administrative and consulting costs for firms. In the three years since Chile introduced its new transfer-price regulation, the number of employees that specialize in transfer pricing in the four big consulting firms in Santiago has increased from 6 to about 80. This represents a large cost of doing international business, which might reduce foreign direct investment. Based on interviews with representatives of consulting firms, we are planning to quantify the approximate compliance costs for firms. Given the potentially very large compliance costs, it is important to understand whether such costs are justified or whether alternative systems might be both more effective to enforce taxes and less costly to firms. In this context, we also plan to conduct a cost-benefit analysis to assess the welfare effects of the reform.

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Figure 1: Total Payments by Type of Affiliation

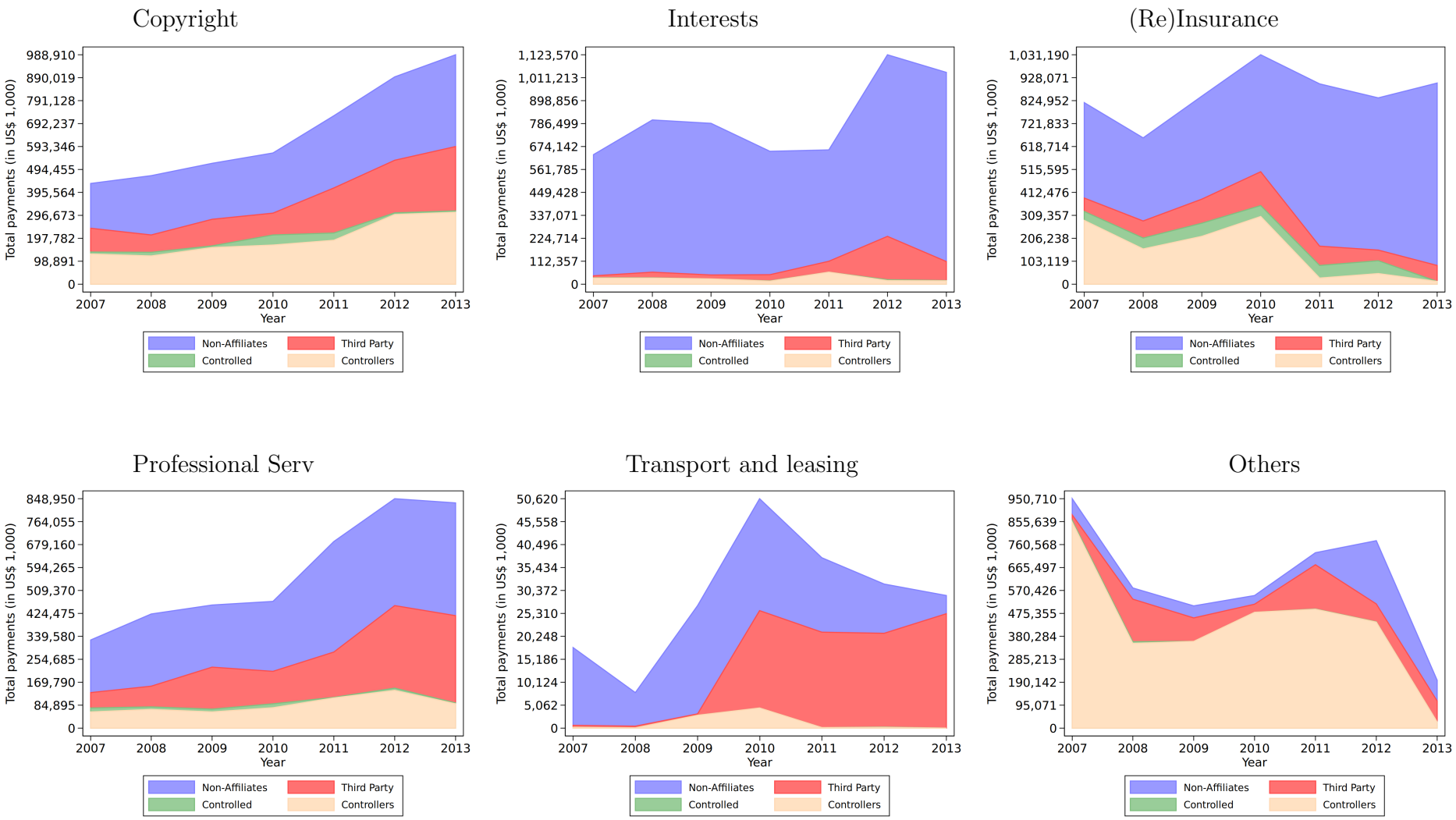
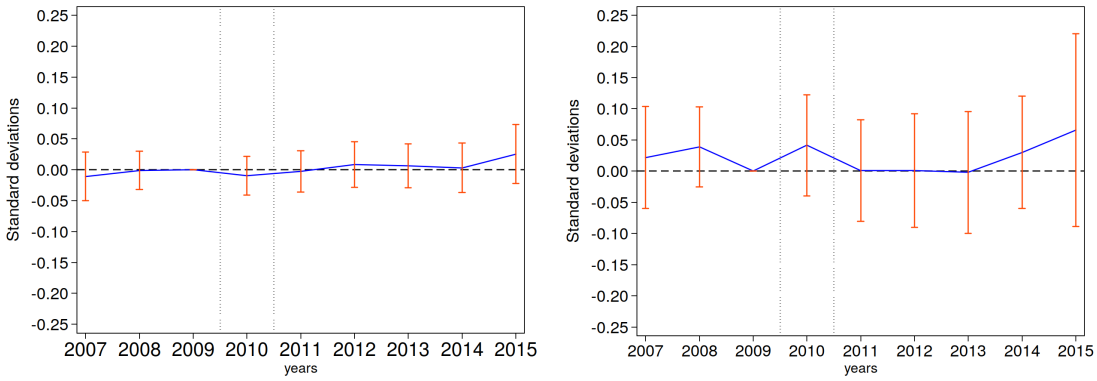


