Ballots & Taxes: Empirical Studies on Voting Behavior and Tax Enforcement

DOCTORAL THESIS

Presented to the Faculty of Management, Economics and Social Sciences
at the University of Fribourg (Switzerland)

by

José Vila-Belda Montalt
Valencia, Spain

in fulfillment of the requirements for the degree of
Doctor of Philosophy in Economics (PhD)

Accepted by the Faculty of Management, Economics and Social Sciences
December 15th, 2025 at the proposal of
Prof. Dr. Mark Schelker (first referee)
Prof. Dr. Dina Pomeranz (second referee)
Prof. Dr. Lorenzo Casaburi (chairman of the committee)

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The Faculty of Management, Economics and Social Sciences of the University of Fribourg (Switzerland) does not intend to approve or disapprove the opinions expressed in a thesis: they must be considered as the author's own (decision of the Faculty Council of 23 January 1990).

To Tania and Alma.

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Introduction

Democratic governments face two key challenges. They need to ensure that policy decisions reflect citizens' preferences, and they have to collect resources to fund the implementation of policies once they are enacted. Electoral institutions play a key role in translating citizen preferences into policy outcomes. However, the details of how these institutions function can have significant impacts on who participates and what decisions emerge. Similarly, tax systems form the financial foundation of governmental functions, and their effectiveness depends greatly on enforcement capacity and the behavioral responses they elicit from taxpayers. Through rigorous empirical analysis, this thesis examines both sides of this governance equation, investigating specific mechanisms that shape democratic representation and tax capacity.

Chapter 1, "Did Agriculture Referendums Sink Switzerland's 2021 CO_2 Bill? Voter Mobilization Effects of Policy Themes" (with Emilio Dal Re), investigates whether concurrent referendums on certain policy themes can systematically alter the composition of the electorate and thereby influence policy outcomes. The analysis reveals that agricultural referendums increase voter turnout in rural and right-leaning municipalities relative to urban and left-leaning ones in concurrent referendums unrelated to agriculture. Referendums related to gender & family policy produce similar effects, while referendums related to immigration and housing policy produce opposite effects, increasing participation in urban and left-leaning municipalities relative to rural and right-leaning municipalities. These findings imply that authorities could strategically schedule referendums to take advantage of the voter mobilizing effects of certain policy themes for electoral advantage.

The subsequent chapters shift focus to taxation, examining how governments can effectively enforce tax policies once they are established. Chapter 2, "Challenges of Monitoring Tax Compliance by Multinational Firms: Evidence from Chile" (with Sebastián Bustos, Dina Pomeranz and Gabriel Zucman), introduces the central challenges of international tax enforcement and the legislation that Chile introduced in 2011 to reduce tax avoidance by multinational firms. It presents descriptive evidence suggesting that multinational firms engage in tax avoidance, as indicated by their lower profit rates compared to similar domestic firms in Chile. This analysis sets the stage for the more comprehensive investigation in Chapter 3.

Chapter 3, "The Race Between Tax Enforcement and Tax Planning: Evidence From a Natural Experiment in Chile" (with Sebastián Bustos, Dina Pomeranz, Juan Carlos Suárez Serrato and Gabriel Zucman), presents the core empirical contribution in the taxation domain. This research evaluates the effectiveness of transfer pricing regulations in Chile, an approach advocated by the OECD to curb the ability of multinational firms to avoid taxation by shifting profits to lower-tax jurisdictions. Using detailed administrative tax and customs data and a difference-in-differences design, the study finds that despite significantly expanding reporting requirements and enforcement resources, the reform was ineffective in reducing multinationals' transfers to lower-tax countries and did not significantly raise tax payments. Extensive qualitative interviews reveal that the tax advisory industry expanded dramatically in response to the reform, with an initial focus on compliance support that evolved into more sophisticated tax planning.

Chapter 4, "Taking State-Capacity Research to the Field: Insights from Collaborations with Tax Authorities" (with Dina Pomeranz), broadens the perspective by reviewing recent research on tax capacity conducted in partnership with tax authorities worldwide. This chapter contextualizes the empirical findings of the previous chapters within the growing literature on tax enforcement and compliance. It examines how access to information, third-party reporting, and digitalization have transformed tax administration capabilities. The chapter also provides practical guidance for researchers interested in collaborating with tax authorities, drawing on experiences from numerous such partnerships.

From a methodological perspective, this thesis rests on the shoulders of the "credibility revolution", a paradigm shift in economics and social sciences that transformed the way researchers approach the study of causal relationships. Beginning in the 1990s, this movement emphasized research designs that could credibly identify causal effects, addressing a fundamental and pervasive limitation in social science research, where causal claims are too often derived from correlations. Thanks to the methodological developments that ensued, our ability to establish causal relationships in social sciences has vastly improved, enabling rigorous policy evaluation and deeper understanding of behavioral responses to institutional designs. This advancement has fueled the proliferation of evidence-based policymaking worldwide, with specialized governmental agencies increasingly adopting these methods and researchers collaborating directly with governments to evaluate policy impacts, as exemplified in Chapters 3 and 4. The significance of these methodological innovations is highlighted by two

recent Nobel Prizes in Economics. First, the prize awarded to Joshua Angrist, Guido Imbens, and David Card for their work on quasi-experimental methods, which exploit natural variation in policy implementation or institutional rules to approximate the conditions of randomized experiments. Second, the Nobel awarded to Esther Duflo, Abhijit Banerjee, and Michael Kremer for their posterior work implementing randomized experiments in development economics.

The empirical studies (Chapters 1 and 3) use a difference-in-differences methodology to establish causal relationships. When randomized evaluations are not feasible due to practical, ethical, or institutional constraints, or because policies have already been implemented, this methodology offers a powerful alternative by leveraging variation in how different groups are affected by a policy change or incentive over time. As illustrated in these chapters, this methodology allows for meaningful causal analysis even without pure control groups, which greatly expands the opportunities to investigate causal links.

The first three chapters rely heavily on administrative data, either publicly available (Swiss referendums) or obtained through a partnership with public institutions (Chilean tax and customs data). Publicly available administrative data represents an essential resource for evidence-based policy research, enabling analyses with high external validity and comprehensive coverage that surveys often cannot match. When concerns about privacy, confidentiality, or data complexity prevent public release of such data, research partnerships between academics and government institutions become invaluable. Chapter 4 explicitly discusses the growing importance of such collaborations specifically in the study of tax enforcement and compliance.

A common aspect across the chapters is the focus on understanding behavioral responses, whether these are voters responding to voting incentives or multinational firms reacting to tax enforcement efforts. The studies highlight how policy effectiveness depends critically on how policies interact with existing incentive structures. Together, they contribute to our understanding of the challenges of democratic representation and tax enforcement.

Chapter 1

Did Agriculture Referendums Sink Switzerland's 2021 CO_2 Bill? Voter Mobilization Effects of Policy Themes

Emilio Dal Re[1]
José Vila-Belda Montalt[2]

Abstract

In June 2021, the Swiss narrowly voted against a law proposed by the government to reduce the country's carbon emissions. Media commentators claimed that concurrent referendums related to agriculture led to an unusually high mobilization of the rural vote, arguing that this caused the rejection of the CO_2 bill. Using a difference-in-differences design and municipal-level results from over 450 federal referendums held in Switzerland from 1970 to 2022, we find that agriculture referendums increase voter turnout in rural and right-leaning municipalities relative to urban and left-leaning municipalities, in concurrent referendums unrelated to agriculture. Beyond turnout effects, agricultural referendums lead to a decrease in the share of votes aligned with the voting recommendation of the Social Democratic Party, in rural municipalities compared to urban ones. Similar patterns emerge for gender & family referendums, while referendums on immigration and housing mobilize urban and left-leaning municipalities more. Back-of-the-envelope calculations suggest that the concurrence of agricultural referendums is unlikely to fully explain the rejection of the 2021 CO_2 bill, as rural voters represent a small share of the electorate. Policy themes that mobilize urban voters are more likely to influence referendum outcomes.

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1.1 Introduction

In June 2021, Swiss voters rejected a law proposed by the government to reduce carbon emissions, with 51.6% voting against it. The Federal Act on the Reduction of Greenhouse Gas Emissions aimed to bring Switzerland's carbon emissions down through increased taxes on fossil fuels, promotion of energy-efficient buildings, and investments in renewable energy. After extensive legislative debate, the government had secured support from all political parties except the right-wing Swiss People's Party (SVP), which launched the referendum to repeal the law.

Media commentators as well as the President of the Farmers' Association[2] attributed this unexpected rejection to unusually high mobilization of rural voters, arguing that the latter was caused by two referendums related to agriculture held at the same time as the CO_2 vote.[3] Commentators supported this narrative with data showing remarkably high participation in general, but particularly in rural areas, [4] and substantially lower approval of the CO_2 bill in rural compared to urban parts of the country.[5]

This anecdote raises an intriguing question about Swiss direct democracy: Could the concurrence of certain policy themes systematically alter the composition of the electorate and thereby influence policy outcomes? The goal of this study is to test this empirically. Using municipal-level results from 457 federal referendums held in Switzerland between 1970 and 2022, we employ a difference-in-differences design to analyze whether agricultural referendums mobilize rural voters differently than urban voters.

Our findings confirm that agricultural referendums increase turnout in rural municipalities relative to urban municipalities. Importantly, this effect persists

[2]Neuhaus, Christina. 10.07.2021. Einfamilienhaus, Auto und Bauern – woran das CO2-Gesetz gescheitert ist. NZZ.ch (Link); Rigendinger, Balz. 13.06.2021. Volk lehnt CO2-Gesetz mit 51,6% ab. swissinfo.ch (Link); Interview with the President of the Farmers' Association (Link)

[3]These two referendums were concerned with the use of pesticides and antibiotics in agricultural production. The Pesticides Initiative proposed to ban the use of synthetic pesticides, as well as the import of food treated with them. The Clean Water Initiative aimed to ban subsidies to farmers that use pesticides and antibiotics. Both of these referendums were rejected. In addition to these, there were two other referendums held on the same day, one related to COVID and one to terrorism.

[4]Average turnout in rural municipalities was 15 percentage points higher compared to the average of the legislature (68.8% vs 53.8%), while in urban areas this difference was just 8.9 points (61.1% vs 52.2%)

[5]Approval of the CO_2 bill was less than 35% in rural areas vs 47.7% in urban areas and 51.2% in large urban agglomerations (Zurich, Geneva, Bern, Basel, Lausanne and their surroundings), as described in this media article: NZZ interview: https://www.nzz.ch/schweiz/co2-und-covid-gesetz-hier-klafft-der-stadt-land-graben-ld

when the outcome measure includes only turnout in concurrent referendums unrelated to agriculture, suggesting spillover effects where agricultural topics mobilize rural residents to participate in all referendums held on the same day. Specifically, we estimate a 2.47 percentage points increase in turnout in rural municipalities relative to urban municipalities—a 5.70% increase from the baseline turnout of 43.40% in non-agricultural referendums in rural areas.

Further analyses show that agricultural referendums shift the electorate's composition rightward, with turnout in left-leaning municipalities decreasing by 1.48 percentage points relative to all other municipalities (3.42% relative to the baseline). Examining party-specific effects, we find that municipalities with above-average conservative (SVP) support show increased mobilization, at the expense of municipalities with above-average support for liberal and left-wing parties. This pattern suggests that the SVP is the primary beneficiary of agriculture-induced voter mobilization.

Beyond turnout effects, we find that agricultural referendums influence vote shares in concurrent, non-agricultural referendums. When agricultural referendums occur, the proportion of votes aligned with the voting recommendation of the Social Democratic Party (in concurrent votes unrelated to agriculture) decreases by 1.33 percentage points in rural municipalities compared to urban ones—a 2.70% reduction from baseline. While we are unable to study the mechanisms driving this result, we posit that this rightward shift could occur through either compositional changes (mobilization of rural voters is stronger among more conservative sections of the rural electorate) or framing effects (agricultural debates influence voting choices on concurrent issues).

When extending our analysis to other policy themes, we find that referendums related to gender & family policy produce effects similar to those of agricultural referendums, increasing turnout in rural and right-leaning municipalities and shifting vote shares to the right in rural municipalities relative to urban ones. Referendums related to immigration and housing policy produce opposite effects in terms of turnout, increasing participation in urban and left-leaning municipalities relative to rural and right-leaning municipalities. While housing policy referendums seem to shift vote shares leftwards in urban relative to rural areas, immigration referendums appear to reduce left-aligned vote shares in urban relative to rural areas. Note that across these analyses the treatment theme under study is always excluded from the outcome measure (average turnout or average left-aligned vote share).

Going back to the media story that motivates this study, while our findings confirm that the concurrence of agricultural referendums likely had some influence in the result of the 2021 CO_2 referendum, back-of-the-envelope calculations suggest that this is unlikely to fully explain the rejection of the bill. Even under counterfactual scenarios involving strong assumptions about the differential mobilization effects of agricultural referendums, the CO_2 bill would still have fallen short of the required majority. Since rural voters represent a relatively small share of the electorate (17.0% in this specific referendum), moderate treatment effects on turnout and vote shares translate into small impacts on aggregate voting results. The concurrence of policy themes that mobilize urban voters, such as immigration and housing, is more likely to influence the outcome of referendums.

Given the finding that certain policy themes can systematically change voter composition and vote shares, authorities could schedule referendums strategically to leverage these effects for electoral advantage. The final section of the study presents descriptive statistics to tentatively examine this possibility. To illustrate, suppose that a close vote is expected in a referendum where center and right parties have the same position (either in favor or against). These parties could benefit from scheduling an agricultural referendum to coincide with this close vote. Influence over referendum scheduling is arguably more likely when these parties hold a majority of seats on the Federal Council, the institution tasked with allocating referendums to voting dates. Therefore, we hypothesize that under strategic scheduling agricultural referendums would be more likely to occur on voting dates when both the incentives (a close vote) and the influence (a majority of seats) for strategic scheduling exist.

Analyzing patterns from 1970-2022, we find correlational evidence consistent with strategic scheduling of agricultural and immigration referendums, particularly in the post-1990 period when political competition intensified. For housing referendums, the results are only partially aligned with strategic scheduling expectations, while for gender & family referendums, the results generally contradict strategic scheduling predictions. Overall, we interpret this evidence as suggestive of possible strategic scheduling, but largely inconclusive given mixed results, limited sample size, and lack of causal identification.

While the Swiss context is unique, our findings have broader relevance for other democracies where concurrent elections occur. The composition of electorates in national, regional, or local elections can be influenced by which of these election types are held simultaneously, potentially affecting outcomes. For exam-

ple, the composition of the electorate in European elections could be affected by whether these are held concurrently with national or subnational elections.

Our findings are closely related to research on the timing of elections, showing that concurrent votes tend to increase voter turnout[6] and can, intentionally or not, alter the composition of the electorate. We contribute to this literature by showing that, in addition to the timing of votes, the specific thematic mix that is on the ballot in a direct democracy setting can mobilize different groups of voters to different degrees, which can impact policy outcomes. Timing elections strategically can be a means to intentionally influence results, for instance, by calling early elections to take advantage of a transitory political mood or by making a vote coincide or not with other events or circumstances, in an attempt to sway who shows up to vote.[7]

Our study contributes to the literature on voter behavior, policies to increase voter turnout, and their effects on the composition of the electorate. Concurrent votes are one among several options that policymakers have used to try to increase turnout by reducing the costs of voting. As cited in Schmid (2015), other examples include abolishing literacy tests (Husted and Kenny 1997), making voter registration easier (Knack 1995), or allowing postal voting (Hodler, Luechinger, and Stutzer 2015). Even subsiding the small cost of voting by post has been found to increase turnout (Schelker and Schneiter 2017). Several countries have also experimented with compulsory voting (Lijphart 1997; Mueller and Stratmann 2003; and Bechtel, Hangartner, and Schmid 2016) as a way to boost participation by increasing the costs of not voting.

Intentionally or not, policies that influence voter turnout are likely to be accompanied by changes in the composition of the electorate, which can influence electoral outcomes. Bechtel, Hangartner, and Schmid (2016) cite examples of this in the background of representative elections, and find evidence of this in a direct democracy setting. Using a natural experiment in the Swiss canton Vaud, Bechtel, Hangartner, and Schmid (2016) find large effects of compulsory voting on participation in referendums, with a stronger effect among left-leaning voters.[8] Relatedly, Schmid (2015) finds that holding cantonal elections concur-

[6] See, for instance, Gersen (2011) and Garmann (2016) in the context of representative elections in the US and Germany respectively, and Schmid (2015) in the Swiss context, looking at the interaction between subnational representative elections and concurrent, national referendums

[7] Smith (2004) summarizes research on this topic in the area of comparative politics. Meredith (2009) finds evidence of strategic scheduling of school referendums in Wisconsin aimed at increasing the share of pro-education spending voters.

[8] Bechtel, Hangartner, and Schmid (2016) explain this finding with the idea that monetary sanction for abstention imposes higher relative costs among lower-income citizens, which tend to favor more redistribution.

rently with federal referendums leads to higher turnout in the latter, and finds a stronger effect among young male voters in the center of the political spectrum, who usually participate less. His results suggest an increase in support for the referendum option promoted by the incumbent party. Hodler, Luechinger, and Stutzer (2015) find that reducing voting costs by introducing postal voting in Swiss referendums leads to higher turnout and changes in the composition of the electorate, towards voters with lower average education and lower political knowledge. They argue that these less informed voters are more susceptible to influence, attracting campaign efforts from special interest groups which in turn lead to lower social welfare expenditures and lower business taxation.

