Tax arbitrage and domestic profit-shifting in environments with co-existing income tax regimes

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Abstract

This paper explores the consequences of having two co-existing corporate income tax regimes within a domestic tax system. This scenario is interesting because, in such environments, a simple theoretical model predicts an optimal strategy involving tax arbitrage through income shifting across regimes. The empirical exercise focuses on the case of Guatemala, where firms choose between a regime that taxes profits –*Regimen Optativo*–, and a regime that taxes turnover –*Regimen General*–. The Guatemalan setting is particularly useful to analyze this topic for two reasons. First, firms can change their choice of regime before each fiscal year –something generally not observed in other countries. And, second, a recent income tax reform introduced variation in the marginal tax rates of each regime, creating the scope to analyze the differential behavior predicted by the theoretical model. Following a difference-in-difference approach, where treatment and control groups are defined by whether firms belong to a tax arbitrage network or not, the results show differential behavior between the two groups. After the reform, firms that do not belong to a tax arbitrage network faced a decrease of around one percentage point more than the treatment group in the probability of registering in *Regimen General*. This effect seems to concentrate on low turnover firms. On aggregate, it is estimated that the tax savings obtained by arbitrage networks could be as large as 66% of their tax liability without profit shifting, and equivalent to about 30% of the overall corporate income tax liability in the country.

Keywords: Behavioral Responses to Taxation, Domestic profit-shifting, Guatemalan Income Tax.

JEL Codes: H25, H26, O12.

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1. Introduction

This paper explores the consequences of having two co-existing corporate income tax regimes within a domestic tax system. This scenario is interesting because, in such environments, a simple theoretical model predicts an optimal strategy involving tax arbitrage through income shifting across regimes. Until now, much of the literature on domestic income shifting has focused on advanced economies, and on the shifting between labor income and corporate income [e.g. Gordon et al. (1995), Slemrod (1995), Gordon and Slemrod (1998), Pirttilä and Selin (2011), Harju and Matikka (2016)]. Only recently, researchers have devoted their attention to the developing world [e.g. Shevlin et al (2012), Foremny et al. (2018)], where countries often harbor multiple income tax regimes, including special simplified regimes aimed to addressing informality concerns among small and micro enterprises by reducing the costs of tax compliance.[2]

The present study contributes to this body of literature by analyzing the case of Guatemala. Using tax administrative data from 2010 to 2015, the empirical analysis focuses on the identification of behavioral responses consistent with tax arbitrage between the two parallel income tax regimes in the country. Under Guatemalan tax law, firms are allowed to choose between a tax on profits –*Regimen Optativo*–, or a tax on turnover –*Regimen General*–. In theory, profit-maximizing firms are expected to choose the regime where their tax liability is lowest, conditional on output. In practice, there is anecdotal evidence that firms engage in tax arbitrage by creating a network of legal entities in both regimes. In its simplest form, firms start by creating one entity in each regime. Then, they take advantage of the tax arbitrage opportunity by carrying out profit shifting from *Regimen Optativo* to *Regimen Simplificado*.[3]

The Guatemalan case provides an interesting setting for two reasons. First, there are no big barriers for firms to switch regimes after their initial choice. Firms are able to adjust their choice before the start of each fiscal year. This differs from the standard practice observed in other countries with co-

[2] See Inter-American Development Bank (2013) and Coolidge and Yılmaz (2016) for a review of simplified regimes in the developing world.

[3] In other countries with similar regimes, it is also common to observe large marginal tax rate differentials between profit taxation and turnover taxation. See Section 3 for a full description of the Guatemalan case.

existing regimes, where firms are unable to switch with such ease after their initial choice at the time of registration. Second, in 2013 there was an income tax reform that modified the marginal tax rates in each of the two existing regimes —from 31% to 25% in *Regimen Optativo*, and from 5% to 7% in *Regimen General*. As a result, firms' incentives to choose each regime changed differentially depending on their use of tax arbitrage schemes or not. On the one hand, the theoretical model developed in Section 2 predicts that, after the reform, firms belonging to a tax arbitrage network should not show any switching behavior. On the other, firms with no such networks should show some migration from *Regimen General* to *Regimen Optativo*.

To test this empirically, the analysis uses the variation in marginal tax rates introduced by the reform, as well as three different network definitions to group firms. Graphical evidence largely confirms the predicted patterns for the alternative network definitions. Following a difference-in-difference approach, where treatment and control groups are defined by whether firms belong to a tax arbitrage network or not, the results show differential behavior between the two groups. For the baseline model, firms that do not belong to a tax arbitrage network faced a decrease of around one percentage point more than the treatment group in the probability of registering in *Regimen General* after the reform. Extending the baseline model to a generalized difference-in-difference yields similar results. The analysis also shows that the differential effect seems to be concentrated on lower income firms. Lastly, an estimate of the maximum tax savings possible across all identified tax arbitrage networks is calculated. On aggregate, it is estimated that tax savings obtained by arbitrage networks could be as large as 66% of their tax liability prior to profit shifting, and equivalent to about 30% of the overall corporate income tax liability in the country.

The rest of the paper is organized as follows. Section 2 develops the theoretical model used to obtain behavioral predictions for firms with and without tax arbitrage networks. Section 3 describes the data used in the analysis, the income tax regimes in Guatemala, and the implications of the 2013 income tax reform. Section 4 explains the empirical methodology, while the results are presented in Section 5. Finally, the conclusions and policy implications of these findings are discussed in Section 6.

2. Theoretical Model

To understand the factors affecting firm behavior, this section presents a theoretical framework in which firms face incentives created by a system with two parallel income tax regimes. First, a basic profit maximization model is used to understand incentives for firms under a tax on profits and a tax on turnover, separately. Then, the case of a network of two firms which operate jointly, one in each regime, is presented.

2.1. A simple model of profit maximization

Let y represent output, $c(y)$ the total cost function –increasing in output level–, τ_π the marginal tax rate on profits, and τ_y the marginal tax rate on turnover.[4] Furthermore, let us suppose that there are two alternative tax regimes that firms can opt for, one in which firms pay taxes on profits and another one in which firms pay taxes on turnover. Under this very simple framework, we can express the firm's profit maximization problem as follows.[5] Firms registering in the profit tax regime maximize[6],

$$\max_y \; y - c(y) - \tau_\pi(y - c(y)), \tag{1}$$

while for firms in the turnover tax regime, the maximization problem would be,

$$\max_y \; y - c(y) - \tau_y y. \tag{2}$$

The first order conditions for an interior solution to these problems are, respectively,

$$1 = c'(y) \tag{3}$$

$$1 - \tau_y = c'(y), \tag{4}$$

which imply that a profits tax is production efficient, but a turnover tax is distortionary.