Figure 2: Reform Impact on Domestic Sales over Payroll

(a) Multinationals vs domestic firms (b) Multinationals in tax havens vs without



Notes: Regressions use data from the Chilean corporate income tax form (Form F22). Estimates are denoted in standard deviations. We control for the interaction between year and the pre-treatment average of: sales over payroll, sales over assets, total sales and industry (continuous variables are winsorized at the 99th percentile). Standard errors are clustered at the firm level and the outcome is winsorized at the 99th percentile.

Figure 3: Reform Impact on Coporate Income Tax Paid over Payroll

(a) Multinationals vs domestic firms (b) Multinationals in tax havens vs without

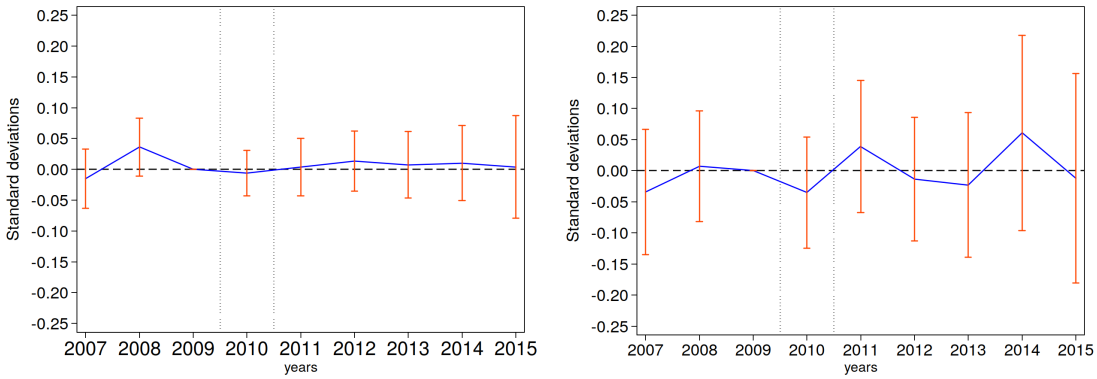
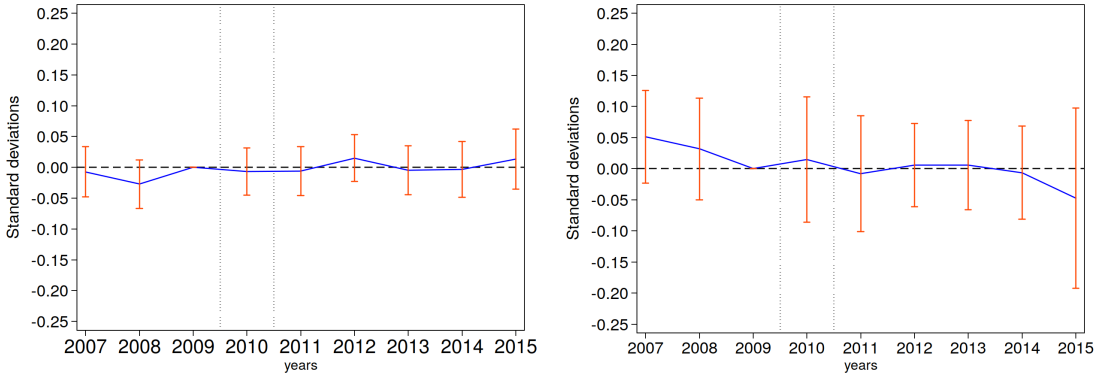