Structure of the Article The remainder of the paper is organized as follows. Section 1.2 provides background on the Swiss political system, the regulation of referendums, and the urban-rural gap in political attitudes. Section 1.3 presents the data sources and key variables. Section 1.4 describes the identification strategy for our main research question: whether agriculture and other policy themes mobilize different voters with different intensity. Section 1.5 presents the empirical results, examining the effects of agricultural referendums on turnout and vote shares before turning attention to other policy themes. Section 1.6 provides back-of-the-envelope calculations for the 2021 CO_2 referendum. Section 1.7 tentatively investigates the possibility that authorities engage in strategic scheduling of referendums. Section 1.8 concludes.

1.2 Background

The Swiss political system and the "magic formula" The political system of Switzerland is unique, blending elements of both direct and representative democracy. Switzerland operates as a federal state consisting of 26 cantons, each of which enjoys a significant degree of autonomy, and citizens have the right to propose and vote on laws and constitutional changes through referendums and popular initiatives. In the past 50 years, the Swiss have voted in 8.6 federal referendums per year on average, held on three to four voting dates per year. In addition to federal-level direct votes, during the same period Switzerland's 26 cantons have held an average of 5.5 cantonal referendums on two annual voting dates on average, and there are also municipal-level referendums.[9]

[9] As far as we know, there is no systematic data currently available for municipal-level referendums.

The Swiss parliament, known as the Federal Assembly, consists of two chambers: the National Council and the Council of States. The National Council represents the people and is elected through proportional representation, while the Council of States represents the cantons and operates on a majority voting system.[10]

The Swiss government is led by a seven-member executive called the Federal Council, with each member heading a department. The Federal Council operates on a consensus principle, and there is no single head of state. The seven members of the Federal Council are determined through a power-sharing arrangement colloquially known as the 'magic formula', where major political parties come together to share power and ensure representation of different linguistic and cultural groups in the country (Church 2003). Traditionally, the "magic formula" involves the four major political parties in Switzerland: the Conservatives/Nationalists (SVP, Swiss People's Party), the Socialdemocrats (SP, Social Democratic Party), the Liberals, and the Christian Democrats (CVP, Democratic People's Party). The Federal Council is formed with the aim of each of these parties holding one or more seats in the council, with the distribution of seats roughly proportional to each party's electoral strength (Figure A1 shows the evolution of its composition by political party group over the study period). The presidency of the Federal Council rotates annually among its members, ensuring that each major party has the opportunity to hold the presidency.[11]

Types of referendums In this article, we use the term "referendum" to collectively refer to all types of direct votes that exist in Switzerland, following the definition of the International Encyclopedia of Political Science (Badie, Berg-Schlosser, and Morlino 2011): "A referendum is a device of direct democracy by which the people are asked to vote directly on an issue or policy. It differs from an election, which is a vote to elect persons who will make decisions on behalf of the people [...]."

There are three types of referendums in Switzerland.[12] (i) Mandatory referendums are those that must be held by law under certain conditions, such as when a revision of the Constitution is proposed or when there is a proposal to join international organizations such as the UN or the EU. (ii) Optional referendums are

[10]For further details about the Swiss political system, see this website maintained by the Swiss Federal Department of Foreign Affairs: www.aboutswitzerland.eda.admin.ch/en/political-system

[11]www.swissinfo.ch/eng/swiss-politics/separation-of-powers/29288762

[12]For further details, see www.swissinfo.ch/eng/politics/direct-democracy/47697554

direct votes initiated by citizens to oppose bills approved by parliament, which can be launched by collecting 50,000 signatures within 100 days. (iii) Popular initiatives are a mechanism often used by opposition parties to launch partial amendments to the constitution, which can be initiated by collecting 100,000 signatures in 18 months. In the latter, the government or either of the two parliamentary chambers can present a counter-proposal to the popular initiative.

Voting in practice Swiss citizens who are 18 years of age or older are eligible to vote in federal referendums, and those who reside in Switzerland are automatically registered. Votes can be cast in person, but the large majority of voters do so by mail.[13] Voters receive their voting materials by mail several weeks before the referendum date, including a ballot paper, a list of proposals to be voted on, instructions on how to vote, and a brief summary of the proposed law or constitutional amendment, including arguments for and against it. If voting by mail, voters must fill out the ballot paper, place it in the provided envelope, and mail it back to their local authorities before the deadline. If voting in person, voters must bring their voting materials to their local polling station on the day of the referendum and fill out the ballot paper in a private voting booth.[14]

Regulation on the timing of referendums The voting dates reserved to hold federal referendums are defined well in advance. Specifically, the voting dates for the next 40 years have already been defined.[15] However, the exact topics that are voted on on each date are defined much closer to the voting date, as follows.

Both the Federal Council and the Parliament play a role in the timeline that takes a referendum from a proposal to a vote. For instance, in the case of popular initiatives, from the moment that signatures are deposited, the Federal Council has 12 months to draft a message for Parliament explaining its position either approving or rejecting the initiative, a period that gets extended to 18 months if the Federal Council wants to submit a counterproposal.[16] Afterward, the Parliament has 18 months to decide on the validity of the initiative, or 12 months if a counterproposal is involved.

[13] More than 80% of voters do so by post (source). In recent years, there have been trials of electronic voting, involving a limited share of the electorate in certain cantons and votes. For details, see this March 3, 2023 media release from the Federal Council.

[14] www.ch.ch/en/votes-and-elections/elections/where-and-when-to-vote/

[15] Link

[16] www.ch.ch/it/votazioni-e-elezioni/iniziative/iniziativa-popolare–passo-per-passo#ulteriori-informazioni

Although the specific steps and timeline vary a bit for different types of referendums, a common element is that once Parliament has given the green light to the proposal, the Federal Council is ultimately responsible for allocating specific referendums to specific voting dates. From the moment Parliament agrees to take forward a referendum, the vote must be held within 10 months, and the Federal Council has to determine the voting date at least 4 months before the date. In practice, this generally means that the Federal Council can allocate a given referendum to one of two or three upcoming voting dates (see Figure A2 for an illustration of the Federal Council's timeline to allocate referendums to voting dates).

Schmid 2015 presents findings from a semi-structured interview with a councellor who was involved in the process of assigning referendums to voting dates. The interviewee stated that strategic scheduling or bundling of votes does not happen, with the exception of highly salient referendums. The latter tend to be allocated to voting dates where no other salient referendums are planned, to avoid crowding out public debate, and to reduce voter fatigue.

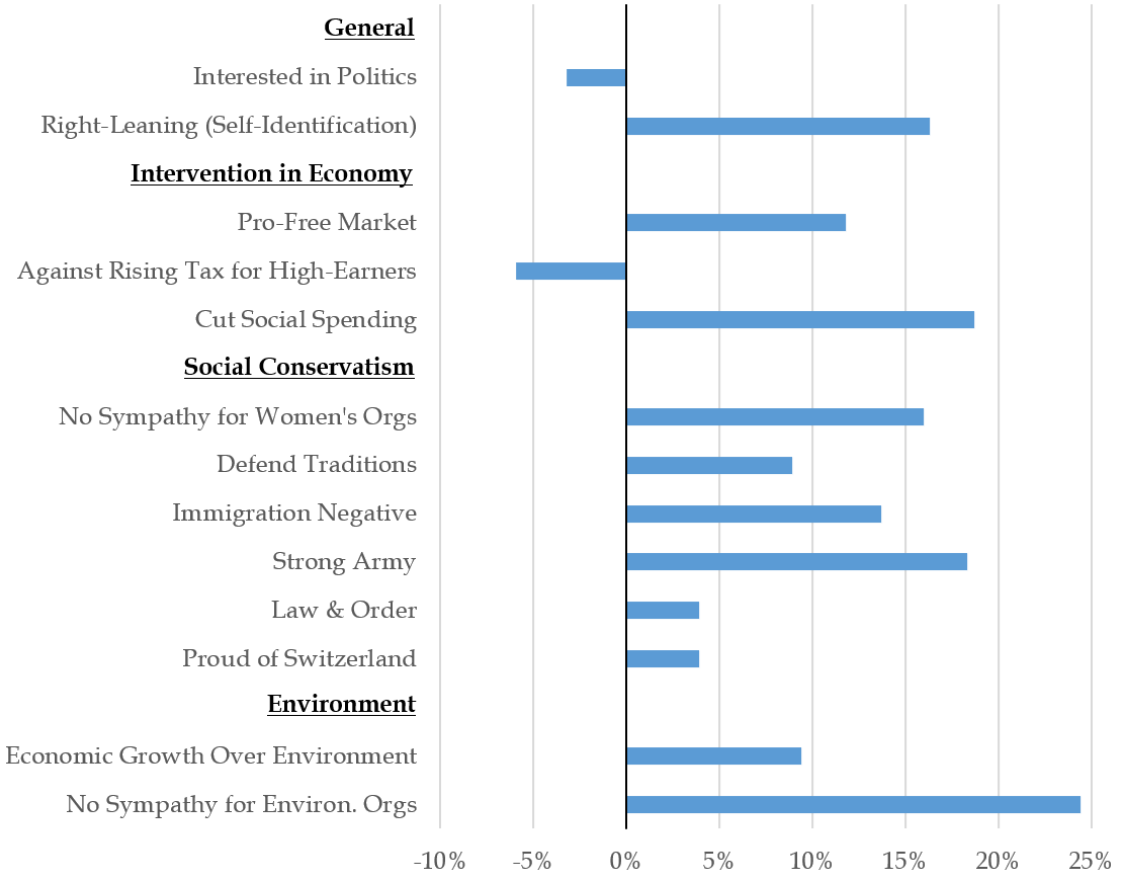
Overall, we conclude that political parties likely have some degree of influence in the scheduling of referendums through their representation in Parliament and the Federal Council. Influence in the Federal Council is particularly important when it comes to bundling or splitting specific referendums. However, exerting influence in this institution can be complex given the checks and balances that arise from the "magic formula" described above.

The urban-rural divide Switzerland's political landscape reflects a notable urban-rural divide. Similarly to what happens to other countries, urban areas in Switzerland tend to be more liberal and cosmopolitan in their political leanings; rural regions often exhibit more conservative and traditional tendencies. This divide is evident in voting patterns, with urban centers typically supporting progressive policies and parties, while rural areas tend to lean toward conservative and right-wing political options.

Figure 1 reflects the gap in political attitudes using survey data from the SELECTS dataset, showing the percentage difference in the proportion of rural respondents who agreed with each statement compared to urban respondents. Rural respondents tend to self-identify themselves as right-leaning more often, tend to be less favorable to intervention in the economy and social spending, express more socially conservative attitudes, and are less pro-environment.

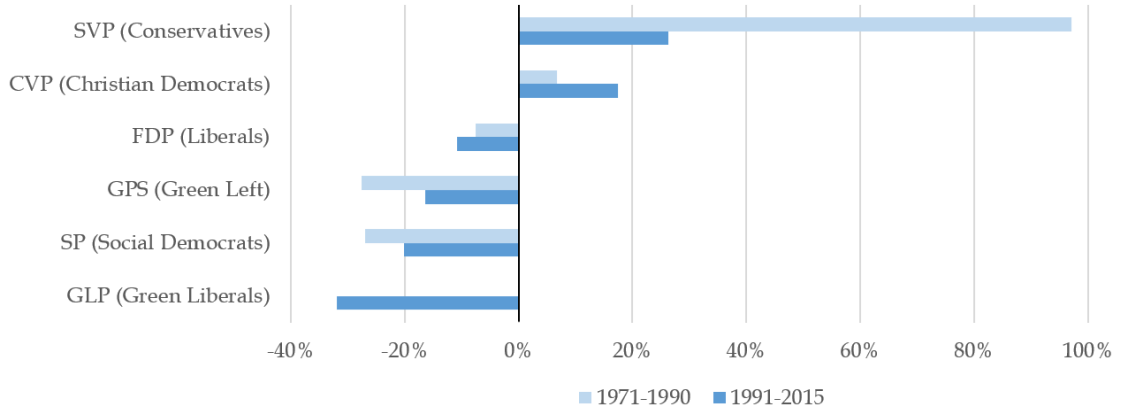
Figure 2 shows how the main Swiss political parties perform in rural areas compared to urban areas, which is informative of the extent to which the political agendas of these parties align with the attitudes of rural voters. Each bar represents the percent difference in the proportion of votes that a given party obtained in rural municipalities compared to urban municipalities, in the most recent federal parliamentary election. The SVP (conservatives) and, to a lesser extent, the CVP (christian democrats) perform better in rural areas compared to urban areas, while the other main parties (liberals, green and left parties) perform better in urban areas.

Figure 1: Political Attitudes: Rural vs Urban



Notes: This figure plots the percent different in the proportion of rural respondents that agreed with each statement, relative to the proportion of urban respondents, pooling respondents from 1971 to 2019 surveys. Political attitude measures are obtained from the consolidated SELECTS dataset and are expressed as binary variables, where a value of 1 represents responses against state intervention and towards social conservatism. For example, the value in "Right-Leaning (Self-Identification)" indicates that the proportion of rural residents that identified themselves as right-leaning is 16% higher than the proportion among urban residents.

Figure 2: Votes Shares: Rural vs Urban



Notes: The figure shows the percent difference in the proportion of votes that each party obtained in rural municipalities relative to urban municipalities, pooling federal parliamentary elections in each period. Source: Federal Statistics Office.

1.3 Data and Summary Statistics

Turnout in federal referendums Voter turnout in federal referendums at the municipal level is obtained from the Swiss Federal Statistics Office, including the number of yes, no and blank votes, as well as the size of the electorate. Although turnout would typically include all votes cast, including blank votes, in this study we define turnout as the proportion of yes/no votes as a share of the electorate. We exclude blank votes because they do not influence the result of referendums. This approach ensures that if we find effects on turnout, we can rule out the possibility that these effects occur through an increase in blank votes.

The analysis dataset includes 457 federal referendums held between 1970 and 2022 on 160 voting dates, with results for 2,186 municipalities. Overall, there are over 325,000 time-municipality observations, with an average turnout of 44.3% (see Table 6). During our analysis period, average turnout decreased slightly from 41.7% in the 1970s to 40.4% in the 1980s, then progressively increased to 46.9% in the 2010s.

In the analysis sample, we apply trimming to reduce noise in the estimation, dropping observations (municipalities) in the bottom and top 1% of the outcome distribution, stratified by year and treatment group.

Policy themes The classification of all federal referendums by policy theme is based on the SwissVotes dataset,[17] maintained by the Institute of Political Science of the University of Bern. This dataset has a detailed classification of policy themes, where each referendum is assigned up to three themes, each of them available at three levels of aggregation. For the referendums in the analysis period, the most aggregated classification has twelve themes.[18] These can be disaggregated into 48 themes, which in turn can be disaggregated into 81 themes using their most granular classification. We start from their 12-theme classification and split up some of them when they contain salient policy themes that concentrate a large proportion of referendums, creating a classification with 20 policy themes. For example, we split their "public finance" theme into "taxation" (one of their subthemes under "public finance") and "public finance" (containing the remaining subthemes: "financial regulation", "public expenditure" and "saving and restructuring measures"). Details of how our classification is created based on the SwissVotes themes can be found in Appendix figure A3.

Note that some referendums are related to more than one policy theme. Specifically, of the 457 federal referendums in the data, 267 (58.4%) referendums are classified in a single theme in our aggregated classification; 189 (41.4%) are classified in two themes; and 1 referendum (0.2%) is classified in three themes. Of the 160 federal voting dates in the dataset, 24 dates include a federal vote related to agriculture. Figure 3 shows the distribution of federal referendums on agriculture over time. Of the 24 dates involving referendums on agriculture, 3 dates involve a single referendum, while the remaining 21 involve a mix of referendums related to agriculture and referendums not related to agriculture. Table 6 shows that the average turnout in agricultural referendums was higher in rural municipalities (44%) than in urban ones (42%). We also see that in rural areas, turnout in agricultural referendums is slightly higher than that in non-agricultural referendums, while the opposite is true in urban areas.

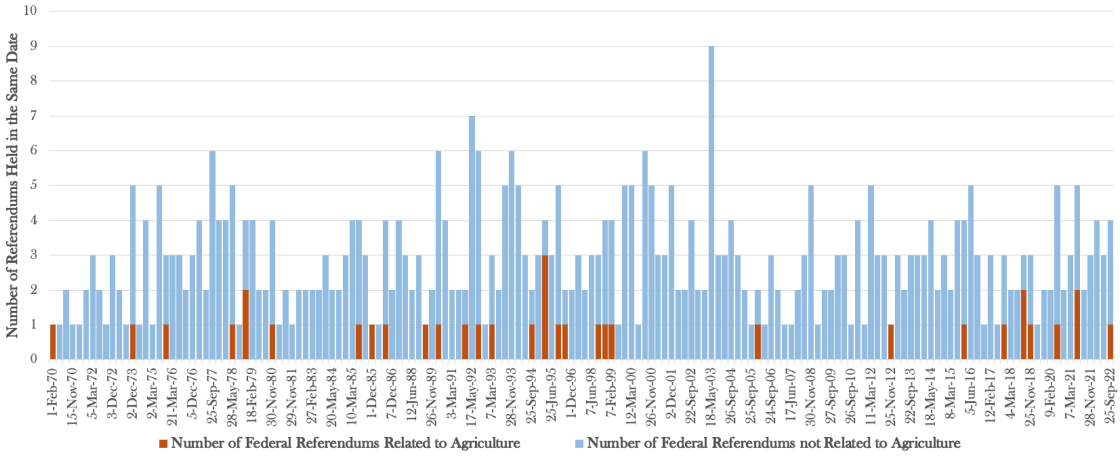
Figure 4 shows the distribution of the 20 policy themes over time. This study looks at policy themes as treatments, and this figure illustrates a major challenge in the causal analysis we attempt here: on any given voting date, multiple policy themes concur, which can make it hard to disentangle their respective effects. In

[17] https://swissvotes.ch

[18] These twelve themes are: state order, foreign policy, security policy, economy, agriculture, public finances, energy, traffic and infrastructure, environment and habitat, social policy, education and research, and culture, religion and media. The complete codebook can be found at swissvotes.ch/page/dataset.