[4] The words output and turnover are used interchangeable in the models and equations of this paper. Although in reality these terms differ, the aforementioned convention follows from a normalization of the price level used to define turnover.

[5] For simplicity, the model presented here does not account for the possibility of turnover and/or cost misreporting. An extension including these margins of adjustment is shown further into the paper, yielding similar conclusions.

[6] Although the model assumes all costs are deductible (i.e. a pure profit tax), in practice, tax systems feature non-deductible costs.

Under profit maximization, firms will choose to register in the regime where their after-tax profits are expected to be higher. Hence, conditional on expected output, firms should opt to register in the regime that taxes profits if,

$$y - c(y) - \tau_\pi\big(y - c(y)\big) \geq y - c(y) - \tau_y y,$$

which implies,

$$\frac{\tau_y}{\tau_\pi} \geq \frac{(y - c(y))}{y}. \tag{5}$$

The left-hand side of the inequality above is the ratio of marginal tax rates. The right-hand side is the firm's profit margin, a measure of profitability. In practice, it is common for τ_y to be significantly smaller than τ_π. Thus, this simple theoretical model implies that, other things equal, firms with low expected profitability will choose to pay taxes on profits, while firms with high expected profitability will prefer to pay taxes on turnover.

Suppose that the government approves a fiscal reform in which the marginal tax rate on profits decreases to $\tau_\pi{}'$ and the marginal tax rate on turnover increases to $\tau_y{}'$. In this scenario, there is a change in the threshold defined by the ratio of the marginal tax rates, since

$$\frac{\tau_y{}'}{\tau_\pi{}'} > \frac{\tau_y}{\tau_\pi}.$$

Therefore, under the assumption of stable profitability, it would be expected that firms with a profit margin just above the old threshold should now face incentives to switch regime. Specifically, these firms would have incentives to move from the turnover tax regime to the profit tax regime, as they would expect to pay less taxes by doing so. These incentives are asymmetric, in the sense that only firms above the profit margin threshold defined by the marginal tax rates will be affected. Firms below the threshold do not have any change in incentives.

2.2. Tax arbitrage and profit-shifting between regimes

In the previous framework firms are assumed to choose between two mutually exclusive income tax regimes. However, it is not uncommon to come across anecdotal evidence in developing countries pointing to strategies to carry out tax arbitrage between two co-existing regimes.

In order to analyze this possibility, let us consider a case where a firm decides to split its reported activities into two legal entities. One entity is registered as a firm in the profit tax regime and the other as a firm in the turnover tax regime. The joint maximization problem of these two newly created firms can be expressed as,

$$\max_{y,d} \; y - c(y) - \tau_\pi(y - c(y) - d) - \tau_y d - k(d), \tag{6}$$

where d represents the amount of profits transferred by the firm in the profits tax regime to the firm in the turnover tax regime.[7] Moreover, this group of firms incur transaction costs, $k(d)$, which account for the expenses involved in transferring profits between firms; these transaction costs are increasing in the amount being shifted.

Since the optimization is now carried out over two variables, namely turnover and transferred profits, there are two first order conditions associated with an interior solution,

$$\partial y: \quad 1 = c'(y) \tag{7}$$

$$\partial d: \quad \tau_\pi - \tau_y = k'(d). \tag{8}$$

Equation (7) replicates the first order condition shown in equation (3) and indicates that under this arrangement the (joint) firm's production choice is still independent of the marginal tax rates. This is interesting, since a turnover tax is distortionary, as seen in equation (4). Yet, when firms are able to operate in both regimes through two legal entities, then the distortionary nature of turnover taxation does not affect the (joint) firm's decision.[8] On the other hand, equation (8) defines the optimal level of profits that should be shifted to the firm in the turnover tax regime. The left-hand side is a measure of the marginal benefit of profit transfers between the firms, while the right-hand side is the marginal cost of this transfer. The condition is intuitive, as it relates the amount shifted to the tax rate differential between the two regimes. In other words, the larger is the difference in the marginal tax rates, the greater are the gains to engage in tax arbitrage through profit shifting.

[7] This model specification views profit shifting as an administrative arrangement. It implies that the production technology used by the firm is unaffected by its decision to split into two legal entities.

[8] The two key assumptions here are, (i) that production technology is unchanged by the firm's administrative arrangement, as discussed before; and, (ii) that the cost of profit shifting does not depend on output level.

Let us consider what would happen with a similar tax reform as the one described in the previous section. Since now $\tau_\pi{}' < \tau_\pi$ and $\tau_y{}' > \tau_y$, then the tax differential has decreased,

$$\tau_\pi{}' - \tau_y{}' < \tau_\pi - \tau_y.$$

Firms will respond by reducing the amount of profits being shifted from the profits tax regime to the turnover tax regime. However, as long as the differential remains positive, firms will continue to have an incentive to engage in tax arbitrage. Provided that the amount of profits shifted is positive before and after the reform, the main implication is that these firms will not switch regimes as firms without a tax arbitrage network would do.

2.3. Robustness of the model to turnover and cost misreporting

The simple model presented above can also be extended to account for the possibility of turnover and cost misreporting. Let $\hat{y}$ and $\hat{c}$ denote reported turnover and reported costs, respectively, and $h(y - \hat{y}, \hat{c} - c)$ represent the convex costs of misreporting.

Firms that opt for the profits tax regime solve,

$$\max_{y,\hat{y},\hat{c}} \; y - c(y) - \tau_\pi(\hat{y} - \hat{c}) - h(y - \hat{y}, \hat{c} - c), \tag{9}$$

where the firm has two additional margins of adjustment instead of only output. The following are the first order conditions for an interior solution,

$$\partial y: \quad 1 - h_{y-\hat{y}}(y - \hat{y}, \hat{c} - c) = c'(y)[1 - h_{\hat{c}-c}(y - \hat{y}, \hat{c} - c)] \tag{10}$$

$$\partial \hat{y}: \quad \tau_\pi = h_{y-\hat{y}}(y - \hat{y}, \hat{c} - c) \tag{11}$$

$$\partial \hat{c}: \quad \tau_\pi = h_{\hat{c}-c}(y - \hat{y}, \hat{c} - c). \tag{12}$$

As before, these conditions put together imply,

$$1 = c'(y),$$

which was the result obtained in the case with no misreporting.