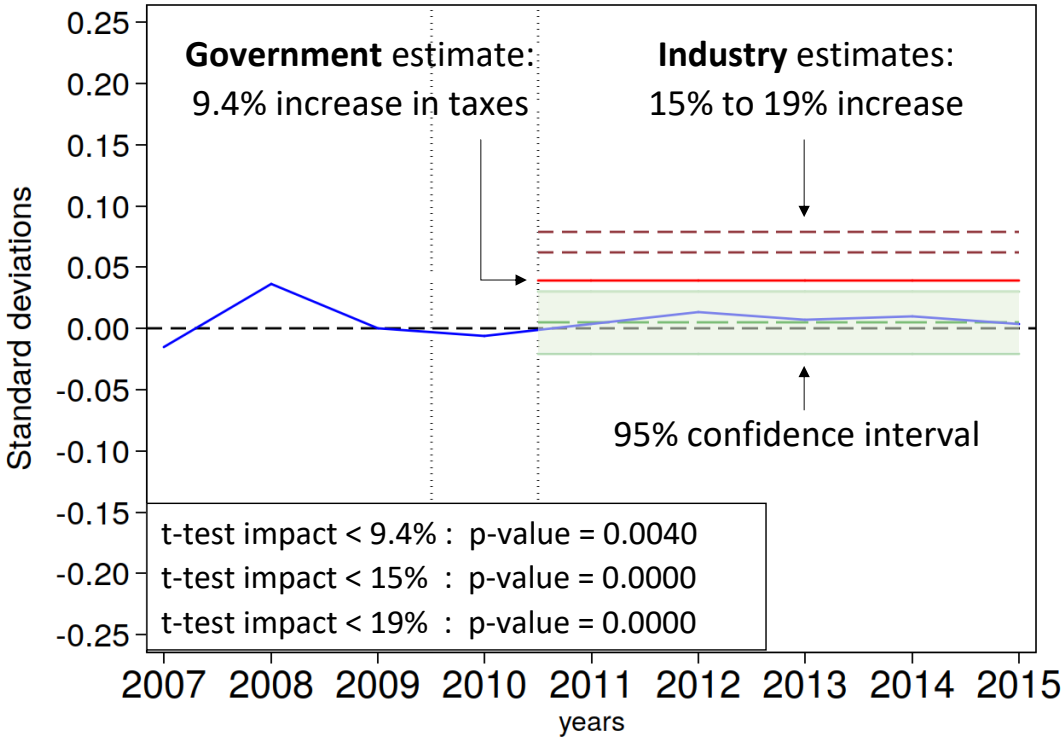
Figure 4: Reform Impact on EBIT over Payroll

(a) Multinationals vs domestic firms (b) Multinationals in tax havens vs without



Notes: Regressions use data from the Chilean corporate income tax form (Form F22). Estimates are denoted in standard deviations. We control for the interaction between year and the pre-treatment average of: sales over payroll, sales over assets, total sales and industry (continuous variables are winsorized at the 99th percentile). Standard errors are clustered at the firm level and the outcome is winsorized at the 99th percentile.

Figure 5: Reform Impact on Coporate Income Tax Paid over Payroll compared with Previous Estimations



Notes: Regressions use data from the Chilean corporate income tax form (Form F22). Estimates are denoted in standard deviations. We control for the interaction between year and the pre-treatment average of: sales over payroll, sales over assets, total sales and industry (continuous variables are winsorized at the 99th percentile). Standard errors are clustered at the firm level and the outcome is winsorized at the 99th percentile.

Table 1: Revenues in 2009, thousands of USD

	Comparison 1		Comparison 2	
	MTNs	Domestic firms	MTNs with tax havens	MTNs without tax havens
Mean	55,885	6,858	189,877	50,615
Median	13,101	2,099	31,001	10,864

Table 2: Reform Impact on Main Outcomes

	Tax paid/ payroll	EBIT/ payroll	Domestic sales/ payroll	Costs/ payroll
Comparison 1 (multinational vs domestic firms)				
Treated × post	0.0048	0.0105	0.0091	-0.0062
	(0.0188)	(0.0138)	(0.0127)	(0.0121)
Controls	Yes	Yes	Yes	Yes
Pre-treatment mean	0.1406	1.9582	12.2605	9.4606
Observations	112,648	112,648	112,648	112,648
Comparison 2 (multinationals with tax havens vs without)				
Treated × post	0.0314	-0.0253	-0.0180	-0.0378
	(0.0458)	(0.0255)	(0.0338)	(0.0260)
Controls	Yes	Yes	Yes	Yes
Pre-treatment mean	0.1674	3.3341	13.7841	11.5222
Observations	17,048	17,048	17,048	17,048