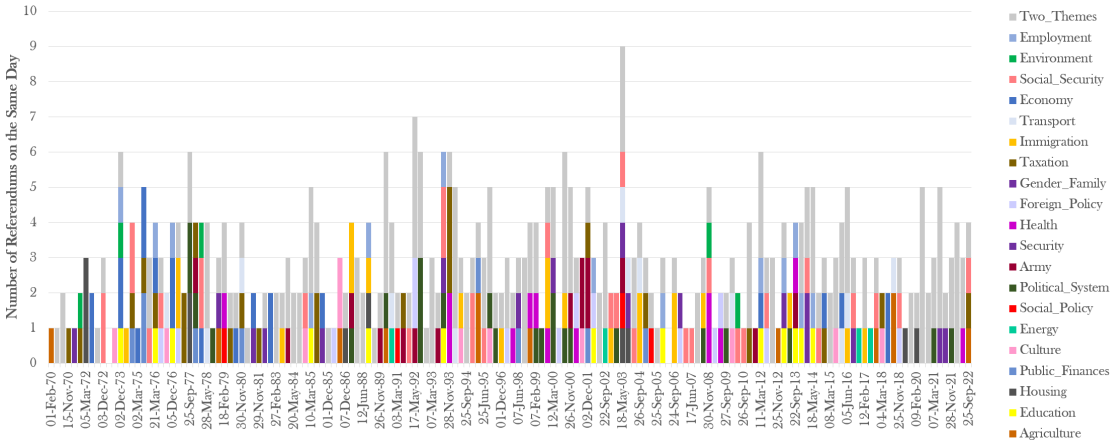
Section 1.4, we look at the correlation between policy themes and discuss this threat to internal validity.

Figure 3: Concurrent Federal Referendums: Agriculture vs Other Themes



Notes: The figure shows the distribution over time of the number of federal referendums held by date, differentiating referendums on the theme of agriculture. Source: SwissVotes data, using our own re-classification of policy themes.

Figure 4: Concurrent Federal Referendums: All Policy Themes



Notes: The figure shows the distribution over time of the number of federal referendums held by date, by policy theme. Referendums classified in two policy themes are represented in grey. Source: SwissVotes data, using our own re-classification of policy themes.

Classification of political parties We classify Swiss political parties into three categories, as follows. Note that some of the parties listed below might have merged or split up over the study period.

- *Left:* Social Democratic Party of Switzerland (SP), Green Party of Switzerland (GPS), Partito Socialista Autonomo (PSA), Progressive Organisations

of Switzerland (POCH), Christian Social Party (CSP), Swiss Labor Party (PdA), Alternative Left (FGA) and Solidarity (Sol).

- *Center:* Christian Democratic People's Party of Switzerland (CVP), Free Democratic Party of Switzerland (FDP), The Liberals (LP), Liberal Party of Swtizerland (LPS), Civil Democratic Party (BDP), Green Liberal Party (GLP), Evangelical People's Party of Switzerland (EVP), Democratic Social Party (DSP) and Die Mitte.

- *Right:* Swiss People's Party (SVP), Alliance of Indenpendents (LDU), Mouvement Citoyens Romands (MCR), Lega dei Ticinesi (LEGA), Swiss Democratic Union (EDU), Freedom Party of Switzerland (FPS), Swiss Democrats (SD), Republicans (REP) and Democrats (DEM).

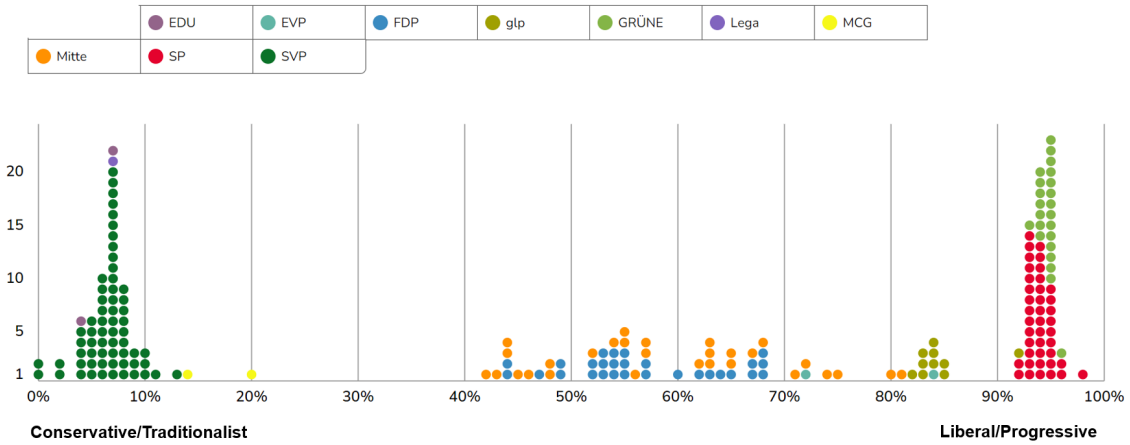
The above classification of parties in the left group follows the classification proposed by the Federal Statistics Office[19]. We also follow this website to classify small political parties as left, center or right. In addition to a "left and green parties" group, this website proposes two other groups, labeled "center and other parties" and "traditional bourgeois and right-wing parties". The latter includes the main liberal parties (FDP and LPS; nowadays The Liberals) and the christian democrats (CVP, nowadays Die Mitte). However, we classify these parties as center following the conservative-liberal rating of political parties by Smartmonitor[20], which uses party votes in federal laws and resolutions as well as parliamentary initiatives to rate parties on this scale (Figure 5).

In the analysis of strategic scheduling of referendums (Section 1.7), we refer to center-right or center-left majorities in the Federal Council. A center-right majority in this context refers to one formed by the SVP plus liberals and/or christian democrats. A center-left majority is one formed by the social democratic party plus liberals and/or christian democrats.

[19] www.bfs.admin.ch/bfs/de/home/statistiken/kataloge-datenbanken/definitionen.assetdetail.-27285175.html

[20] smartmonitor.ch/de/issues/10

Figure 5: Classification of Political Parties Along the Conservative/Traditionalist vs Liberal/Progressive Axis (SmartMonitor.ch)



Notes: This figure shows the position of council members by political party along a conservative/traditionalist vs liberal/progressive axis. The classification is made by SmartMonitor based on the votes of council members on federal laws or federal resolution and parliamentary motions, in the 2019-2024 period. Source: SmartMonitor. Link

Party positions in referendums For each referendum in the study period, the SwissVotes dataset contains information on the voting recommendations issued by each political party. Parties can position themselves in favor of the policy voted in a given referendum or against it. They can also decide not to issue a recommendation or recommend submitting a blank ballot. We use this data to create our secondary outcome measure, the share of votes aligned with the left, as follows. For each referendum, we check whether the Social Democratic Party issued a recommendation to either vote in favor or against. If it did, we define the share of votes aligned with the left as the share of votes for the option favored by this party. For each date and municipality, the outcome variable is the average of this across concurrent referendums, excluding those on the policy theme under study. As show in table 6, the average of this outcome across all voting dates was 49.35% among rural municipalities and 52.09% among urban ones.

Characteristics of municipalities Federal Statistics Office[21] is the common source of variables used to characterize municipalities, which we use for heterogeneity analysis. To identify rural municipalities, we use the "Rural-Urban 2012 typology", a time-invariant classification based on 2017 data. 51.6% of the municipalities are classified as rural, while the rest are classified as urban. Urban municipalities can also be divided into intermediate (54.1%) and urban (45.9%) munici-

[21] https://www.bfs.admin.ch/bfs/en/home.html

palities. 15.13% of employment on average is concentrated in the primary sector (2021 data).

To characterize municipalities in a left-right political spectrum, we use municipal-level results of federal elections held in 1970-2022, obtained from the "relative party strength" datasets from the Federal Statistics Office[22]. Using these data, we classify a municipality as left-leaning if, in the most recent national council election, the percentage of votes for left-leaning parties (as classified above) in the municipality was equal to or greater than the percentage at the federal level. This classification is therefore time-varying, with each national council election (held every four years). Thirty-two percent of the municipality-year observations are classified as left-leaning based on this definition (Table 6). On average, the left-leaning parties obtained 23.15% of the vote.

Table 6: Summary Statistics

	Level	Mean	S.D.	Min	Max	N
Federal Referendums						
Turnout	Time-Munic.	44.30	13.77	1.84	100	323,844
Turnout in Agricultural Rerefendums						
In Rural Municipalities	Time-Munic.	44.03	14.83	2.19	100	24,784
In Urban Municipalities	Time-Munic.	41.35	12.73	7.99	89.66	23,164
Turnout in Non-Agricultural Rerefendums						
In Rural Municipalities	Time-Munic.	43.40	14.19	2.14	100	162,405
In Urban Municipalities	Time-Munic.	43.61	12.50	3.34	94.02	151,681
% of Left-Aligned Votes						
In Rural Municipalities	Time-Munic.	49.35	16.33	0.00	100	165,835
In Urban Municipalities	Time-Munic.	52.09	15.06	0.00	100	154,384
# Federal Referendums per Date	Time	2.86	1.45	1	9	160
Referendum on Agriculture Held	Time	0.15	0.36	0	1	160
Municipalities						
Municipality is Rural	Munic.	0.52	0.50	0	1	2,114
% of Employment in Primary Sector	Munic.	15.13	15.03	0	79.90	2,038
Municipality is Left-Leaning	Time-Munic.	0.32	0.47	0	1	23,346
% Votes for Left-Leaning Parties	Time-Munic.	23.15	11.93	0	73.79	23,346

Notes: This table shows averages across voting dates and municipalities in the datasets, or across voting dates - as indicated in the "level" column. Turnout is the average of yes/no votes over the electorate (in percentage) across federal referendums held on a given date. The percent of left-aligned votes is an average based on the percentage of yes/no votes casted on each referendum that is aligned with the position of the Social Democratic Party. Rural and urban municipalities are defined based on the Federal Statistics Office' "Rural-Urban 2012 typology". "% Votes for left-leaning parties" is the percentage of votes for left-leaning parties in the most recent national council election. "Municipality is left-leaning" is a dummy indicating whether the vote share for left-leaning parties in the municipality is equal or greater than at the federal level.

[22] www.bfs.admin.ch/bfs/de/home/statistiken/politik/wahlen/nationalratswahlen/parteistaerken.html

1.4 Identification Strategy

The main focus of this study is to investigate whether certain policy themes mobilize different types of voters differently. Specifically, the media story presented earlier suggests that referendums related to agricultural policy mobilize rural voters more than urban ones, so we start the analysis paying attention to this policy theme and subsequently present results for other themes.

To investigate this, we use municipal-level data on all federal referendums held in Switzerland from 1970 to 2022. Using a difference-in-differences strategy, we look at the change in turnout induced by the concurrence of a referendum related to agriculture, comparing urban to rural municipalities. While all municipalities are subject to the treatment, the hypothesis that we want to test presumes differential effects depending on whether a municipality is rural or urban, which enables us to use these two types of municipalities as treated and controls groups, respectively.

Regression specification The unit of observation is a municipality at time $t \in T$, where T represents all dates on which at least one federal referendum was held. To estimate the causal effects of interest, we estimate a two-way fixed effect model with multiple leads and lags as follows:

$$\begin{aligned} AverageTurnout_{m,t+k}^{\text{All Votes}\setminus\text{Agric}} &= \beta_{1,t+k} Rural_m Agriculture_t \\ &+ \beta_{2,t+k} Rural_m NumberOfReferendums_t \\ &+ \sum_{\substack{p=1 \\ p\neq\text{Agric}}}^{20} \gamma_{p,t+k} Rural_m PolicyTheme_{p,t} \\ &+ \delta_m + \lambda_t + \delta_{c,t} + \varepsilon_{m,c,t+k} \\ &\text{with } k = -4, ..., 4 \end{aligned} \tag{1}$$

The outcome of interest is $AverageTurnout_{m,t+k}^{\text{All Votes}\setminus\text{Agric}}$, which represents the average turnout in concurrent referendums in municipality m in time $t+k$, excluding referendums related to agriculture (denoted by the $\setminus Agric$ notation). Agriculture-related votes are excluded from the outcome because we are interested in measuring their impact on turnout in concurrent referendums. Turnout is defined as the percentage of valid, nonblank votes cast out of the electorate of the municipality, measured in a 0-100 scale.

We express the treatment assignment for each municipality using a binary variable $Rural_m \in \{0, 1\}$ that takes a value of 1 if the municipality is classified as rural, as described in Section 1.3. The treatment variable is $Agriculture_t$, which indicates whether a referendum related to agricultural policy was held in time t. The coefficient of interest is β_1, which captures the change in turnout in rural municipalities compared to urban municipalities when a vote related to agriculture policy was held. We do this estimation for four pre-treatment and four post-treatment periods, which allows us to examine whether the parallel trends assumption appears to hold or not.

Correlation among policy themes A key threat to our identification strategy is that multiple treatments (policy themes) occur at the same time. This arises both from the fact that a single given referendum can be related to more than one policy theme (e.g., agriculture and environment) and due to the concurrence of multiple referendums related to different policy themes. In the Appendix, Table A4 dissects both sources of policy theme concurrence. Panel A looks at individual referendums and shows, for instance, that 34.5% of the 29 referendums related to agriculture are also related to the environment, while 17.2% are also related to public finance. Panel B does a similar analysis at the voting date level. By construction, frequent policy themes such as taxation, the environment, and social security (the three most common themes) tend to concur with many other policy themes. Of the 24 voting dates with referendums on agriculture, the environment was a concurrent topic on 54.2% of these dates, taxation concurred on 33.3% voting dates, and transport and public finance did so on 29.2% dates, to name a few.

We address the above as follows. First, we control for the total number of concurrent federal referendums held on a given voting date, denoted $NumberOfReferendums_t$ – interacted with $Rural_m$. Second, we include as controls dummies representing the 19 remaining policy themes ($PolicyTheme_{p,t}$), interacted with $Rural_m$. This is captured in the summation term $\sum_{\substack{p=1 \\ p \neq \text{Agric}}}^{20}$, where p indexes dummies for each policy theme. Although the interaction term $Rural_m Agriculture_t$ is not different from the elements of the summation term, we represent it separately to emphasize its special role as the "treatment theme", i.e. the theme for which we estimate treatment effects. Regression equations used to estimate the effects of each of the 20 policy themes differ only in the outcome variable, because average turnout in a given voting date is computed excluding turnout in referendums associated to the "treatment theme".

Municipality fixed effects are represented by δ_m, while λ_t captures time fixed effects (voting dates). Canton-specific linear time trends are represented by $\delta_{c,t}$. The idiosyncratic error term, $\varepsilon_{m,c,t}$, is clustered at the cantonal-date level. Regressions are weighted according to the size of the electorate per municipality and year.

We next describe variations of the above model used in the article to extend the analysis and carry our robustness and validity checks.

Treatment assignment In addition to looking at the heterogeneous effects of agriculture on turnout in the rural-urban dimension, we study whether heterogeneity exists on the left-right dimension. To do so, we replace the dummy $Rural_m$ with the variable $LeftLeaning_{m,t}$, which is equal to 1 if the percentage of voters in municipality m at time t who voted for leftist parties in the most recent federal election was greater than the proportion at the national level (as described in Section 1.3). Finally, we study heterogeneous effects by political party comparing municipalities in which the vote share of a given party or party group is greater than the national share in the preceding federal election, against all other municipalities.

Outcome measures In addition to turnout, we examine the effects on vote shares. Specifically, this is measured by the average proportion of votes aligned with the option supported by the social democrats. This is either the proportion of "yes" votes or the proportion of "no" votes, depending on which option is supported by the social democrats. For each date and municipality, the outcome is measured as the simple average across concurrent referendums, excluding those on the policy theme under study (i.e. the theme acting as the treatment shock).

Policy themes After a close look at the effects of referendums related to agricultural policy, we extend the analysis to another 19 policy themes.

Robustness checks To check whether the main results on heterogeneity by $Rural_m$ and $LeftLeaning_{m,t}$ are robust, we present an equivalent analysis using continuous versions of these variables: $RuralShare_m \in (0,1)$ represents the share of employment in the primary sector of the municipality (2021 data), and $LeftShare_{m,t} \in (0,1)$ represents the proportion of votes cast to leftist parties.