On the other hand, firms opting to pay the tax on turnover evaluate,

$$\max_{y,\hat{y},\hat{c}} \; y - c(y) - \tau_y \hat{y} - h(y - \hat{y}, \hat{c} - c), \tag{13}$$

which yields as first order conditions,

$$\partial y: \quad 1 - h_{y-\hat{y}}(y - \hat{y}, \hat{c} - c) = c'(y)[1 - h_{\hat{c}-c}(y - \hat{y}, \hat{c} - c)] \tag{14}$$

$$\partial \hat{y}: \quad \tau_y = h_{y-\hat{y}}(y - \hat{y}, \hat{c} - c) \tag{15}$$

$$\partial \hat{c}: \quad 0 \leq h_{\hat{c}-c}(y - \hat{y}, \hat{c} - c). \tag{16}$$

Once again, when taken together these conditions imply the same result as the case with no misreporting,

$$1 - \tau_y = c'(y),$$

since the optimal amount of cost misreporting, defined by equation (12), is $\hat{c} - c(y) = 0$.[9]

Finally, firms that engage in tax arbitrage by splitting into two legal entities solve,

$$\max_{y,\hat{y},\hat{c},d} \; y - c(y) - \tau_\pi(\hat{y} - \hat{c} - d) - \tau_y d - h(y - \hat{y}, \hat{c} - c) - k(d). \tag{17}$$

The first order conditions for an interior solution replicate equations (8), (10), (11), and (12), ensuring that the main properties of the model remain the same. In particular, the tax system continues to be non-distortionary to production for the same reasons discussed earlier in the paper.[10] Additionally, equations (8), (11), and (12) imply,

$$\tau_\pi = h_{y-\hat{y}}(y - \hat{y}, \hat{c} - c) = h_{\hat{c}-c}(y - \hat{y}, \hat{c} - c) = \tau_y + k'(d),$$

which simply states that the marginal benefit of turnover and cost misreporting should equal that of profit shifting, as otherwise the (joint) firms can rearrange its reporting and profit transferring decisions to increase overall profits.

3. Context and Data

3.1. Corporate income tax regimes in Guatemala

According to Guatemalan tax law, there are two coexisting and mutually exclusive income tax regimes where a firm can register to fulfill its tax obligations. The first is *Regimen General*, a regime in which taxes

[9] The functional form of $h(y - \hat{y}, \hat{c} - c)$ is assumed to be such that $h_{y-\hat{y}}(0, \hat{c} - c) > 0$, $h_{\hat{c}-c}(y - \hat{y}, 0) > 0$, and $h(0,0) = 0$.

[10] Besides the assumptions highlighted earlier, it is important to clarify that this theoretical result also relies on the profits tax being non-distortionary, a condition which may not be verified in practice.

are paid on the amount of reported turnover. The second is *Regimen Optativo*, where taxes are levied on firms' profits.[11] When a firm enters the Tax Registry for the first time, it must choose which income tax regime to belong to. Once in the registry, firms are allowed to switch regime before the beginning of each fiscal year.

Prior to 2013, firms in *Regimen General* paid a flat marginal income tax rate of 5% on turnover, while in *Regimen Optativo* the marginal tax rate was 31% on profits. The 2013 fiscal reform altered these marginal tax rates. The marginal tax rate on the former regime increased up to 7%, depending on turnover, and the marginal tax rate on the latter regime decreased to 25%. Table 1 summarizes this information and shows the marginal tax rates during the transition period.

Table 1 – Marginal Income Tax Rates Before and After the 2013 Fiscal Reform

	Pre-reform	**Post-reform**		
	Up to 2012	2013	2014	From 2015
Regimen General	5% on turnover	5% for monthly turnover up to Q30,000; 6% for turnover in excess Q30,000	5% for monthly turnover up to Q30,000; 7% for turnover in excess Q30,000	5% for monthly turnover up to Q30,000; 7% for turnover in excess Q30,000
Regimen Optativo	31% on profits	31% on profits	28% on profits	25% on profits

Source: Superintendencia de Administración Tributaria

3.2. Data

The data used in this analysis comes from a panel database of Guatemalan tax administrative records. This dataset contains the universe of corporate income tax returns filed annually under *Regimen General* and *Regimen Optativo* for the years 2010 to 2015. Moreover, this data is complemented by a database with information on firms' registered accountant and legal representative.[12] As it will be explained in the

[11] After the 2013 tax reform, *Regimen General* was renamed to *Regimen Opcional Simplificado sobre Ingresos*, while *Regimen Optativo* became known *as Regimen sobre las Utilidades*.

[12] Following common practice, the information in both datasets has been anonymized by the Guatemalan Tax Authority.

empirical section, this latter dataset allows the creation of a proxy for whether firms belong to a network of related firms or not.

Consistency checks were carried out to ensure basic reliability of the data, which resulted in some observations being dropped. Non-commercial firms are excluded from the main sample due to their non-for-profit nature. Table 2 provides summary statistics for the final sample under analysis.

Table 2 – Summary Statistics for Firms under *Regimen General* and *Regimen Optativo*

Indicator	Full Sample	2010	2011	2012	2013	2014	2015
Observations	414,189	61,923	65,399	68,135	70,470	73,223	75,039
Share in *Regimen General*	53.0%	52.3%	53.0%	54.0%	52.8%	52.9%	52.7%
Related by accountant	80.4%	79.3%	80.0%	80.5%	80.9%	81.3%	80.0%
Related by legal representative	51.0%	48.9%	49.9%	50.7%	51.8%	52.5%	51.8%
Related by accountant and legal representative	28.4%	27.0%	27.6%	28.0%	28.9%	29.5%	29.2%

4. Empirical Strategy

This section discusses the empirical strategy to test some of the predictions of the theoretical model presented in Section 2, and shows the results found after carrying out this empirical exercise. First, it shows the procedure used to separate firms according to whether they are likely to be part of a network of related firms, or not. Then, it defines treatment and control groups, according to their network characteristics. Finally, it presents the difference-in-difference model which is used to obtain the empirical results.

4.1. Identification of networks of related firms

The model presented in Section 2 predicts that firms operating in only one income tax regime should respond differently to a change in marginal tax rates than firms belonging to a network of related firms operating in two income tax regimes simultaneously. As explained earlier, this is because the latter type of firms has incentives to engage in profit shifting between regimes and exploit tax arbitrage opportunities.