Notes: 2007 to 2010 are pre-treatment years, 2011 to 2014 are post treatment.
Controls: We control by size, technology and industry. Size is the pre-treatment average winsorized sales (and it squared) × year; technology is the pre-treatment average winsorized sales over payroll and over assets (and it squared) × year. We also control for the industry reported in 2009 × year and fixed effect by firm. Error are clustered at firm level.
*** two-sided p-value<1%, ** two-sided p-value<5%, * two-sided p-value<10%.

Appendices

A Additional Figures & Tables

Table A1: Reform Impact on Main Outcomes

	Tax paid/ payroll	EBIT/ payroll	Domestic sales/ payroll	Direct costs/ payroll
Comparison 1 (multinational vs domestic firms)				
Treated × post	0.0016	0.0676	0.2058	-0.1210
	(0.0064)	(0.0887)	(0.2883)	(0.2366)
Pre-treatment mean	0.1540	2.2906	13.0618	9.9406
R-squared	0.0180	0.0410	0.4140	0.3880
Observations	112,648	112,648	112,648	112,648
Comparison 2 (multinationals with tax havens vs without)				
Treated × post	0.0133	-0.3189	-0.4668	-0.9412
	(0.0194)	(0.3221)	(0.8777)	(0.6478)
Pre-treatment mean	0.1674	3.3341	13.7841	11.5222
R-squared	0.0090	0.0840	0.3970	0.3000
Observations	17,048	17,048	17,048	17,048
Controls	Yes	Yes	Yes	Yes

Notes: 2007 to 2010 are pre-treatment years, 2011 to 2014 are post treatment.
Controls: We control by size, technology and industry. Size is the pre-treatment average winsorized sales (and it squared) × year; technology is the pre-treatment average winsorized sales over payroll and over assets (and it squared) × year. We also control for the industry reported in 2009 × year and fixed effect by firm. Error are clustered at firm level.
*** two-sided p-value<1%, ** two-sided p-value<5%, * two-sided p-value<10%.

B Tax Haven Definition

The Chilean Internal Revenue Service assumes that firms transacting with firms in tax havens are affiliates of foreign firms. There have been two definitions of tax havens relevant for our paper. The first definition was introduced when the Ministry of Finance issued in July of 2003 the decree 628 which provides a list of 39 states considered to be tax havens. The table below provides the list of states. As a comparison we provide the classification according to Hines and Rice (1994)[10]; there are 10 states treated as tax havens in this definition which are considered as non-tax havens by Hines and Rice. In addition, there are 10 states classified as tax havens only by Hines and Rice; Hong Kong, Ireland, Jordan, Lebanon, Luxemburg, Macao, Maldives, Saint Martin, Singapore and Switzerland. The second definition was introduced in 2014 but became binding in 2017. In 2014, after a major tax reform at the end of the period analyzed in our paper, a change to the Income Tax Law (article 41 H) defined the guidelines to be followed by the IRS in order to classify states as tax havens. The IRS issued in 2017 the resolution 124 which provides a list of 149 countries classified as tax havens.[11]

[10] James R. Hines, Jr. Eric M. Rice, "Fiscal Paradise: Foreign Tax Havens and American Business". The Quarterly Journal of Economics, Volume 109, Issue 1, 1 February 1994, Pages 149–182

[11] Online-References, checked on June 27 2018: Resolution 124 ; Resolution 124, Appendix 2

Table B1: Overview of Tax Haven Definitions

Country	Hines and Rice	Country	Hines and Rice
Andorra		Liechtenstein	
Anguilla		Malta	
Antigua and Barbuda		Marshall Islands	
Antilles		Mauritius	Non tax haven
Aruba	Non tax haven	Monaco	
Bahamas		Montserrat	
Bahrain		Nauru	Non tax haven
Barbados		Niue	Non tax haven
Belize		Panama	
Bermuda		Saint Kitts and Nevis	
Cayman Islands		Saint Lucia	
Cook Islands		Saint Vincent and the Grenadines	
Cyprus		Samoa	Non tax haven
Dominica		San Marino	Non tax haven
Gibraltar		Seychelles	Non tax haven
Grenada		Turks and Caicos Islands	
Guernsey	Non tax haven	Vanuatu	
Isle of Man		Virgin Islands, U.K.	
Jersey	Non tax haven	Virgin Islands, U.S.	Non tax haven
Liberia			