Validity checks Results from the event study regressions are presented in graphical form and allow to observe whether there are parallel trends before and after the treatment. A legitimate concern about the analysis is that we estimate a few hundred coefficients, and many will be statistically significant by pure chance. To address this, Appendix A5 and A6 presents results for the two outcomes of interest, turnout and vote shares, using a random treatment assignment: instead of splitting municipalities by whether they are rural or urban, they are split randomly. In this estimation, we do not expect heterogeneity in the treatment effects, and therefore none of the estimates should be statistically significant unless by chance. The results align with this expectation: very few estimates are statistically significant and most are small in size, with just a few exceptions generally concentrated in less frequent policy themes (where idiosyncratic factors can have a greater influence in the results).[23]

1.5 Results

In this section, we first analyze how referendums on agricultural issues affect voter turnout in concurrent referendums not related to agriculture by comparing rural and urban municipalities (Section 1.5.1). To more directly examine the political implications, we compare turnout in left- and right-leaning municipalities and explore heterogeneous effects across political party groups. Next, we investigate how agriculture-related referendums influence vote shares, specifically focusing on the proportion of votes aligned with the position of the Social Democratic Party (Section 1.5.2). In Section 1.5.3, we analyze the effects on turnout and vote shares across all other policy themes, with particular attention to three topics that stand out in the empirical results: gender and family, immigration, and housing.

1.5.1 Agriculture: Effects on Turnout

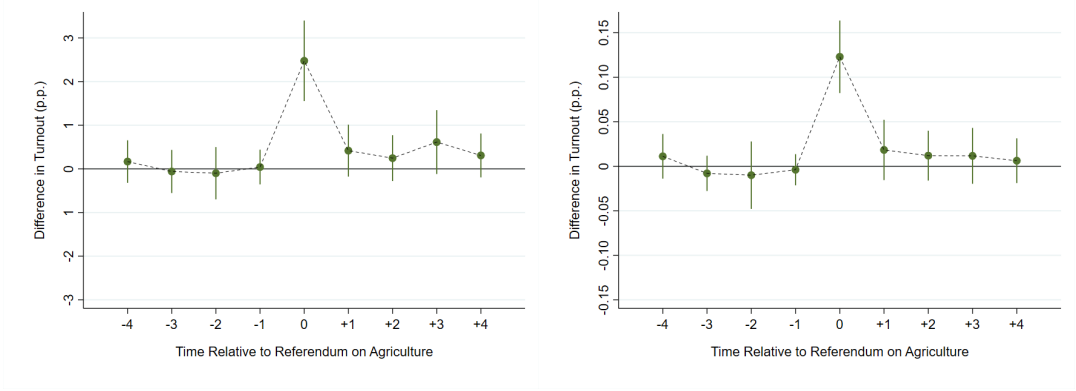
Figure 7 presents the key empirical finding of this paper: Agriculture-related referendums increase turnout in rural municipalities relative to urban municipalities. While this increase holds when looking at turnout in all concurrent referendums, the results presented here specifically refer to turnout in concurrent

[23] An alternative and arguably more rigorous approach to address concerns due to multiple hypothesis testing would be to use the Benjamini-Hochberg procedure Benjamini and Hochberg (1995) to control the false discovery rate (FDR) when performing multiple hypothesis tests, an avenue that we have not explored.

referendums unrelated to agriculture. This is particularly interesting because it implies a spillover effect: rural voters are drawn to vote due to the occurrence of a vote related to agriculture, but this boost in turnout is visible as well in concurrent referendums on other policy themes. Specifically, turnout increases by 2.48 percentage points, representing a 5.70% rise relative to the average turnout of 43.40% for non-agricultural referendums in rural municipalities. As a robustness check, Panel B shows the results using a continuous treatment assignment variable: the share of employment concentrated in the agricultural sector.

The estimates for the four pre-treatment periods are close to zero and not statistically significant, supporting the parallel trends assumption. In the post-treatment periods, point estimates are also close to zero and not statistically significant, confirming that treatment effects are confined to the voting date when the referendum on agriculture takes place, as expected.

Figure 7: Effect of a Concurrent Referendum on Agriculture on Turnout: Rural vs Urban Municipalities



(a) Rural vs Urban (b) Share Rural

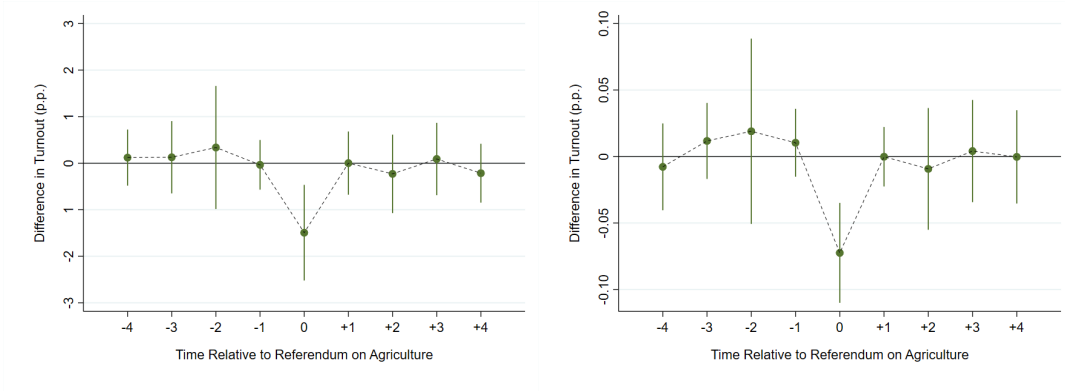
Notes: This figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1. Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. The outcome variable is average turnout (0 to 100) across concurrent referendums, excluding those related to agriculture. Panel (a) compares turnout in rural versus urban municipalities based on the Swiss Federal Statistical Office's "Rural-Urban 2012 typology." In panel (b), the treatment status is a continuous variable, *ShareRural*, representing the share of employment in the primary sector. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year.

Having established that agricultural referendums differentially mobilize rural and urban voters, we next examine potential heterogeneous effects along the left-right political dimension. Such heterogeneity might be expected given the stronger left-wing orientation of urban municipalities, as documented in Section 1.2. Differential effects across the political spectrum could alter the ideological

composition of the electorate at the national level, potentially influencing voting outcomes.

Figure 8 presents these results. When a referendum on agriculture occurs, turnout in concurrent non-agricultural referendums decreases by 1.48 percentage points in left-leaning municipalities relative to right-leaning ones (a drop of 3. 42% from baseline). This finding is robust to using a continuous treatment measure: the vote share of left-leaning parties in the most recent federal election. The effect likely stems from the more conservative political preferences of rural residents rather than a lower interest in agricultural issues among left-leaning voters.

Figure 8: Effect of a Concurrent Referendum on Agriculture on Turnout: Left vs Right-Leaning Municipalities



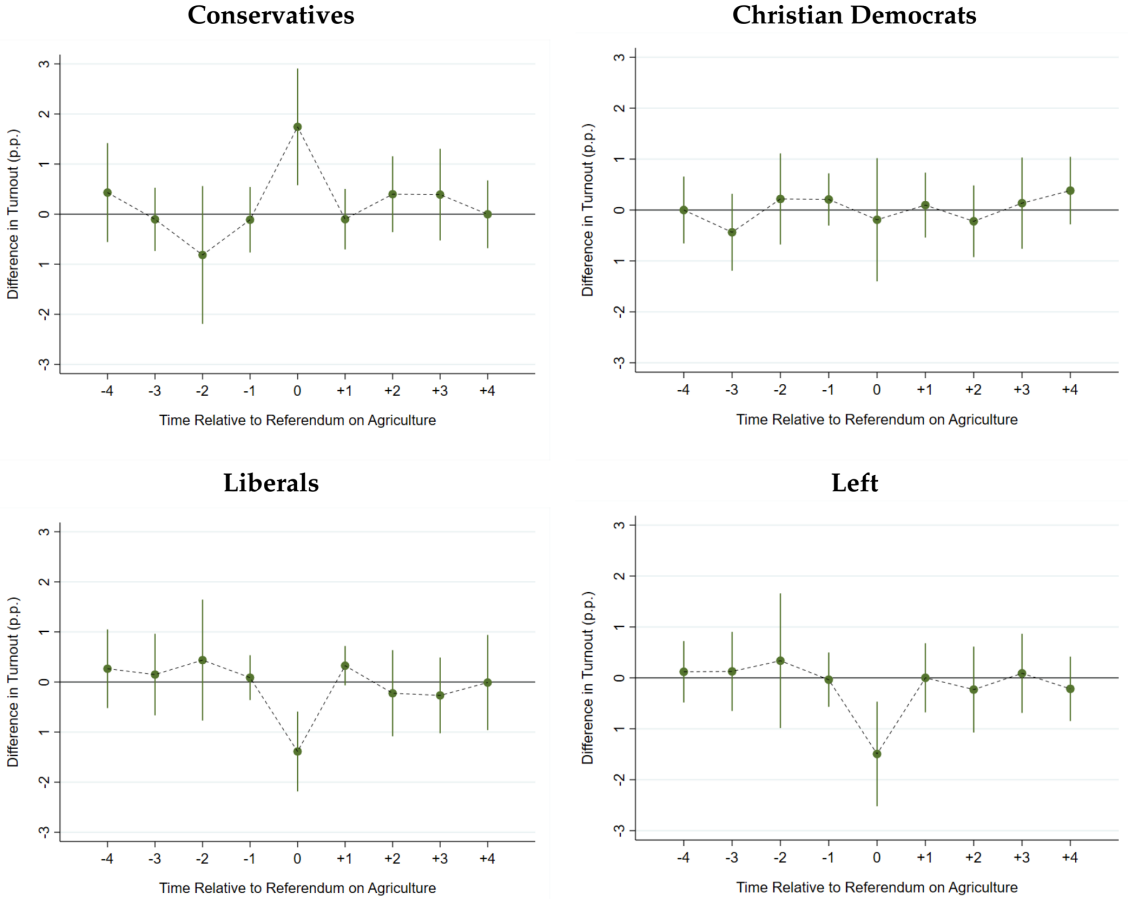
(a) Left vs Right-Leaning Municipality (b) Vote Share of Left-Leaning Parties

Notes: This figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1, modifying the treatment status variable to compare left-leaning against other municipalities. Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. The outcome variable is average turnout (0 to 100) across concurrent referendums, excluding those related to agriculture. Panel (a) compares turnout in left-leaning versus all other municipalities, as defined in section 1.3. In panel (b), the treatment status is a continuous variable, $ShareLeft$, representing the share of votes to left-leaning parties in the municipality in the most recent national council election. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year.

We further analyze heterogeneity by political affiliation by examining party-specific effects. Figure 9 presents these results, with the first panel focusing on the conservative party (SVP). For this analysis, we divide municipalities into two groups based on whether the conservative party vote share in the most recent federal election was above or below the national average. Consistent with our previous findings, municipalities with above-average conservative support show higher voter mobilization during agricultural referendums. In contrast, municipalities where liberal and left- wing parties enjoy stronger support experience relative decreases in turnout. Notably, municipalities with above-average

christian democrat support show no differential turnout effects. These patterns align with the rural-urban distribution of party support documented in Figure 2 and suggest that the conservative party is the primary beneficiary of agriculture-induced voter mobilization.

Figure 9: The Impact of Agricultural Policy on Turnout in Federal Referendums: Results by Party



Notes: This figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1, modifying the treatment status variable to compare municipalities in which the vote share of a given party was greater than the national share in the preceding national council election, against all other municipalities. Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. The outcome variable is average turnout (0 to 100) across concurrent referendums, excluding those related to agriculture. Conservatives refers to the SVP. Christian Democrats are the CVP. Liberals refers to the FDP, rebranded as The Liberals in 2009. The left contains all the parties classified as left in section 1.3. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year.

1.5.2 Agriculture: Effects on Vote Shares

Our previous findings indicate that agricultural referendums shift the national composition of voters toward the right through increased turnout in rural, right-leaning municipalities. This shift alone could influence the outcome of refer-

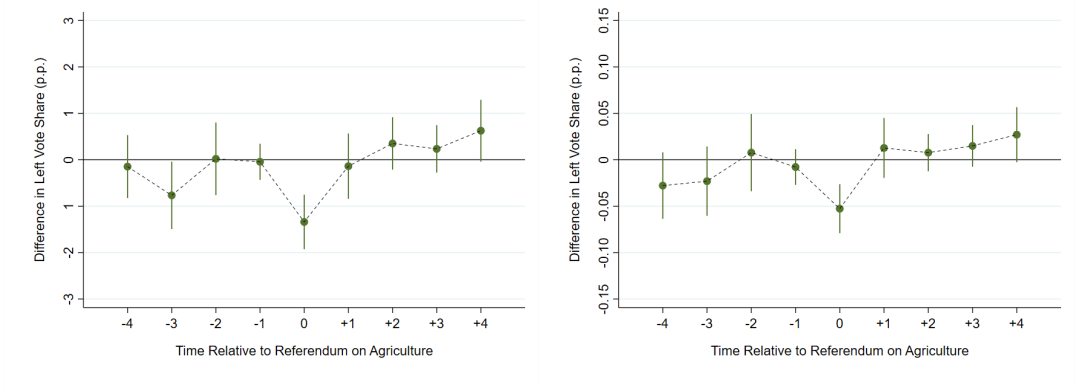
endums, particularly for close votes. In addition, voters in rural municipalities mobilized by agricultural referendums are likely to differ from regular voters, suggesting changes in the composition of voters *within* municipalities.

To investigate this, we analyze vote shares, specifically the proportion of votes aligned with the Social Democratic Party's position across concurrent, non-agricultural referendums. For each referendum, this measure is either the proportion of 'yes' or 'no' votes, depending on which option the Social Democrats supported.

Figure 10 presents these results. Panel A compares rural to urban municipalities, while Panel B uses a continuous treatment measure: the share of agricultural employment in each municipality. While Panel A shows a negative and statistically significant coefficient in the $t-3$ pre-treatment period, challenging the parallel trends assumption, both panels reveal a distinct and statistically significant negative effect in the treatment period. Specifically, Panel A indicates that when an agricultural referendum occurs, the proportion of votes aligned with the Social Democrats decreases by 1.33 percentage points in rural municipalities compared to urban ones—a 2.7% reduction from the baseline of 49.31%.

Unlike our analysis of turnout differences by rural and urban areas, we had no prior hypothesis about the effects of agricultural referendums on vote shares. The rightward shift in voting choices in rural areas could operate through two potential channels. First, within rural areas, agricultural referendums might disproportionately mobilize right-leaning citizens, shifting the rural voter composition to the right. Alternatively, framing effects might lead some rural voters to choose more right-leaning options in concurrent, non-agricultural referendums due to their alignment with right-leaning positions on agricultural issues. Developing and distinguishing between these two mechanisms exceeds the scope of this study, but this finding provides an important input for the back-of-the-envelope calculations presented in the next section, where we evaluate the media narrative that concurrent agricultural referendums influenced the rejection of the CO_2 bill.

Figure 10: Effect of a Concurrent Referendum on Agriculture on the Share of Votes Aligned with the Left: Rural vs Urban Municipalities



(a) Rural vs Urban (b) Share Rural

Notes: This figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1, replacing the outcome variable to estimate the effect on the share of votes aligned with the Social Democratic Party. For each referendum, this is either the proportion of "yes" or "no" votes out of all "yes" and "no" votes, depending on which option is supported by this party. This is then averaged across non-agricultural referendums held in the same voting date. Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. Panel (a) compares left-aligned vote shares in rural versus urban municipalities, based on the Swiss Federal Statistical Office's "Rural-Urban 2012 typology." In panel (b), the treatment status is a continuous variable, *ShareRural*, representing the share of employment in the primary sector. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year.

1.5.3 Results for Other Policy Themes

Having established the effects of agricultural referendums, we now examine patterns across other policy themes. Results for all 20 policy themes are presented in the Appendix, Figures A7 to A11. In addition to agriculture, we highlight the results that emerge for three other policy domains: gender and family, immigration, and housing. Figure 11 presents three sets of results for each selected policy theme: differences in turnout between rural and urban municipalities, differences in turnout between left and right-leaning municipalities, and differences in left-aligned vote shares between rural and urban municipalities.

Across the results for the 20 policy themes, two outcomes and alternative specifications, some statistically significant coefficients are found in pre- and post-treatment periods, which can arise due to chance or to unobserved factors. Given this, some of the statistically significant coefficients found in the treatment period could be spurious. Our findings should be interpreted with this limitation in mind.

Gender and family The results for referendums related to gender and family follow patterns similar to those related to agriculture, showing increased turnout

in both rural and right-leaning municipalities, while reducing support for left-aligned positions in concurrent votes, in rural relative to urban areas. This parallel is surprising, as gender and family issues might not appear inherently rural. One potential explanation for the effects on turnout could be that these topics might be particularly salient for rural, conservative voters relative to other policy issues, while for urban and more liberal citizens, the topic of gender and family could be as salient as other topics, such as taxation, environment, or social security. The effects on vote shares could be driven by a similar mechanism, where relatively more conservative rural citizens within rural municipalities are movilized more. Alternatively, framing effects could explain the latter results, whereby rural voters identify with right-leaning positions in gender and family referendums and this leads them to make more right-leaning choices in concurrent referendums.