Hence, one important step in the empirical exercise is to separate firms according to whether they are part of such networks or not. Direct identification would require, at a minimum, information about firms' transactions with each other. While records of these interactions may be accessible in advanced economies, one of the challenges of data from developing countries is that this information is either unavailable or incomplete. Such is the case for the Guatemalan setting studied here.

In the absence of a direct method to categorize firms, this paper follows an alternative –albeit indirect– identification strategy. Firms are grouped according to their *probability* of being part of a network of related firms. The reasoning followed here is that it seems plausible to argue that if two firms share (i) accountant, (ii) legal representative, or (iii) both accountant and legal representative, they are more likely to be related than two firms not sharing any of these individuals. Therefore, those three grouping definitions are used in the empirical analysis as indirect ways to identify tax arbitrage networks. Provided that separating firms using this procedure correctly identifies related firms *on average*, the empirical results should be informative about the differential behavior caused by the Guatemalan income tax reform on regime choice.

A further refinement to the above grouping definitions arises from the realization that some networks of firms may only operate in the same regime. These one-regime networks do not have observable direct opportunities to engage in tax arbitrage and, thus, are considered to have different incentives than two-regimes networks. In other words, the distinction between one-regime and two-regimes networks is important because only firms with a network that covers both regimes would be expected to benefit from income shifting.

4.2. Definition of treatment and control groups

For the rest of the paper, treatment and control groups are defined in the following manner. Conditional on the type of network (i.e. by accountant, by legal representative, or by both), the treatment group

includes firms that belong to a two-regimes network. By definition, this excludes firms in one-regime networks, as well as all unrelated firms. Nonetheless, for practical purposes the control group only includes the latter firms.

There are two main arguments behind this rationale. First, from a conceptual point of view, firms in one-regime networks may still be indirectly involved in two-regimes networks. For instance, a firm related by its accountant only to a one-regime network, may also be related by its legal representative to a different network which operates in the excluded regime. Second, from a methodological perspective, one-regime networks seem to have different characteristics than the other two groups.[13] As a consequence, the parallel trends assumption needed by the differences-in-differences approach used in the empirical analysis is likely to be violated. Hence, both of these issues could lead to problems of identification if one-regime networks are included as either part of the control or treatment groups.

4.3. Empirical model

Based on the network definitions above, the empirical analysis relies on the following difference-in-difference model to identify the effect of the Guatemalan income tax reform on regime choice,

$$RG_{it} = \beta_0 + \beta_1 network_i + \beta_2 reform_t + \beta_3 network_i \times reform_t + \beta_4 turnover_{it} + \nu_{it} \quad (18)$$

where, RG_{it} is a dummy variable that captures whether firm i is registered in *Regimen General*[14] or not at time t; $network_i$ is a dummy variable that equals one if firm i belongs to the treatment group under analysis; $reform_t$ is a dummy variable that equals one for the post-reform period (i.e. from 2013 onwards); $turnover_{it}$ corresponds to the value in Quetzales of firm i's reported turnover at time t; and, ν_{it} is the error term. The coefficient β_3 is the object of interest, as it captures the differential behavior between treatment and control group caused by the introduction of the tax reform. The model's causal interpretation of β_3 relies on the assumption of parallel trends for both groups before the reform. The plausibility of this assumption will be discussed in the next section.

[13] See the discussion about this issue in Section 5.

[14] Since regime choice is mutually exclusive, a firm that is not registered in *Regimen General* must be registered in *Regimen Optativo*.

5. Results

5.1.1. Firms' registration in Regimen General by network type

Figure 1 shows the evolution over time of firm's registration in *Regimen General* by network type. The shaded area in each graph corresponds to the post-reform period. Panel (a) presents the share of firms registered in *Regimen General*, according to whether firms are related by a common accountant. As predicted by the model, the share of unrelated firms, and firms operating within a one-regime network, shows a marked decrease immediately after the 2013 reform. On the other hand, firms in a network covering both regimes seem to be less reactive to this change, but still show a significant fall in their share. Panel (b) repeats the same exercise for firms related by a common legal representative. As before, unrelated firms, and firms in a one-regime network experience a marked decrease after the reform, but in this case firms in two-regimes networks do not show any noteworthy response. Finally, panel (c) examines the shares for firms related by both a common accountant and a legal representative. Similar to panel (b), each group's behavior seems consistent with the theoretical predictions of the model.

A final observation regarding Figure 1, is that the graphical evidence suggests the existence of parallel trends between unrelated and two-regimes firms, but not for one-regime networks. This evidence supports the use of unrelated firms as a control group, and of firms in two-regimes networks as the treatment group. As this evidence is suggestive only, in the next section this intuition will be formalized by a more rigorous analysis of these patterns.

5.1.2. Results of the baseline difference-in-difference estimation

Table 3 summarizes the results of estimating the baseline difference-in-difference model presented in equation (18). According to these estimates, the impact of the income tax reform on regime choice ranges between 0.79 and 1.15 percentage points. Since in this setting the treatment group consists of firms belonging to a two-regimes network –which by the nature of the treatment remain unresponsive to the reform–, these coefficients represent a decrease in an unrelated firm's probability of registering in *Regimen General*. The direction of the effect is in line with the prediction of the theoretical model.

To test the parallel trends assumption in this model, a placebo reform dummy was introduced. This placebo reform dummy is equal to one for the year 2012, and zero for previous years. For the model to be consistent with the parallel trends assumption, the β_3 coefficient must not be significantly different