Immigration The results for referendums on immigration are similar to those for agriculture and gender and family, but flipped. The negative coefficient for turnout when comparing rural to urban municipalities suggests that urban turnout increases relative to rural areas. This likely reflects the predominantly urban nature of immigration. The urban mobilization effect likely explains the moderate increase in turnout in left-leaning municipalities compared to right-leaning municipalities. Interestingly, these referendums are associated with increased support for left-aligned positions in concurrent votes in rural areas relative to urban ones, which in practice probably means a reduction in support for left-aligned positions in urban areas. This could reflect changes in urban voter composition, where immigration referendums might mobilize urban voters holding more conservative views on immigration. Alternatively, immigration debates might influence some urban voters to support right-leaning positions in concurrent referendums through framing effects. While the effects on turnout shift the national composition of voters to the left, the effects on vote shares shift average voter choice to the right.

Housing Finally, the results for referendums associated to housing are more noisy, but suggest an increase in turnout in urban areas compared to rural areas. This is an intuitive finding given housing policy's greater salience in urban settings. We also find weak evidence of higher turnout in left-leaning compared to right-leaning municipalities. Assuming that the results are driven by changes in urban rather than rural areas, the analysis of vote shares indicates that sup-

port for left-aligned positions in concurrent votes increases in urban areas when referendums on housing take place - contrary to what we find for immigration. The voter composition story would be one where voters mobilized by housing referendums are more left-leaning than the average urban voter. The framing mechanism would involve average urban voters adopting a more left-leaning position in concurrent referendums unrelated to housing due to the occurrence of a referendum on housing.

Appendix Figures A7 to A11 present results for the remaining policy themes. Several themes show no effects on either turnout or vote shares: foreign policy, security, army, employment, political system, public finance, and energy.

Other themes For other themes, presented in order of frequency, we find varying patterns:

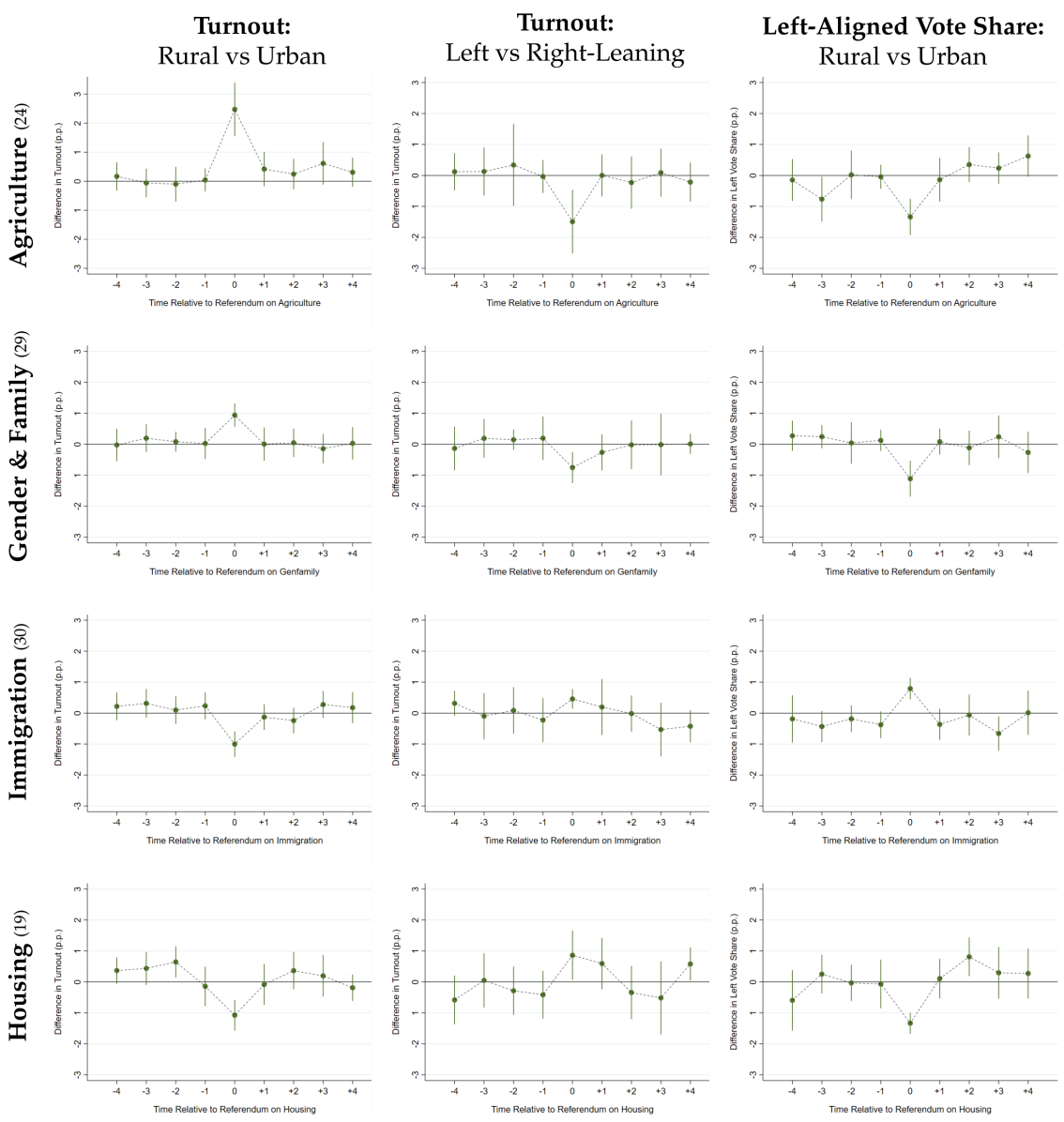
- Taxation (most frequent theme, 48 voting dates) shows no differential mobilization effects but suggests a leftward shift in rural voting patterns or a rightward shift in urban areas.
- Environmental referendums increase rural turnout without left-right turnout differences, and show increased support for left-aligned positions in rural areas.
- Social security does not show differences in rural-urban turnout, and mixed results on turnout when comparing left- to right-leaning municipalities. In terms of voter shares, rural areas shift toward left-aligned positions compared to urban areas.
- Economy-related referendums show a voter mobilization effect in favor of rural areas, but no differential effects across left and right-leaning municipalities. Vote share effects are unclear due to significant pre-treatment estimates.
- Transport shows no differential effects on turnout, but estimates suggest that rural voters shift toward left-aligned positions in concurrent votes (or urban voters shift rightward).
- Health policy results indicate no turnout effects and weak evidence of rural areas shifting leftward in their voting choices, relative to urban areas.
- Education shows no turnout effects but suggests rightward shifts in rural voting choices, relative to urban areas.

- Culture-related referendums moderately increase turnout in rural and right-leaning areas, though vote share effects are unclear due to differences in pre-treatment periods.
- Social policy (least frequent theme, 9 voting dates) shows no turnout effects but suggests rightward shifts in rural voting choices, though significant pre- and post-treatment estimates warrant caution.

These results should be interpreted cautiously, given (i) the large number of coefficients that we estimate, which implies that some of them will be statistically significant by chance; (ii) the high density of concurrent treatment (policy themes); and (iii) the fact that for less frequent themes individual referendums or unobserved factors may disproportionately influence estimates. Moreover, these findings are likely to be context-specific, reflecting Switzerland's policy debates and the salience of certain issues for different sociodemographic groups.

In addition, our interpretation of differential effects contains an implicit directional assumption. When we observe higher turnout in rural relative to urban municipalities during agricultural referendums, we interpret this as increased rural mobilization rather than urban demobilization, though both mechanisms could contribute to the observed difference. The same applies to the effects found on vote shares.

Figure 11: Effects of Concurrent Referendums on Selected Policy Themes



Notes: The figures in the first column plot the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1. The second column presents the corresponding figures when comparing left-leaning vs all other municipalities. The third column shows the results for our secondary outcome measure, the share of votes aligned with the Social Democratic Party. For each referendum, this is either the proportion of "yes" or "no" votes out of all "yes" and "no" votes, depending on which option is supported by this party. This is then averaged across referendums held in the same voting date (excluding referendums on the treatment theme). Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year. Numbers in parentheses next to the theme names indicate the number of voting dates in the 1970-2022 period that featured each policy theme.

1.6 Back-of-the-Envelope Calculations for the 2021 CO_2 Referendum

In this section, we conduct counterfactual calculations to assess whether concurrent agricultural referendums influenced the rejection of the CO_2 referendum on June 13, 2021, as suggested by media narratives. The total electorate for this referendum comprised 5,507,117 voters, of which 17.0% resided in rural municipalities.

Until now, our analysis of the impact of agricultural referendums on turnout relied on a binary rural-urban classification. It could be argued that back-of-the-envelope calculations based on this would underestimate the real aggregate effects, since many municipalities are not purely urban or purely rural, and agriculture referendums could have some degree of voter mobilization effects along this spectrum. To address this concern, we adopt a more nuanced classification from the Swiss Federal Statistical Office that divides our initial urban group into 'urban' and 'intermediate' municipalities. The latter category comprises dense peri-urban areas and rural centers that exhibit both urban and rural characteristics. Under this three-way classification, intermediate municipalities account for 22.3% of the 2021 electorate, while purely urban municipalities comprise 60.7%. The rural group is the same as in the binary classification.

We repeat the estimation of treatment effects using this classification, to serve as an input for the back-of-the-envelope calculations. In the Appendix, Figure A12, panel A presents the results for turnout obtained from the comparison of rural to urban municipalities (excluding those in the intermediate group). The point estimate is 2.85, or 6.58% relative to the baseline. Panel B presents the results obtained from comparing intermediate to urban municipalities (excluding those in the rural group), with a point estimate of 1.16, representing a 2.65% change relative to the baseline. Figure A13 in the Appendix presents equivalent results for the effects on vote shares. The estimates indicate that the share of votes aligned with the Social Democratic Party decreases by 1.53 points in rural compared to urban municipalities (a 2.91% reduction relative to the baseline), and by 0.82 points in intermediate relative to urban municipalities (a 1.61% decrease relative to the baseline).

Table 12 presents the results observed for the CO_2 referendum, along with five counterfactual scenarios based on the above estimates. The CO_2 referendum was rejected with 48.41% of votes in favor, falling short by about 1.6 percentage

points. The approval rate was 35.9% in rural municipalities, 41.9% in intermediate municipalities, and 54.7% in urban municipalities.

The first conterfactual scenario adjusts turnout based on our estimates of the differential mobilization effects of agricultural referendums, while vote shares are kept as observed. Removing these effects reduces the turnout gap between urban and rural municipalities, with rural turnout dropping from 66.23% to 62.14% and intermediate municipalities' turnout declining from 62.07% to 60.47%. These changes in turnout only marginally increase support for the CO_2 referendum to 48.59%.

Scenario 2 incorporates both turnout and vote share effects, accounting for our finding that agricultural referendums influence the share of votes aligned with the Social Democratic Party in concurrent referendums. This scenario suggests slightly stronger support for the CO_2 bill at 48.95%, though still short of approval.

Scenarios 3 through 5 present more extreme counterfactuals where turnout is equalized across municipality types. Scenario 3 maintains observed vote shares and equalizes turnout at urban levels (56.69%), resulting in 48.88% support for the CO_2 bill. Scenario 4 combines equal turnout with our estimated vote share effects, yielding 49.22% support. Finally, Scenario 5 doubles our estimated vote share effects while maintaining equal turnout, producing the highest support level at 49.61%.

Even under these various counterfactual scenarios, including those with strong assumptions favoring approval, the CO_2 referendum would still have fallen short of the required majority. While our results confirm that agricultural referendums influenced both turnout patterns and voting behavior, these effects alone do not appear sufficient to explain the rejection of the CO_2 bill.

Table 12: Back-of-the-Envelope Calculations for the CO_2 Referendum

Observed Results:

	Urban	*Intermediate*	*Rural*	*Total*
Electorate	3,339,791	1,228,705	938,621	5,507,117
Turnout %	56.69%	62.07%	66.23%	59.57%
Yes %	54.73%	42.90%	35.90%	**48.41%**

Counterfactual Scenario 1: Turnout Based on Impact Estimates, Observed Vote Shares

	Urban	*Intermediate*	*Rural*	*Total*
Turnout %	56.69%	60.47%	62.14%	58.46%
Yes %	54.73%	42.90%	35.90%	**48.59%**

Counterfactual Scenario 2: Turnout and Vote Shares Based on Impact Estimates

	Urban	*Intermediate*	*Rural*	*Total*
Turnout %	56.69%	60.47%	62.14%	58.46%
Yes %	54.73%	43.61%	36.98%	**48.95%**

Counterfactual Scenario 3: Equal Turnout, Observed Vote Shares

	Urban	*Intermediate*	*Rural*	*Total*
Turnout %	56.69%	56.69%	56.69%	56.69%
Yes %	54.73%	42.90%	35.90%	**48.88%**

Counterfactual Scenario 4: Equal Turnout, Vote Shares Based on Impact Estimates

	Urban	*Intermediate*	*Rural*	*Total*
Turnout %	56.69%	56.69%	56.69%	56.69%
Yes %	54.73%	43.61%	36.98%	**49.22%**

Counterfactual Scenario 5: Equal Turnout, Vote Shares Based on Impact Estimates (2β)

	Urban	*Intermediate*	*Rural*	*Total*
Turnout %	56.69%	56.69%	56.69%	56.69%
Yes %	54.73%	44.33%	38.28%	**49.61%**

Notes: This table presents counterfactual scenarios examining whether the 2021 CO_2 referendum might have passed without concurrent agricultural referendums. "Observed Results" shows actual voting outcomes across municipality types. Scenario 1 adjusts turnout to undo the differential mobilization effects of agriculture referendums, while maintaining observed vote shares. Scenario 2 incorporates both turnout and vote share effects. Scenarios 3-4 equalize turnout across municipality types at urban levels, with Scenario 3 using observed vote shares and Scenario 4 using estimated vote share effects. Scenario 5 doubles the estimated vote share effects (2β) while maintaining equal turnout. The referendum officially required a simple majority to pass (>50%). To illustrate with an example, counterfactual rural turnout in Scenario 1 is estimated as 66.23%/106.58% = 62.14%, where 66.23% is the observed average turnout in rural municipalities, and 6.58% is the relative treatment effect of agricultural referendums when comparing rural to urban municipalities (excluding intermediate municipalities).

1.7 Strategic Scheduling of Referendums

Our findings suggest that the combination of policy themes voted on a given day can influence the composition of the electorate and possibly also voting results, which can impact the outcomes of referendums. These effects appear to operate in a systematic direction in some cases, favoring left- or right-leaning policy options depending on the policy theme. The predictable nature of these mobilization patterns raises the possibility that authorities could strategically schedule referendums to influence outcomes.

Back-of-the-envelope calculations suggest that policy themes that mobilize rural voters are unlikely to change the results of a referendum, given the combination of moderate treatment effects and the fact that rural voters represent less than a fifth of the electorate. In spite of this, political parties might still have had reasons to engage in strategic scheduling. For one, they most likely did not know the moderate size of the average treatment effect. Moreover, policy themes that mobilize urban voters are more likely to impact referendum results, given the weight of urban voters. And even if the likelihood of impacting the outcome of a vote is small, the cost of engaging in strategic scheduling could be low.

In this section, we tentatively investigate whether there is evidence consistent with strategic scheduling of referendums based on policy themes. Lacking a source of exogenous variation and a sufficiently large sample, we explore this question through descriptive statistics. We opt for this approach in the interest of simplicity and transparency in the exposition, given the tentative nature of this analysis.

To guide the analysis, we consider two key conditions that would make strategic scheduling of referendums feasible and attractive. First, the stakes must be sufficiently high. Although many referendums have predictable outcomes with large margins of victory, close votes create stronger incentives for strategic scheduling. Second, any party or coalition seeking to influence referendum scheduling must have sufficient influence within the Federal Council's consensus-based decision process, which is likely to be the case when it holds a majority of seats. Building on these conditions, we hypothesize that strategic scheduling is most likely when close votes meet two criteria: (a) either the "yes" or "no" camp holds a Federal Council majority, and (b) this majority comprises either a center-left or center-right coalition that could benefit from predictable shifts in voter composition.

A hypothetical experiment testing for strategic scheduling would randomly assign dates to close referendums that meet the two conditions just described. Considering the example of agriculture, given that referendums on this topic shift voter composition rightward, strategic behavior would predict (a) a higher likelihood of agricultural referendums on dates assigned to have close votes backed by center-right majority in the council, and (b) a lower likelihood when close votes have a center-left majority position.

A hypothetical experiment to test for strategic scheduling could proceed as follows. First, randomly assign voting dates to close referendums where either the "yes" or "no" camp holds a Federal Council majority with clear ideological alignment (center-left or center-right). Then, observe how the Federal Council schedules agricultural and other policy-themed referendums. Given our finding that agricultural referendums shift voter composition rightward, strategic behavior would generate two predictions: (a) a higher probability of agricultural referendums coinciding with close votes backed by a center-right majority, and (b) a lower probability of agricultural referendums occurring alongside close votes supported by a center-left majority. Since we cannot do an experiment or use a quasi-experimental approach, we look at this through descriptive statistics.

Our exploratory analysis rests on a key assumption: that any relationship between close votes and theme-specific referendums operates solely through scheduling decisions. This assumption is challenged by our main findings, which demonstrate that policy themes can influence referendum outcomes, making a vote's "close" status endogenous. Nevertheless, we expect this channel to play a limited role because our estimated treatment effects are relatively small in magnitude, and concurrent policy-specific referendums could affect vote margins in both directions —some referendums might become close while others become non-close—making systematic bias less likely.