Figure 1 – Firms Registered in *Regimen General* by Network Type

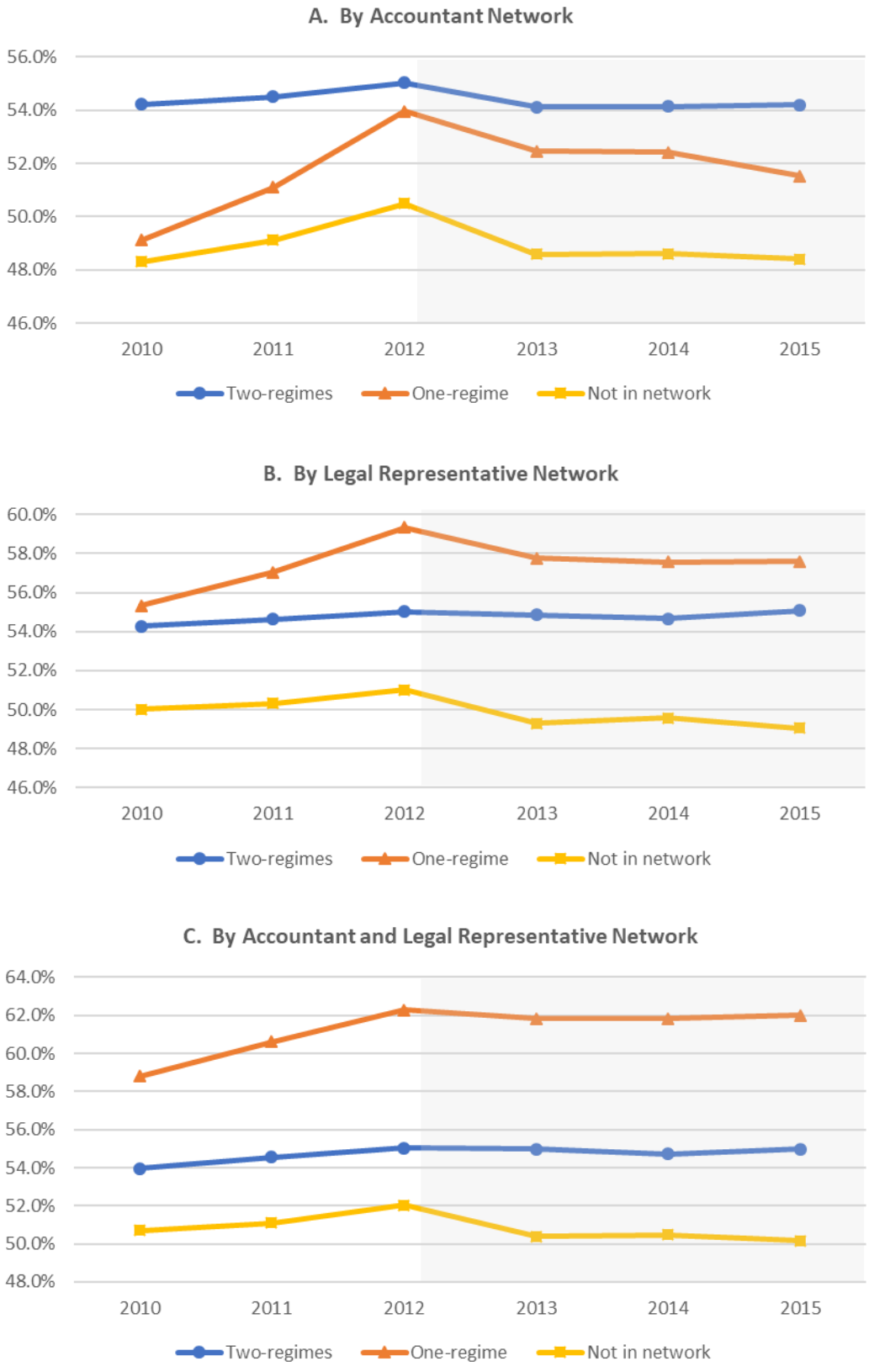


Table 3 – Baseline difference-in-difference estimates, by network type

	By accountant (1)	By legal representative (2)	By acc. & legal rep. (3)
β_3	0.0115*** (0.0022)	0.0079*** (0.0019)	0.0107*** (0.0023)
Observations	362,578	322,052	347,821
Treated	281,280	119,113	51,387
Parallel trends coefficient *(Placebo reform model)*	-0.0008 (0.0020)	0.0036** (0.0016)	0.0008 (0.0020)

Notes: Robust standard errors in parenthesis, clustered at the firm level.

than zero when the model is run for the pre-reform period only. As seen in Table 3, the estimated coefficients support this assumption for the cases of networks linked by accountant only, and by accountant and legal representative, but not when defined by legal representative only.

5.1.3. Results of the generalized difference-in-difference estimation

The baseline model estimates capture the effect of the reform on regime choice for the post-reform period as a whole. However, as shown in Table 1, the reform was rolled in between 2013 and 2015, with marginal tax rates changing every year during that period. For this reason, a generalized difference-in-difference model was estimated, with treatment and control groups as defined before, as well as dummies for each pre-reform and post-reform year.[15]

Figure 2 plots the difference-in-difference coefficients resulting from estimating this model. As seen in the graphs, the estimates suggest that the biggest impact occurred in 2013, with only slight differences in the following years. For networks linked by accountant (panel A), the average effect is around 1.2 percentage points; for networks linked by legal representative (panel B) this average is about 0.6 percentage points; and for networks linked by both accountant and legal representative (panel C), the estimated average impact is 1.1 percentage points. These magnitudes are similar to the baseline model.

[15] The excluded period is 2012, so as to measure the impacts relative to that year.

5.1.4. Heterogeneity of the response by income groups

Besides the transitional adjustment of the marginal tax rates in the post-reform period, Table 1 also shows that income groups were affected differentially. Firms with a monthly income below Q.30,000 faced a slightly lower marginal turnover tax than firms with larger income. Since the available data does not contain monthly income data, firms were separated by their annual income into two categories to analyze the potential heterogeneous effect of the reform. The lower income category corresponds to an annual income below Q360,000 (about US$45,000 at the time), while the higher income category consists of firms with income larger than that amount.[16] The results for each income group are shown in Figure 3.

As shown in the graphs, there are heterogeneous effects of the reform. These effects concentrate on firms with lower income, while there does not seem to be any differential impact on higher income firms. For the former group, the magnitude of the coefficients is slightly higher than those obtained in the previous section, ranging between 0.6 to 1.6 percentage points, depending on the network definition. The results are somewhat surprising, because higher income firms faced larger adjustment in marginal income tax rates.[17] Part of the explanation could be that higher income firms also tend to have lower reported profit margins, which mean that, on average, fewer of them were closer to the switching threshold before and after the reform. On the other hand, higher income firms could also be more likely to belong to two-regimes networks *indirectly*. In such case, the distinction between treatment and control group would be difficult to attain by defining networks using accountants and legal representatives. Finally, higher income firms may also have additional margins of adjustment which are unavailable to lower income firms, and this may be playing a role in firms' behavior.

5.1.5. Estimation of arbitrage networks' tax savings

The differentiated response to the change in the marginal tax rates documented above provides indirect evidence of the existence of tax arbitrage networks. Assuming that these networks are correctly identified in the empirical exercise, it is possible to calculate an upper bound for the tax savings that a network can obtain through domestic profit shifting. Table 4 presents the estimated maximum tax savings for the case of firms linked by both their registered accountant and legal representative.[18]

[16] The chosen annual amount represents what a firm would earn per year if its average monthly income was Q.30,000.
[17] See Table 1.
[18] See the Appendix for a description of the methodology used to obtain these tax savings estimates.

Figure 2 – Generalized difference-in-difference coefficients, by network type

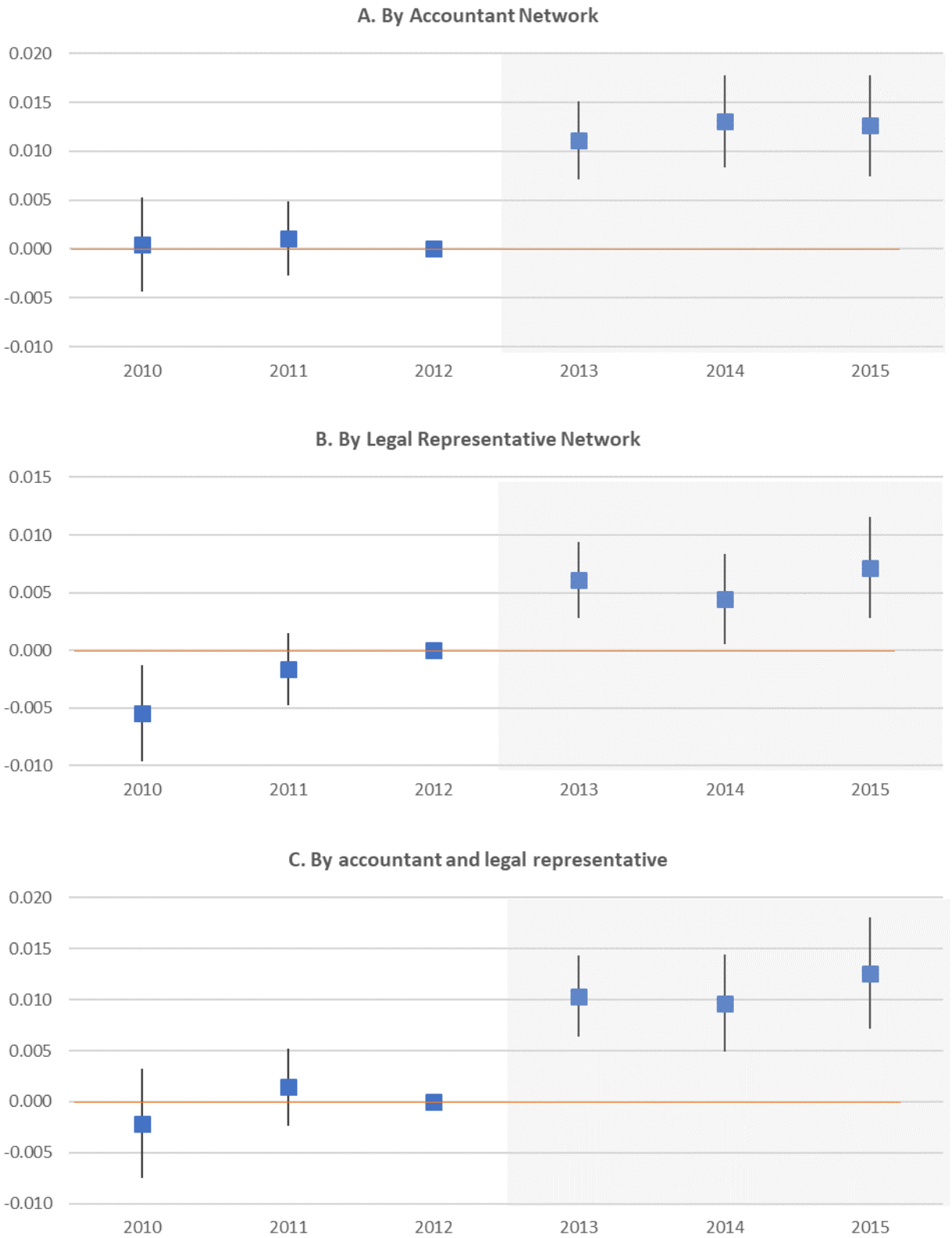
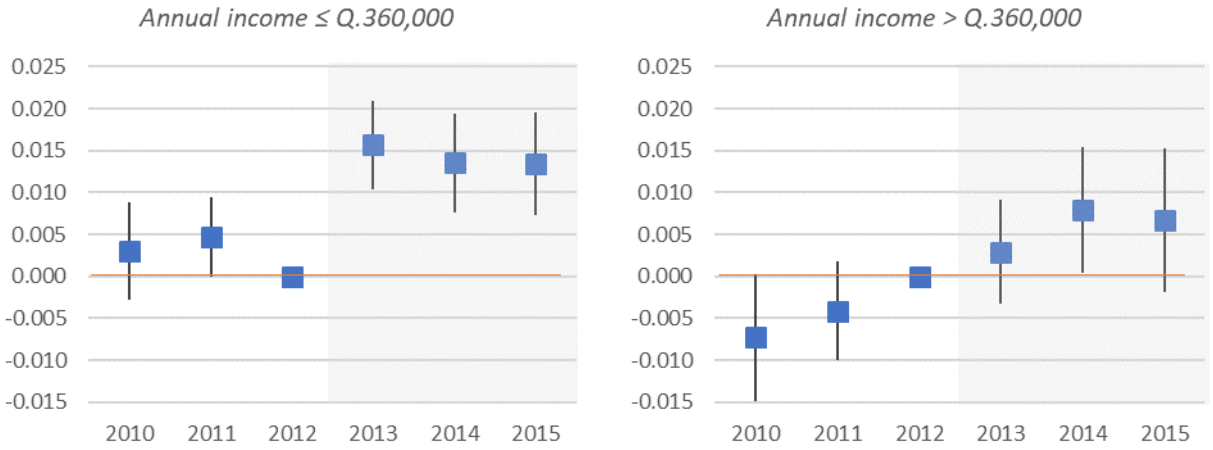
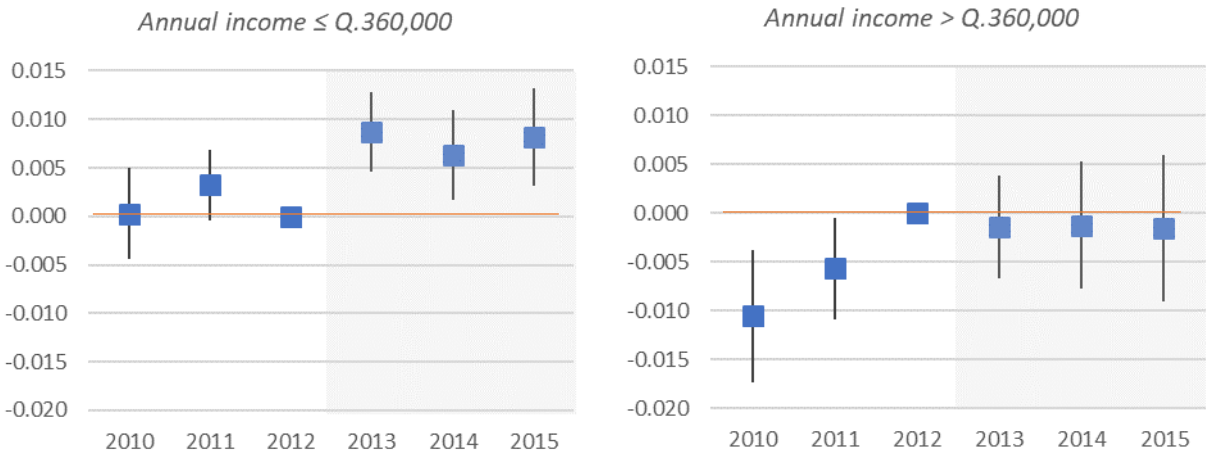