In section 1.7.1, we take a close look at the data to assess the intensity of competition in federal referendums, to understand whether incentives exist to strategically schedule referendums. In section 1.7.2, we present descriptive statistics that compare the relative frequency of policy themes depending on whether close votes and center-right or center-left majorities exist.

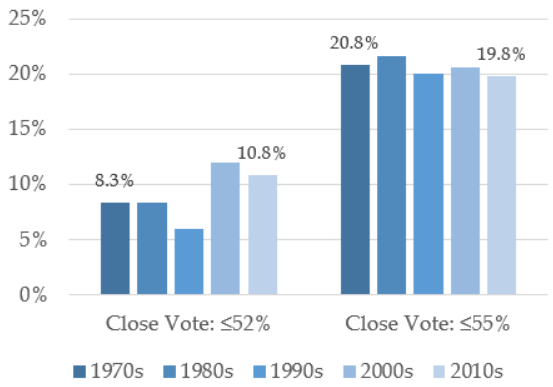
1.7.1 Incentives for Strategic Scheduling: Competition in Federal Referendums

In Section 1.2, we established that federal authorities, particularly the Federal Council, maintain some discretion in bundling or separating referendums. Following our hypothetical experiment framework, this section examines whether the conditions and incentives that could make strategic scheduling feasible and worthwhile existed during our study period. Specifically, we examine how often close votes occur and look at patterns of inter-party agreement in referendums.

We divide the data into two periods—1970-1990 and 1991-2022—reflecting a significant transformation in Switzerland's political landscape. During the 1990s, the Swiss People's Party (SVP) underwent a substantial ideological shift, evolving from a conservative party focused on rural and agricultural interests to a broader right-wing party emphasizing immigration and identity politics. This transformation proved electorally successful, with the SVP emerging as Switzerland's dominant party by the 2000s. The data presented below reveal stark differences between these two periods in both the degree of competition in referendums and the nature of inter-party coalitions, providing clues on how opportunities and incentives for strategic referendum scheduling may have evolved during the study period.

Frequency of close votes over time Figure 13 examines the prevalence of close referendums across our study period using two distinct thresholds. Defining close votes as those where the winning margin was 2 percentage points or less (up to 52% of the vote), we observe a modest increase in the frequency of close votes from 8.3% in the 1970s to 10.8% in the 2010s. Under a broader definition of close votes—those decided by 5 percentage points or less (up to 55% of votes), the frequency remained relatively stable at approximately 20% throughout the study period. These patterns indicate that while close referendums represent a consistent and meaningful portion of all votes, the majority of referendums were decided by substantial margins, and the frequency of close votes did not change substantially.

Figure 13: Percentage of Close Votes Over Time



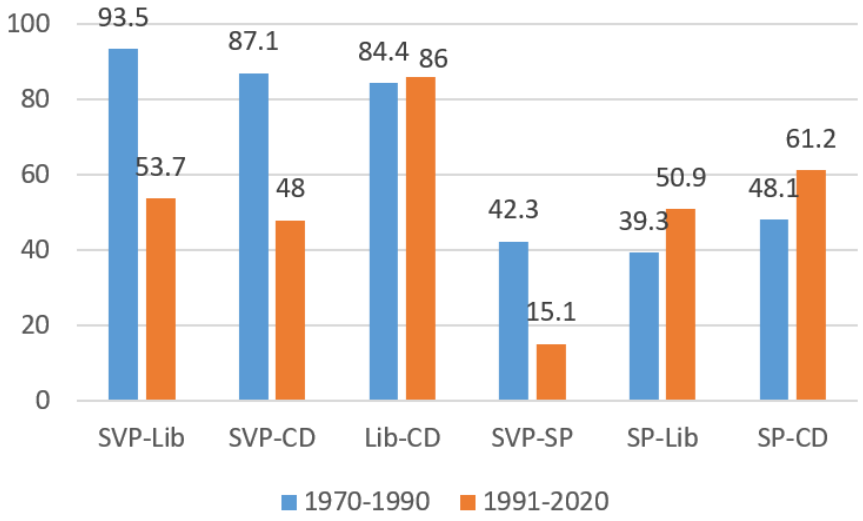
Notes: This figure shows the evolution per decade of the percentage of referendums where the winning margin was low - under two alternative definitions: referendums where the winning margin was 2 percentage points or less, and referendums where the margin was 5 percentage points or less. Source: Federal Statistics Office.

Agreement rates across parties While the overall frequency of close votes remained stable, the underlying political dynamics shifted substantially. Figure 14 analyzes inter-party agreement rates in close referendums (defined as those where the winning side obtained up to 55% of the vote), revealing a marked transformation between the 1970-1990 and 1991-2020 periods. During 1970-1990, the conservative Swiss People's Party (SVP) maintained strong alignment with the two main center parties (the liberals and the christian democrats), sharing positions in more than 85% of close referendums. Conversely, both the center parties and the SVP showed moderate alignment with the Social Democratic Party, with agreement rates below 50%. Given that the SVP, the Christian Democrats and the Liberals together consistently held a majority of seats in the 7-member Federal Council over the 1970-1990 period, it may have been possible for these parties to strategically schedule referendums with the goal of attracting voters sympathetic to their shared positions in referendums.

In the 1991-2022 period, the political landscape was notably different. Partly driven by the SVP's shift further to the right, the rates of agreement with both the Liberals and Christian Democrats were 40 percentage points lower than in the previous period. Simultaneously, these center parties increased their concordance with the Social Democrats by approximately 12 percentage points. The center parties, which controlled 3-4 seats in the seven-member Federal Council during this period, were in agreement among themselves in about 85% of close votes. Their position matched the SVP's stance in roughly half of close votes and aligned with the Social Democrats in the other half. This configuration could have provided the center parties opportunities for strategic scheduling through

selective alliances with either the right or the left, although such tactical maneuvering could become too obvious if abused.[24]

Figure 14: Rates of Agreement Among the Main Political Parties in Close Federal Votes

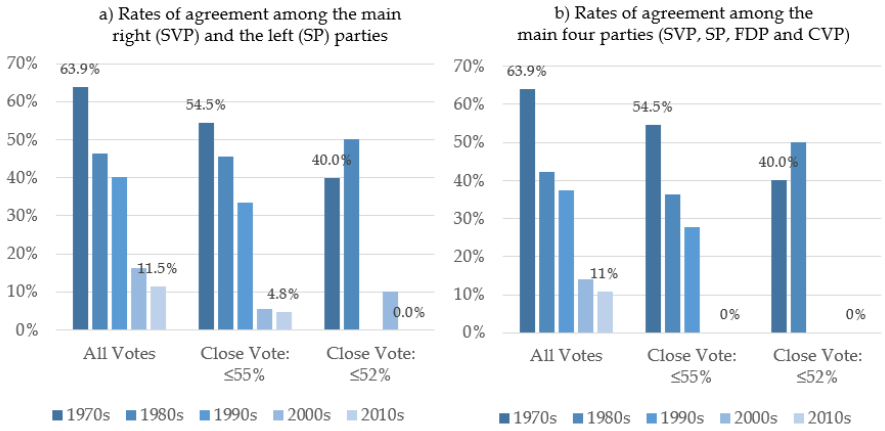


Notes: This figure shows the evolution in the percentage of close federal referendums in which a given pair of parties agreed in their position in the referendum. In this figure, close votes are defined as those where the winning margin was 5 percentage points or less. For each pair of political parties indicated in the horizontal axis, the vertical axis represents the percentage of close federal votes on which the two parties had the same slogan ('yes' or 'no'). Source: SwissVotes and Federal Statistics Office.

Figure 15 provides further details on the evolution of the rates of agreement *(a)* between the main right party (SVP) and the main left party (SP) and *(b)* across all main four parties. This analysis further confirms a large change in the nature and intensity of political competition in federal referendums over the study period. Starting from a scenario in the 1970s where the left and the right held opposed positions in about half of close votes (defined as those where the winning side obtained up to 55% of the vote), we end in one in the 2010s where the left and the right were opposed in 95% of the close votes.

[24] A further complication of this game of strategic alliances could be that on the same date the center might agree with the left on a given referendum but with the right on another one. This is likely to be uncommon once we consider only close votes. In the analysis period, only 10% of the voting dates involved more than one close vote, defined as those where the winning side obtained 55% of the vote or less.

Figure 15: Rates of Agreement Among the Main Left and Right-Leaning Parties, and Among the Four Largest Parties



Notes: Panel (a) shows the percentage of federal referendums per decade where the main left (SP) and main right (SVP) parties held the same position. Panel (b) shows the percentage of federal referendums per decade where the main four political parties (FDP, CVP, SVP and SP) held the same position. Source: SwissVotes and Federal Statistics Office.

These changes have large implications when it comes to the incentives to engage in strategic scheduling of referendums. Attracting left-leaning or right-leaning voters is unnecessary when the left, the right, and the center all hold the same slogan, which was quite common in the early decades of the study period, even in close votes. However, by the 2000s, agreement rates between the SVP and the SP in close votes had plummeted. In this different context, voters who turned up to vote were probably more likely to vote in alignment with parties with a similar political leaning, making the strategic scheduling of referendums more attractive.

1.7.2 Evidence of Strategic Scheduling: Descriptive Analysis

For this analysis, we focus our attention on the four policy themes that we highlighted earlier. Let us assume that political parties anticipate the mobilization patterns that we identified: agriculture and gender & family referendums mobilize rural (predominantly right-leaning) voters, while immigration and housing referendums mobilize urban (predominantly left-leaning) voters. For simplicity, we also assume that parties do not anticipate the more complex findings regarding changes in left-aligned vote shares.

Hypotheses Under the above assumptions, strategic scheduling would produce the following observable patterns:

- A *center-right* majority has incentives to schedule referendums on agriculture and gender & family to coincide with close votes. Therefore, among voting dates with *center-right* majorities (that is, dates with referendums where center and right parties that agree on their position hold a majority of seats in the Federal Council), the likelihood of referendums on these two themes would be *higher* if such a majority exists in the context of a close vote, compared to when no close votes are held.

- A *center-left* majority has incentives to schedule referendums on agriculture and gender & family such that they do not coincide with close votes. Therefore, among voting dates with *center-left* majorities, the likelihood of referendums on these two themes would be *lower* if such a majority exists in the context of a close vote, compared to when no close votes occur.

- The opposite would be the case for referendums on immigration and housing: center-right majorities would try to prevent close votes from coinciding with these themes, while center-left majorities would want these themes to coincide with close votes.

In this analysis, whether a close vote is taking place or not is endogenous: it can be influenced by whether a vote on a theme such as agriculture or immigration takes place. However, only a small proportion of votes are likely to change their "close" status due to the concurrence of a vote on these policy themes, and this endogeneity would operate in both positive and negative directions (some votes could become close while others could become non-close). Ideally, we would define close votes using pre-treatment information such as voting intention polls, but unfortunately such data does not exist[25]. We present this analysis as a tentative exploration, acknowledging that a causal interpretation is not possible.

Agriculture Figure 16 presents the percentage of dates featuring agricultural referendums across different types of voting dates. For the 1970-1990 period, panel (ii) shows that among dates with center-right majorities, the frequency of agricultural referendums remains similar regardless of whether a close vote occurred. However, in the 1991-2022 period, the patterns align with strategic

[25]The VOX/VOTO polls are post-voting polls carried out at voting stations. Measures of advertising intensity or the share of "yes" adverts, available in the SwissVote database, could be correlated with the likelihood of a vote being close and could therefore be used as proxy measures, but this data is only available from 2013

scheduling predictions: of the 38 voting dates with center-right majorities but no close votes, only 7.9% featured agricultural referendums, compared to 23.1% of the 13 dates with center-right majorities in close votes. For dates with center-left majorities in 1991-2022, the results are also consistent with strategic behavior: 16.7% of dates without close votes included agricultural referendums versus just 5% of dates with center-left majorities in close votes. (Note that the 1970-1990 period contains insufficient dates with center-left majorities for a meaningful comparison.)

Gender & family Figure 17 shows the distribution of gender & family referendums across types of voting dates. These results generally contradict strategic scheduling predictions. For the period 1991-1922, among dates with center-right majorities, gender & family referendums were less frequent when these majorities occurred in close votes (7.1%) than when there were no close votes (15.8%)—the opposite of what strategic scheduling would predict. For dates with center-left majorities, the frequency of gender & family referendums remains essentially unchanged regardless of whether close votes occurred.

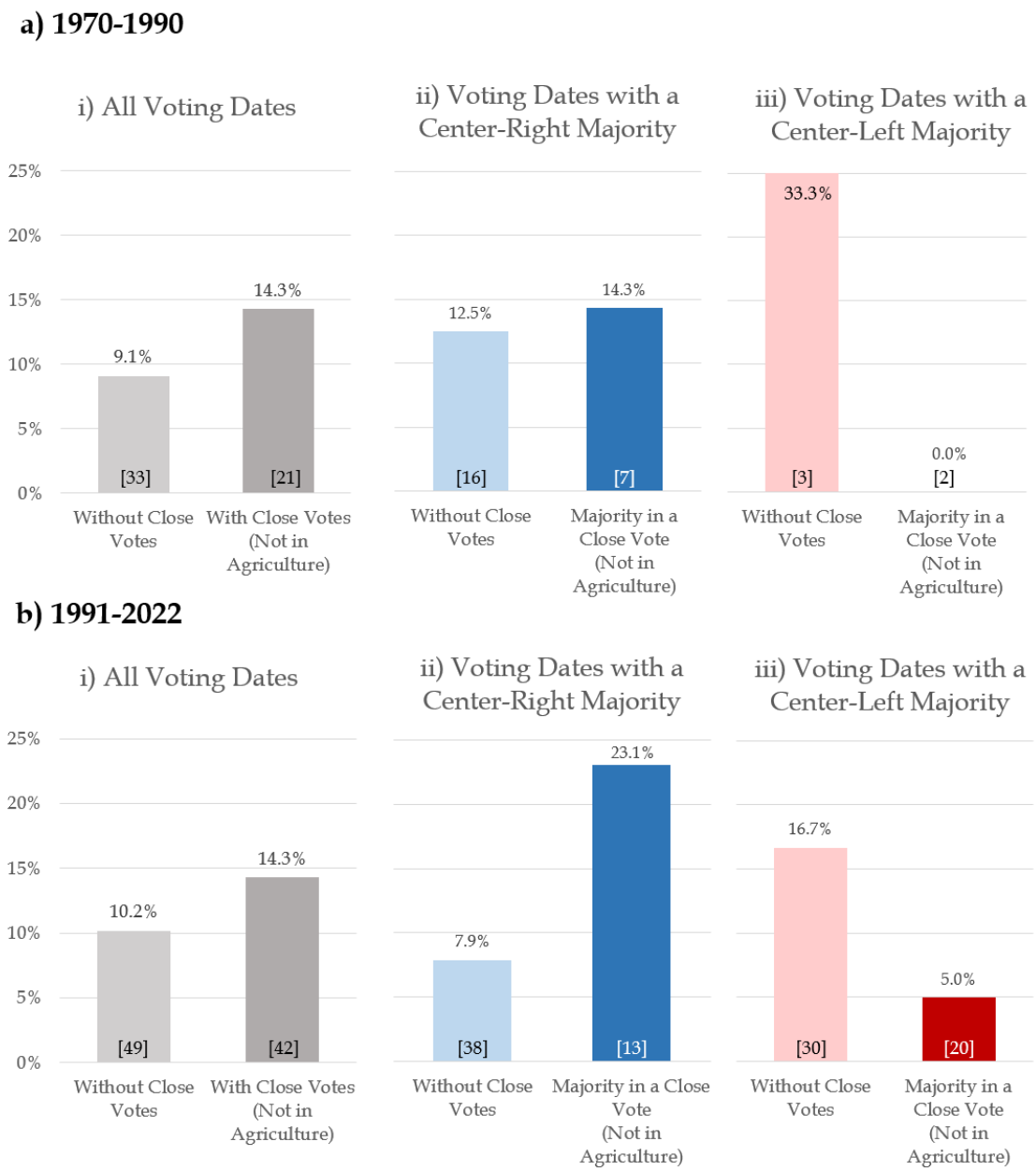
Immigration Results for immigration referendums, presented in Figure 18, generally align with strategic scheduling predictions. In both periods, among dates with center-right majorities, immigration referendums were less frequent when close votes occurred. However, this difference is modest in 1991-2022: 15.8% of dates without close votes featured immigration referendums versus 12.5% of dates with close votes. For center-left majorities in 1991-2022, immigration referendums were substantially more common on dates with close votes (33.3%) than on dates without (16.7%)—consistent with strategic scheduling.

Housing For housing referendums (Figure 19), the evidence is mixed. In both periods, no housing referendums coincided with close votes on dates with center-right majorities, while 12.5% and 15.8% of dates without close votes in the respective periods featured housing referendums. While this aligns with strategic scheduling predictions, the pattern for center-left majorities does not: housing referendums were less frequent on dates with close votes (5.3%) than on dates without (13.3%).