Figure 3 – Heterogeneity by income groups

A. By Accountant Network



B. By Legal Representative Network



C. By Accountant and Legal Representative Network

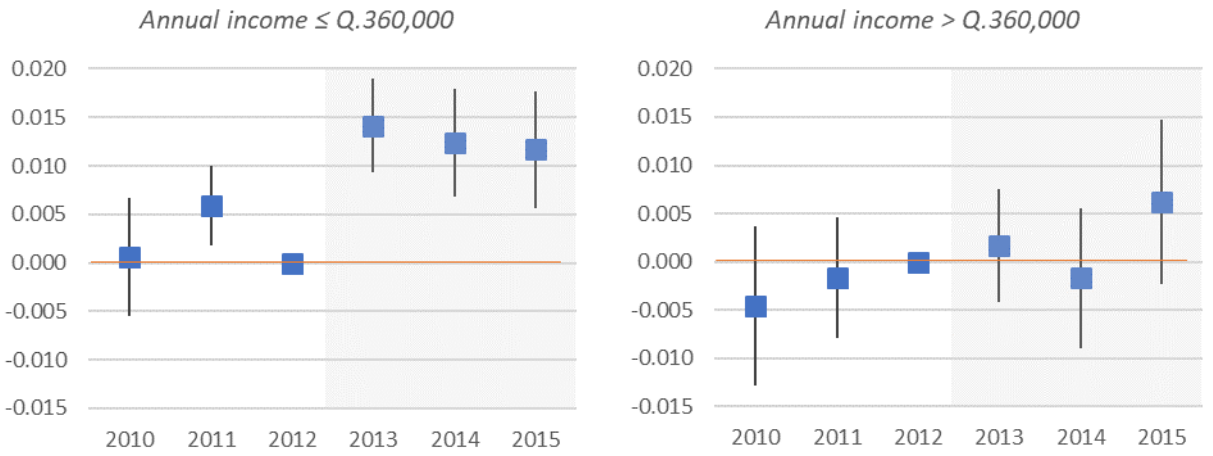


Table 4 – Maximum annual estimates of income tax avoidance through arbitrage networks

Indicator	2010	2011	2012	2013	2014	2015
Estimated Tax Liability for Two-Regime Networks	1,080	1,340	1,500	1,760	1,910	1,940
Estimated Tax Liability for Unrelated Firms	7,840	8,660	8,700	8,740	9,090	8,660
Total Estimated Tax Liability	8,920	10,000	10,200	10,500	11,000	10,600
Estimated Maximum Tax Avoidance	2,150	2,700	3,200	3,160	3,500	2,080
% of Two-regime networks tax liability without profit shifting	66.6%	66.8%	68.1%	64.2%	64.7%	51.7%
% of Total Estimated Tax Liability	24.1%	27.0%	31.4%	30.1%	31.8%	19.6%

Notes: All estimated income tax liabilities in this table are calculated based on taxable income after accounting for deductible costs and exempt income. See the Appendix for the methodology used to calculate the estimated maximum tax avoidance.

As shown in the table, the estimated tax savings of arbitrage networks can be as large as 68.1% of what their income tax liability would be without profit shifting, and as much as 31.8% of the total estimated corporate income tax liability of the country. These figures suggest that tax arbitrage can be a significant problem for tax collection in Guatemala. Further analysis, with data on intra-network transactions, would be needed in order to confirm the full extent of this issue.

6. Conclusions

This paper explored the consequences of having two co-existing corporate income tax regimes within a domestic tax system. The theoretical model developed in Section 2, predicts that firms belonging to a tax arbitrage network should engage in profit shifting to maximize their (joint) profits. The model also predicts that, contrary to unrelated firms, firms in arbitrage networks would not alter their choice of income tax regime in response to a change in marginal tax rates that does not eliminate their disparity.

Following a difference-in-difference approach, where treatment and control groups are defined by whether firms belong to a two-regimes network or not, the empirical results using Guatemalan data show differential behavior between the two groups as predicted by theory. According to the estimates, the 2013 income tax reform had a negative effect of about one percentage point on the probability of registering in *Regimen General* for unrelated firms, relative to firms in two-regime networks. Most of the impact seems to have taken place among lower income firms, despite higher income firms facing larger adjustments in the turnover marginal tax rates. Overall, the differentiated response between treatment and control groups documented in the empirical exercise is interpreted as providing indirect evidence of the existence of tax arbitrage networks in the country. Finally, it is estimated that the tax savings obtained by arbitrage networks could be as large as 66% of their income tax liability without profit shifting, and equivalent to about 30% of the total corporate income tax liability in the country. This suggests that tax arbitrage through domestic profit shifting could be an important issue for income tax collection.

References

Allingham, Michael G., and Agnar Sandmo (1972). "Income Tax Evasion: A Theoretical Analysis." *Journal of Public Economics,* 1:323–38.