Summary Focusing on the 1991-2022 period, when heightened political competition created stronger strategic scheduling incentives, our findings are: (i) con-

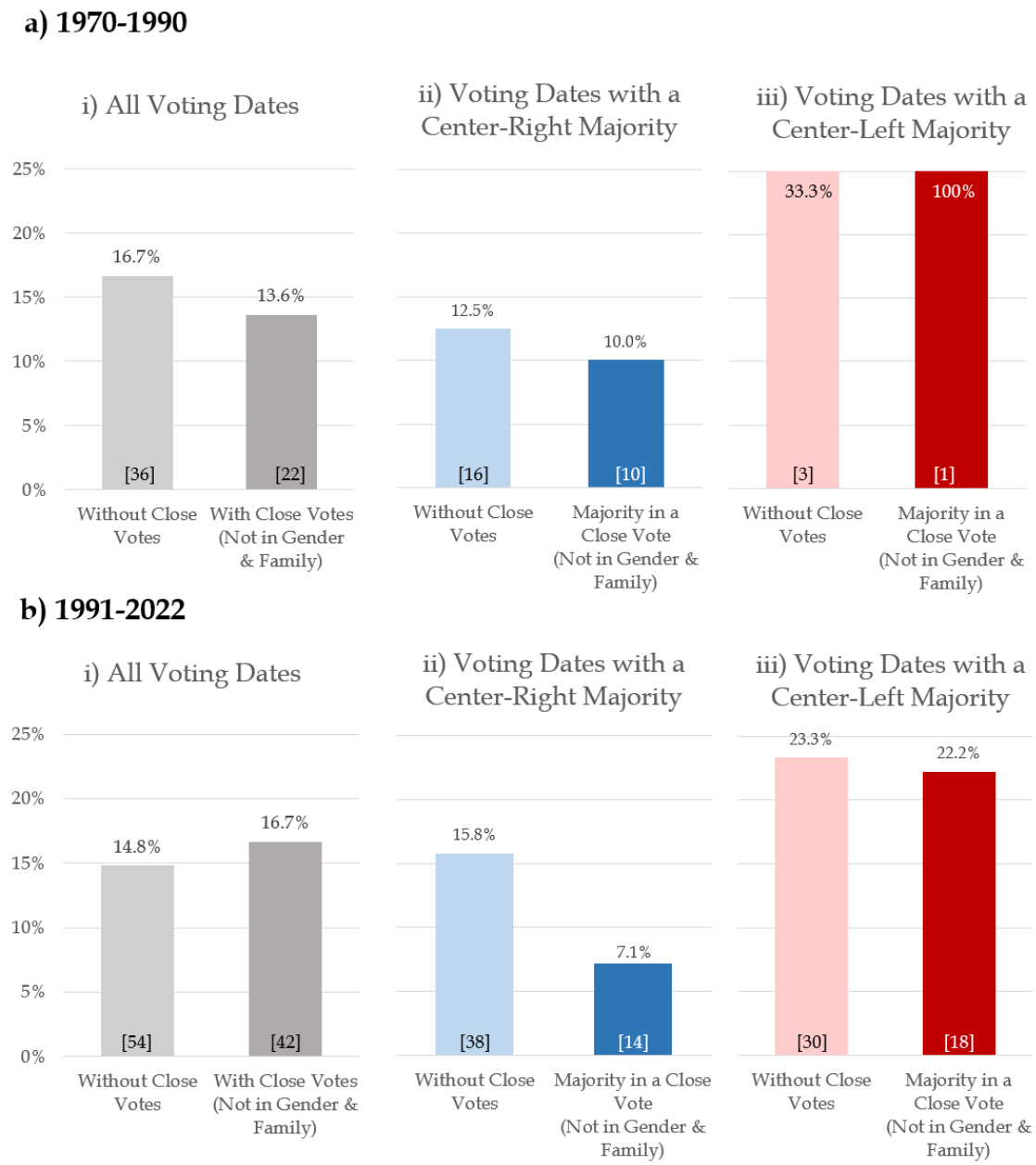
sistent with strategic scheduling by both center-right and center-left coalitions for agriculture and immigration; (ii) consistent with strategic scheduling by center-right but not center-left coalitions for housing; and (iii) inconsistent with strategic scheduling for gender & family. While these patterns could suggest some strategic referendum scheduling, the evidence remains tentative. Small sample sizes and the absence of a rigorous causal identification strategy require caution in interpretation. These results should not be considered definitive evidence of strategic scheduling.

Figure 16: Analysis of Strategic Scheduling. Percent of Voting Dates with a Concurrent Referendum on **Agriculture**.



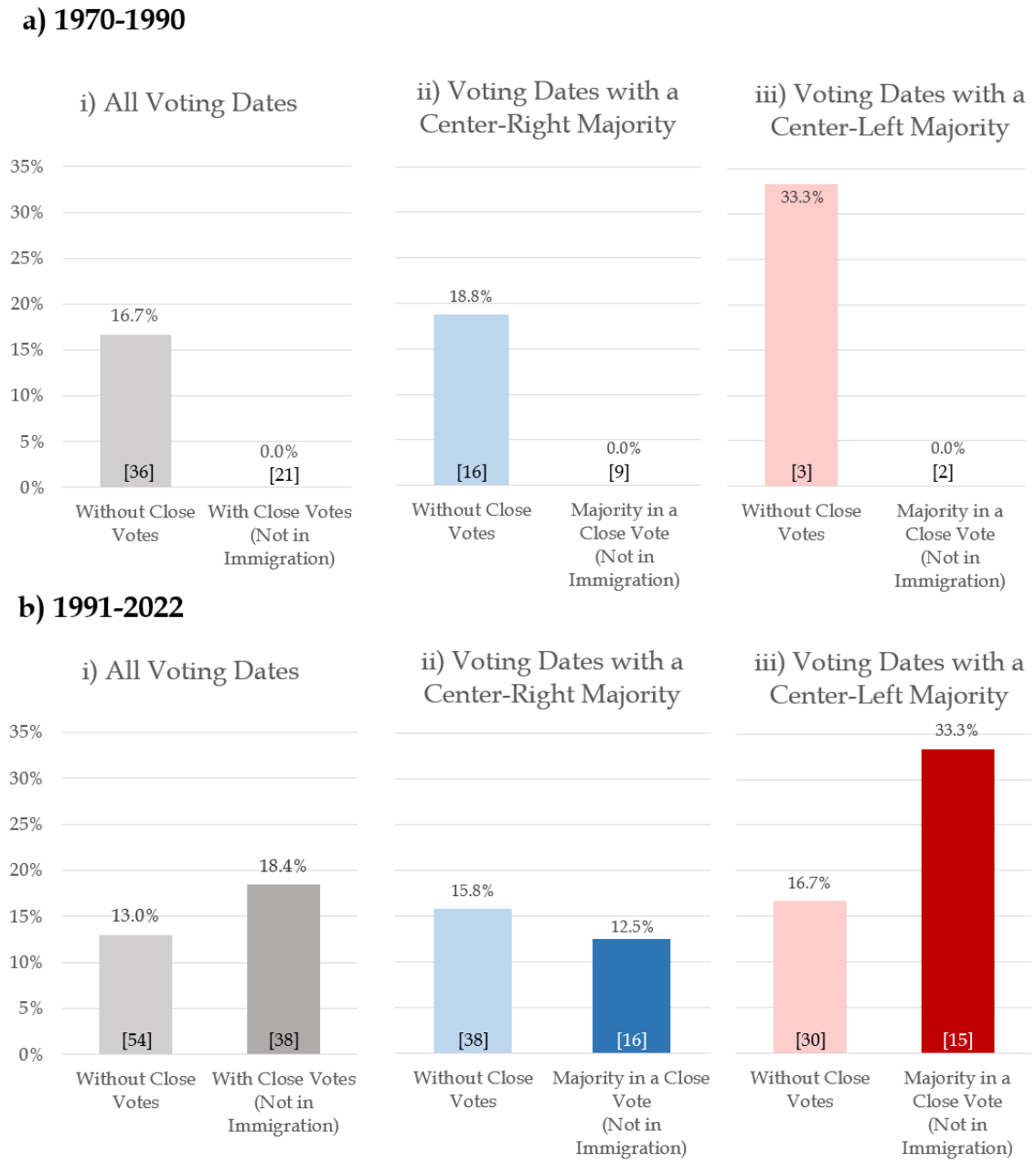
Notes: This figure shows the percentage of voting dates with concurrent agricultural referendums across different subsets of voting dates. Panel a) covers 1970-1990, while panel b) covers 1991-2022. Within each panel: section i) shows this percentage when considering all voting dates; section ii) restricts the sample to voting dates with referendums that had center-right majorities, that is, dates with referendums where center and right parties that agree on their position hold a majority of seats in the Federal Council; and section iii) restricts the sample to dates with center-left majorities. Each section compares dates without close votes to those with close votes where the majority holds on issues unrelated to agriculture. Numbers in brackets indicate the count of voting dates in each category.

Figure 17: Analysis of Strategic Scheduling. Percent of Voting Dates with a Concurrent Referendum on **Gender & Family**.



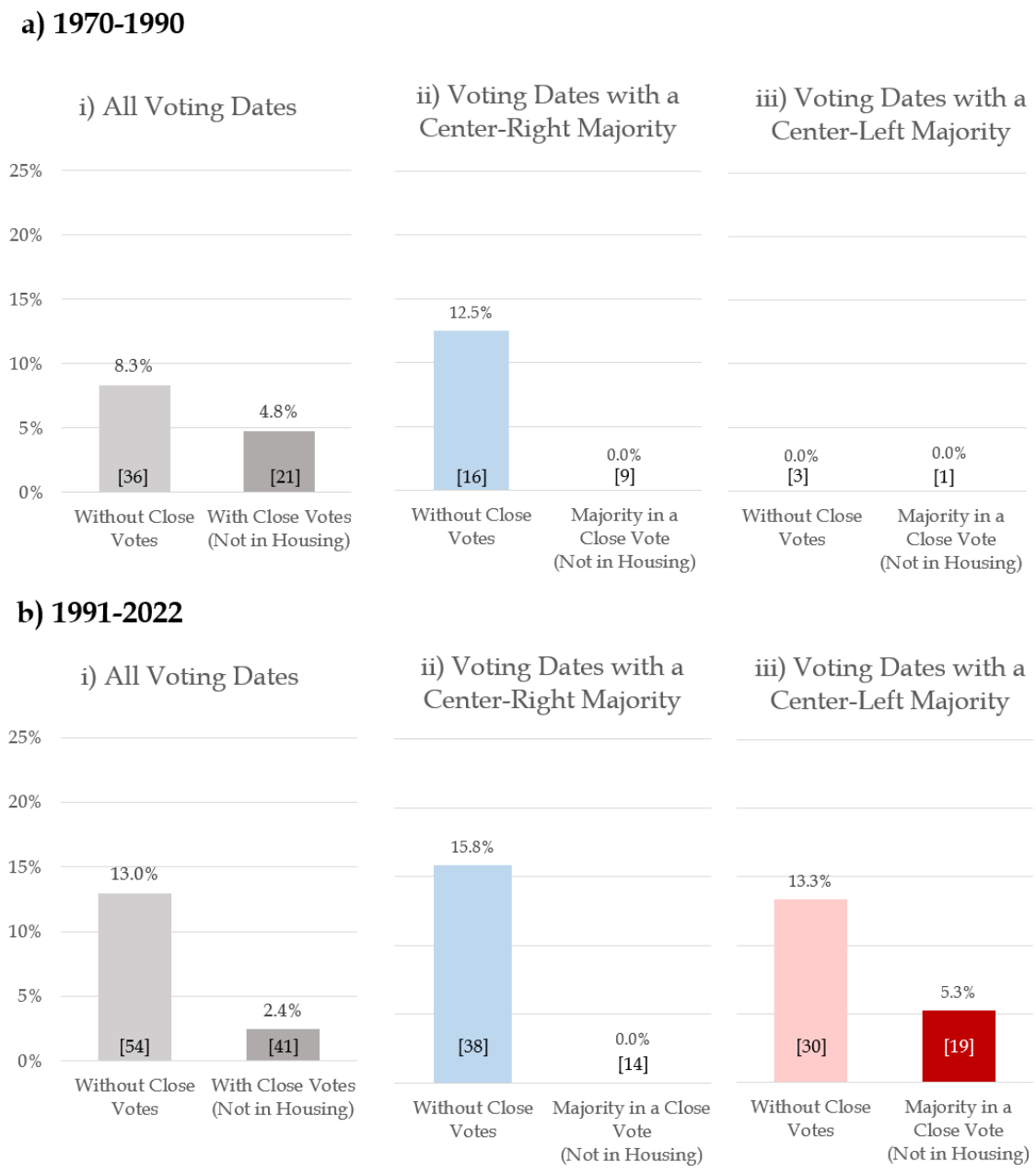
Notes: This figure shows the percentage of voting dates with concurrent gender & family referendums across different subsets of voting dates. Panel a) covers 1970-1990, while panel b) covers 1991-2022. Within each panel: section i) shows this percentage when considering all voting dates; section ii) restricts the sample to voting dates with referendums that had center-right majorities, that is, dates with referendums where center and right parties that agree on their position hold a majority of seats in the Federal Council; and section iii) restricts the sample to dates with center-left majorities. Each section compares dates without close votes to those with close votes where the majority holds on issues unrelated to gender & family. Numbers in brackets indicate the count of voting dates in each category.

Figure 18: Analysis of Strategic Scheduling. Percent of Voting Dates with a Concurrent Referendum on **Immigration**.



Notes: This figure shows the percentage of voting dates with concurrent immigration referendums across different subsets of voting dates. Panel a) covers 1970-1990, while panel b) covers 1991-2022. Within each panel: section i) shows this percentage when considering all voting dates; section ii) restricts the sample to voting dates with referendums that had center-right majorities, that is, dates with referendums where center and right parties that agree on their position hold a majority of seats in the Federal Council; and section iii) restricts the sample to dates with center-left majorities. Each section compares dates without close votes to those with close votes where the majority holds on issues unrelated to immigration. Numbers in brackets indicate the count of voting dates in each category.

Figure 19: Analysis of Strategic Scheduling. Percent of Voting Dates with a Concurrent Referendum on **Housing**.



Notes: This figure shows the percentage of voting dates with concurrent housing referendums across different subsets of voting dates. Panel a) covers 1970-1990, while panel b) covers 1991-2022. Within each panel: section i) shows this percentage when considering all voting dates; section ii) restricts the sample to voting dates with referendums that had center-right majorities, that is, dates with referendums where center and right parties that agree on their position hold a majority of seats in the Federal Council; and section iii) restricts the sample to dates with center-left majorities. Each section compares dates without close votes to those with close votes where the majority holds on issues unrelated to housing. Numbers in brackets indicate the count of voting dates in each category.

1.8 Conclusions

In this study, we examined the hypothesis that referendums related to agriculture mobilize rural and right-leaning voters more than urban and left-leaning voters, altering the composition of the electorate in concurrent referendums unrelated to agriculture. We confirm this hypothesis and find similar effects on turnout in the case of referendums related to gender & family, and opposed effects in the cases of immigration and housing policy, which seem to mobilize more urban voters. In addition to impacting turnout, certain policy themes also seem to influence vote shares, measured as the share of votes aligned with the option favored by the left-leaning Social Democratic Party.

Back-of-the-envelope calculations suggest that the concurrence of agriculture referendums with the CO_2 vote in 2021 is unlikely to fully explain the rejection of the bill. Rural voters constitute a relatively small proportion of the electorate, therefore even substantial changes in rural turnout have a small influence on the final voting outcome. On the other hand, policy themes such as immigration or housing, which seem to mobilize urban voters more, could have a greater influence on referendum outcomes, given the weight of the urban electorate.

These findings suggest that authorities could have incentives to strategically schedule referendums on certain policy themes to try to influence the voting results. We tentatively explore this, presenting descriptive statistics which are suggestive of the presence of strategic behavior, but ultimately the strength of the evidence is weak, given mixed results across themes and lack of causal identification. Although this is just a single data point, it is interesting to note that in the media story that motivates this study the government was the proponent of the CO_2 bill that was narrowly rejected, and the rejection was celebrated as a crucial victory by the right-wing opposition party, the SVP. In this specific case, it seems that the government did not act strategically when scheduling the CO_2 alongside salient, agriculture-related referendums.

The study has several limitations that warrant consideration. First, our analysis focuses primarily on the rural-urban dimension, though differential mobilization effects may operate along other important sociodemographic dimensions such as age, education level, income, or occupation. Our comparison of left-leaning municipalities to others partially addresses this by capturing heterogeneity in political leanings regardless of its underlying drivers, but other dimensions associated to differential voter mobilization of policy themes may remain unexplored.

Second, while we treat policy themes as the causal factor driving differential mobilization, other factors correlated with specific policy themes might in some cases be the true mechanisms at work. For instance, the framing of issues by political parties, the intensity of campaign spending, or media coverage patterns associated with particular themes could drive the observed effects rather than the themes themselves. Agricultural referendums, for example, might receive particularly intense coverage in rural media outlets, potentially explaining the mobilization patterns we observe.

Third, our interpretation of differential effects contains an implicit directional assumption. When we observe higher turnout in rural relative to urban municipalities during agricultural referendums, we interpret this as increased rural mobilization rather than urban demobilization, though both mechanisms could contribute to the observed difference.

Finally, while we document significant effects on vote shares, we lack a theory to understand these effects. Unlike our turnout analysis, which was guided by clear hypotheses derived from a media narrative, our vote share findings emerged without strong priors. Relatedly, we are unable to study the mechanisms that might explain these results, such as composition effects versus framing effects.