Agostini, Claudio A. (2016). "Small Firms and Presumptive Tax Regimes in Chile: Tax Avoidance and Equity". Working Paper No. 49, Adolfo Ibáñez University, School of Government.

Bachas, Pierre, and Mauricio Soto (2017). "Not(ch) Your Average Tax System: Corporate Taxation Under Weak Enforcement." Working paper.

Cabrera, Maynor (2014). "Análisis de la implementación de la reforma tributaria de Guatemala, 2012". CEPAL, Serie Macroeconomía del Desarrollo, No. 160.

Coolidge, Jacqueline, and Fatih Yilmaz (2016). "Small Business Tax Regimes". *Viewpoint*, No. 349, World Bank.

Foremny, Dirk, Leonel Munielo Gallo, and Javier Vazquez-Grenno (2018). "Income Shifting and Tax Evasion: Evidence from an Uruguayan Tax Reform". Working paper.

Gordon, Roger H., Jeffrey K. MacKie-Mason, and R. Glenn Hubbard (1995). "The Importance of Income Shifting to the Design and Analysis of Tax Policy". Chapter in *Taxing Multinational Corporations*, p 29-38. Editors: Martin Feldstein, James R. Hines Jr., R. Glenn Hubbard.

Gordon, Roger H., and Joel Slemrod. (1998) "Are 'Real' Responses to Taxes Simply Income Shifting Between Corporate and Personal Tax Bases?". NBER Working Paper No. 6576.

Harju, Jarkko and Tuomas Matikka (2016). "The elasticity of taxable income and income-shifting: what is "real" and what is not?". International Tax and Public Finance, 23: 640.

Inter-American Development Bank (2013). "More Than Revenue: Taxation as a Development Tool". Editors: Ana Corbacho, Vicente Fretes Cibils, Eduardo Lora.

Pirttilä, Jukka, and Håkan Selin (2011). "Income Shifting within a Dual Income Tax System: Evidence from the Finnish Tax Reform of 1993". *Scandinavian Journal of Economics*, 113(1), 120–144.

Shevlin, Terry, Tanya Y. H. Tang, and Ryan J. Wilson (2012). "Domestic Income Shifting by Chinese Listed Firms". The Journal of the American Taxation Association, Spring 2012, Vol. 34, No. 1, pp. 1-29.

Slemrod, J. (1995). “Income Creation or Income Shifting? Behavioral Responses to the Tax Reform Act of 1986”. *The American Economic Review*, 85(2), 175-180.

Appendix

A. Methodology to estimate tax savings of arbitrage networks

As described in this paper, firms in tax arbitrage networks can decrease their (joint) tax liability by transferring profits from firms in *Regimen Optativo* to those in *Regimen General*. This is profitable because of the marginal tax rate differential between the two regimes.

A precise calculation of the tax savings would require the exact knowledge of the amount of profits being transferred across regimes. Given the impossibility of such calculation with the available data, the approach followed in this analysis is to estimate the maximum tax savings that firms in tax arbitrage networks could achieve. Let us define the maximum aggregate tax savings by arbitrage networks, $\overline{S_t}$, for a given period as,

$$\overline{S_t} = \sum_i (network_i * RG_{it}) \times (\tau_{\pi_t} - \tau_{y_t}) y_{it}. \quad \text{(A1)}$$

where, y_{it} is firm i's turnover in period t; $network_i$ is a dummy equal to one if firm i belongs to an arbitrage network; RG_{it} is a dummy equal to one if firm i is registered in *Regimen General* in period t; and, τ_{π_t} and τ_{y_t} represent the marginal tax rates for profits and turnover in period t. In words, $\overline{S_t}$ sums the tax liability differential saved by arbitrage networks, assuming that all the turnover of the network's firms in *Regimen General* corresponds to shifted profits from the network's firms in *Regimen Optativo*.

B. Supplementary Tables

Table 4 – Baseline difference-in-difference estimates

	By accountant (1)	By legal representative (2)	By acc. & legal rep. (3)
$network$	0.0082	0.0097*	0 .0186**
	(0.0076)	(0.0051)	(0.0089)
$reform$	0.0025	0.0054***	0.0066***
	(0.0020)	(0.0012)	(0.0010)
$network \times reform$	0.0115***	0.0079***	0.0107***
	(0.0022)	(0.0025)	(0.0024)
$income$	-2.05e-10***	-1.88e-10***	-1.98e-10***
	(5.29e-11)	(3.92e-11)	(5.08e-11)
$constant$	0.5204***	0.5101***	0 .5082***
	(0.0059)	(0.0020)	(0.0014)
Observations	362,578	322,052	347,821
Treated	281,280	119,113	51,387

Notes: Robust standard errors in parenthesis, clustered at the firm level.

Table 5 – Generalized difference-in-difference estimates

	By accountant (1)	By legal representative (2)	By acc. & legal rep. (3)
$network$	0.0059 (0.0076)	0.0102** (0.0051)	0.0164* (0.0088)
$year2010$	-0.0197*** (0.0022)	-0.0147*** (0.0013)	-0.0176*** (0.0010)
$network \times year2010$	0.0004 (0.0024)	-0.0054** (0.0021)	-0.0021 (0.0027)
$year2011$	-0.0123*** (0.0017)	-0.0093*** (0.0010)	-0.0108*** (0.0009)
$network \times year2011$	0.0010 (0.0019)	-0.0016 (0.0016)	0.0014 (0.0019)
$year2013$	-0.0084*** (0.0018)	-0.0039*** (0.0011)	-0.0033*** (0.0009)
$network \times year2013$	0.0111*** (0.0020)	0.0061*** (0.0017)	0.0103*** (0.0020)
$year2014$	-0.0073*** (0.0022)	-0.0002 (0.0013)	-0.0010 (0.0010)
$network \times year2014$	0.0131*** (0.0024)	0.0045** (0.0020)	0.0097*** (0.0024)
$year2015$	-0.0070*** (0.0023)	-0.0018 (0.0014)	-0.0023* (0.0011)
$network \times year2015$	0.0126*** (0.0027)	0.0071*** (0.0022)	0.0126*** (0.0028)
$income$	-2.08e-10*** (5.34e-11)	-1.91e-10*** (3.96e-11)	-2.01e-10*** (5.12e-11)
$constant$	0.5320*** (0.0060)	0.5183*** (0.0020)	0 .5175*** (0.0015)
Observations	362,578	322,052	347,821
Treated	281,280	119,113	51,387

Notes: Robust standard errors in parenthesis, clustered at the firm level.