Despite these limitations, our findings contribute to understanding how policy themes shape voter participation and voting behavior in direct democracy settings, with potential implications for referendum scheduling and democratic representation more broadly.

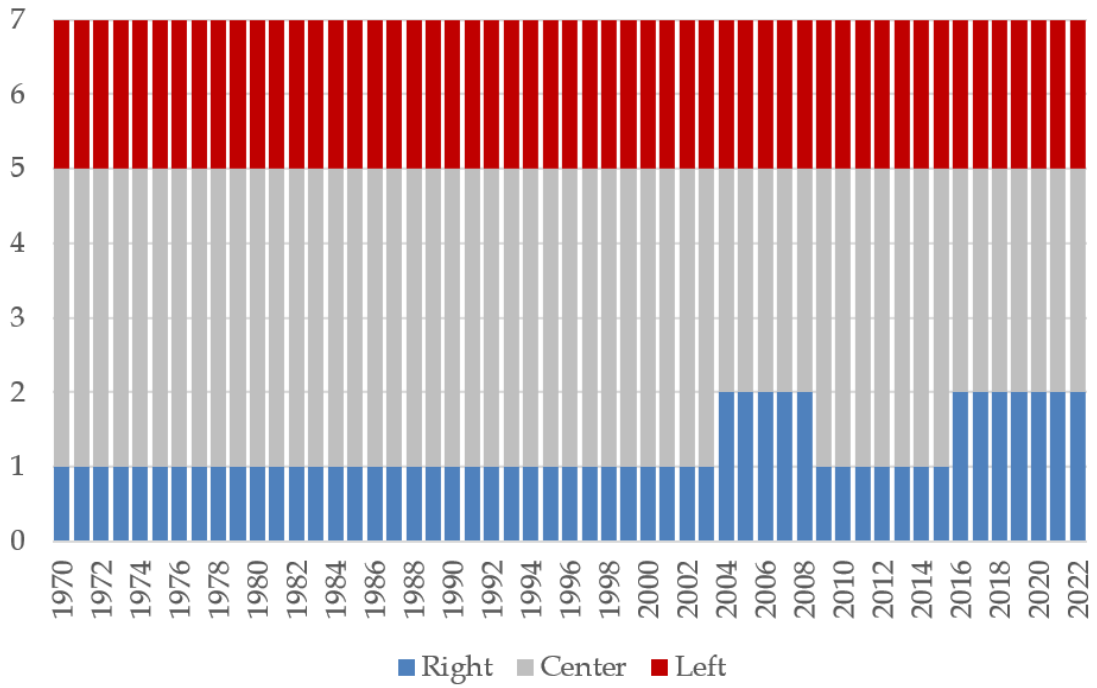
Chapter 1

Appendices

A Additional Figures 57

A Additional Figures

Figure A1: Composition of the Federal Council by Party Group: 1970-2022



Notes: This figure shows the evolution of the 7-member Federal Council by political alignment in the 1970-2022 period, with councillors grouped into three categories: right, center and left. The political groups follow the classification described in section 1.3.

Figure A2: Scheduling of Federal Referendums: Voting Dates Available to the Federal Council After Parliament's Approval

Month	Pre-Scheduled Voting Date	Scenario 1: Parliament Approval in Month *m*		Scenario 2: Parliament Approval in Month *m*+1		Scenario 3: Parliament Approval in Month *m*+2	
		Months Since Approval	Options	Months Since Approval	Options	Months Since Approval	Options
m	**X**	0	Approval				
m+1		1		0	Approval		
m+2		2		1		0	Approval
m+3	**X**	**3**	Too early	**2**	Too early	**1**	Too early
m+4		4		3		2	
m+5		5		4		3	
m+6	**X**	**6**	**Option 1**	**5**	**Option 1**	**4**	**Option 1**
m+7		7		6		5	
m+8		8		7		6	
m+9	**X**	**9**	**Option 2**	**8**	**Option 2**	**7**	**Option 2**
m+10		10		9		8	
m+11		11		10		9	
m+12	**X**	**12**	Too late	**11**	Too late	**10**	**Option 3**
m+13		13		12		11	
m+14		14		13		12	
m+15	**X**	**15**	Too late	**14**	Too late	**13**	Too late

Notes: This figure illustrates the timeline for referendum scheduling after Parliament's approval. The Federal Council must allocate referendums to a date such that (i) the voting date is known at least 4 months before the vote and (ii) the vote is held within 10 months from Parliament's approval. This example assumes pre-scheduled voting dates occurring exactly every three months. In practice, Switzerland holds four referendum dates per year with intervals typically ranging from 2 to 4 months.

Figure A3: Classification of Policy Themes

Policy Theme	Codes from SwissVotes Dataset	Number of Voting Dates	Number of Referendums
1) Taxation	Taxation (6.1)	48	63
2) Environment	Environment (9.3)	45	62
3) Social Security	Social Security (10.2)	45	60
4) Economy	Economy (4), excluding Employment (4.2)	32	46
5) Transport	Traffic and Infrastructure (8)	30	37
6) Immigration	Foreigners (10.3.1); Refugees (10.3.2)	30	39
7) Gender & Family	Status of Women (10.3.3); Family Policy (10.3.4)	29	32
8) Health	Health (10.1)	29	32
9) Foreign Policy	Foreign Policy (2)	27	30
10) Agriculture	Agriculture (5)	24	29
11) Security	Security (3.1); Criminal Law (1.6.5)	23	26
12) Army	Army (3.2)	23	27
13) Employment	Employment (4.2)	21	21
14) Political System	State Order (1), excluding Criminal Law (1.6.5)	20	24
15) Education	Education & Research (11)	19	22
16) Housing	Land (9.1); Housing (9.2)	19	24
17) Public Finance	Public Finance (6), excluding Taxation (6.1)	17	23
18) Culture	Culture, Religion & Media (12)	17	18
19) Energy	Energy (7)	15	23
20) Social Policy	Social Policy (10), excluding subcategories use for Social Security, Immiration, and Gender & Family	9	10

Notes: This table presents our classification of 20 policy themes used in the analysis. The second column shows the corresponding codes from the SwissVotes dataset, indicating how our classification maps to their original categorization. The third and fourth columns show, respectively, the number of voting dates with at least one referendum on each theme and the total number of referendums related to each theme during the 1970-2022 period. Some referendums are categorized under multiple themes.

Figure A4: Concurrence of Policy Themes in Federal Referendums

a) Out of all referendums associated with a given policy theme (rows), percentage associated with other themes (columns)

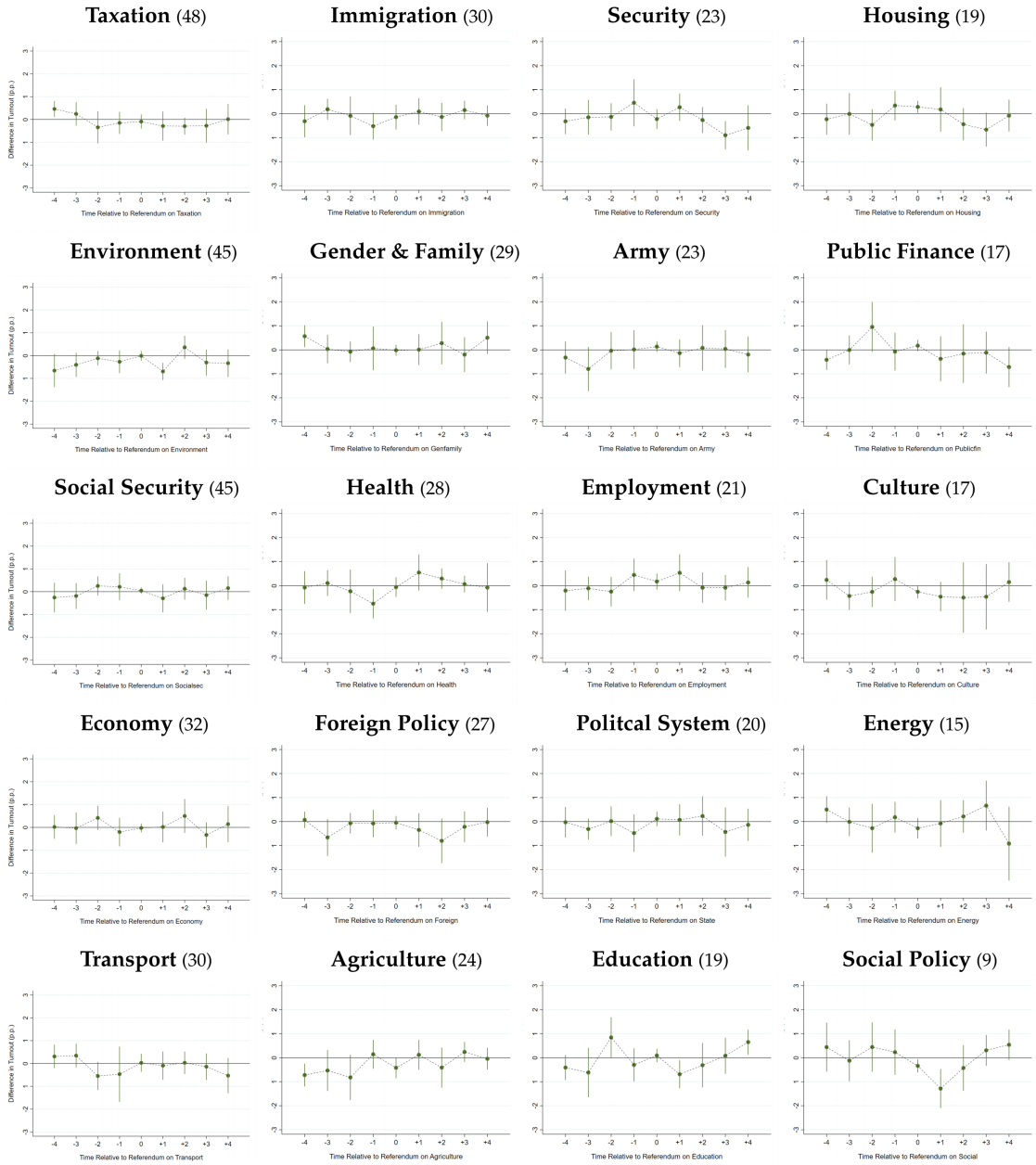
Theme	# of Votes	% of Votes	Taxation	Environ.	Social Security	Economy	Transport	Immigr.	Gender & Family	Health	Foreign Policy	Agricul.	Security	Army	Employ.	Political System	Education	Housing	Public Finance	Culture	Energy	Social Policy
1) Taxation	63	13.8%		7.9%	12.7%	12.7%	12.7%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.3%	0.0%	1.6%	1.6%	1.6%
2) Environment	62	13.6%	8.1%		0.0%	1.6%	24.2%	0.0%	0.0%	1.6%	1.6%	16.1%	0.0%	4.8%	0.0%	0.0%	0.0%	4.8%	0.0%	0.0%	29.0%	0.0%
3) Social Security	60	13.1%	13.3%	0.0%		6.7%	0.0%	0.0%	18.3%	6.7%	0.0%	0.0%	1.7%	0.0%	1.7%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%
4) Economy	46	10.1%	17.4%	2.2%	8.7%		0.0%	0.0%	0.0%	8.7%	4.3%	0.0%	0.0%	4.3%	0.0%	0.0%	0.0%	2.2%	0.0%	6.5%	0.0%	0.0%
5) Transport	37	8.1%	21.6%	40.5%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.4%	0.0%	0.0%	0.0%
6) Immigration	39	8.5%	0.0%	0.0%	0.0%	0.0%	0.0%		2.6%	0.0%	15.4%	0.0%	15.4%	0.0%	7.7%	0.0%	0.0%	5.1%	0.0%	0.0%	0.0%	0.0%
7) Gender & Family	32	7.0%	12.5%	0.0%	34.4%	0.0%	0.0%	3.1%		0.0%	0.0%	0.0%	21.9%	0.0%	6.3%	0.0%	0.0%	3.1%	0.0%	0.0%	0.0%	0.0%
8) Health	32	7.0%	0.0%	3.1%	12.5%	12.5%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	28.1%	0.0%	3.1%	0.0%	0.0%	0.0%
9) Foreign Policy	30	6.6%	0.0%	3.3%	0.0%	6.7%	0.0%	20.0%	0.0%	0.0%		3.3%	3.3%	13.3%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10) Agriculture	29	6.3%	0.0%	34.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.4%		0.0%	0.0%	0.0%	0.0%	0.0%	3.4%	17.2%	0.0%	0.0%	0.0%
11) Security	26	5.7%	0.0%	0.0%	3.8%	0.0%	0.0%	23.1%	26.9%	0.0%	3.8%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%	11.5%
12) Army	27	5.9%	0.0%	11.1%	0.0%	7.4%	0.0%	0.0%	0.0%	0.0%	14.8%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	11.1%	0.0%	0.0%	0.0%
13) Employment	21	4.6%	0.0%	0.0%	4.8%	0.0%	0.0%	14.3%	9.5%	0.0%	4.8%	0.0%	0.0%	0.0%		0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%
14) Political System	24	5.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15) Education	22	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.9%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%		0.0%	9.1%	4.5%	0.0%	0.0%
16) Housing	24	5.3%	16.7%	12.5%	0.0%	4.2%	0.0%	8.3%	4.2%	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	4.2%
17) Public Finance	23	5.0%	0.0%	0.0%	4.3%	0.0%	8.7%	0.0%	0.0%	4.3%	0.0%	21.7%	0.0%	13.0%	0.0%	0.0%	8.7%	0.0%		0.0%	0.0%	0.0%
18) Culture	18	3.9%	5.6%	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	0.0%	0.0%	0.0%	5.6%	0.0%	0.0%		0.0%	5.6%
19) Energy	23	5.0%	4.3%	78.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%
20) Social Policy	10	2.2%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	30.0%	0.0%	0.0%	0.0%	0.0%	10.0%	0.0%	10.0%	0.0%	
Total # Votes	457																					

b) Out of all voting dates with a referendum associated with a given policy theme (rows), percentage involving other themes (columns)

Theme	# of Dates	% of Dates	Taxation	Environ.	Social Security	Economy	Transport	Immigr.	Gender & Family	Health	Foreign Policy	Agricul.	Security	Army	Employ.	Political System	Education	Housing	Public Finance	Culture	Energy	Social Policy
1) Taxation	48	30.0%		25.0%	29.2%	29.2%	22.9%	14.6%	18.8%	14.6%	10.4%	16.7%	10.4%	12.5%	10.4%	8.3%	8.3%	14.6%	16.7%	10.4%	6.3%	2.1%
2) Environment	45	28.1%	26.7%		26.7%	13.3%	35.6%	4.4%	20.0%	17.8%	15.6%	28.9%	22.2%	20.0%	8.9%	17.8%	13.3%	15.6%	8.9%	2.2%	24.4%	8.9%
3) Social Security	45	28.1%	31.1%	26.7%		13.3%	13.3%	22.2%	22.2%	24.4%	17.8%	13.3%	17.8%	13.3%	8.9%	13.3%	11.1%	11.1%	13.3%	4.4%	8.9%	6.7%
4) Economy	32	20.0%	43.8%	18.8%	18.8%		12.5%	18.8%	9.4%	18.8%	15.6%	6.3%	6.3%	9.4%	12.5%	6.3%	9.4%	12.5%	3.1%	15.6%	6.3%	3.1%
5) Transport	30	18.8%	36.7%	53.3%	20.0%	13.3%		16.7%	33.3%	20.0%	10.0%	23.3%	20.0%	20.0%	13.3%	16.7%	16.7%	13.3%	13.3%	10.0%	13.3%	10.0%
6) Immigration	30	18.8%	23.3%	6.7%	33.3%	20.0%	16.7%		26.7%	13.3%	23.3%	6.7%	20.0%	10.0%	20.0%	13.3%	3.3%	10.0%	10.0%	6.7%	3.3%	3.3%
7) Gender & Family	29	18.1%	31.0%	31.0%	34.5%	10.3%	34.5%	27.6%		17.2%	13.8%	17.2%	24.1%	13.8%	13.8%	10.3%	17.2%	13.8%	10.3%	6.9%	6.9%	3.4%
8) Health	28	17.5%	25.0%	28.6%	39.3%	21.4%	21.4%	14.3%	17.9%		14.3%	7.1%	17.9%	14.3%	17.9%	17.9%	35.7%	7.1%	21.4%	14.3%	10.7%	14.3%
9) Foreign Policy	27	16.9%	18.5%	25.9%	29.6%	18.5%	11.1%	25.9%	14.8%	14.8%		11.1%	14.8%	22.2%	7.4%	3.7%	3.7%	7.4%	3.7%	14.8%	7.4%	3.7%
10) Agriculture	24	15.0%	33.3%	54.2%	25.0%	8.3%	29.2%	8.3%	20.8%	8.3%	12.5%		20.8%	8.3%	8.3%	16.7%	12.5%	4.2%	29.2%	8.3%	8.3%	0.0%
11) Security	23	14.4%	21.7%	43.5%	34.8%	8.7%	26.1%	26.1%	30.4%	21.7%	17.4%	21.7%		13.0%	17.4%	13.0%	17.4%	17.4%	21.7%	4.3%	17.4%	17.4%
12) Army	23	14.4%	26.1%	39.1%	26.1%	13.0%	26.1%	13.0%	17.4%	17.4%	26.1%	8.7%	13.0%		13.0%	17.4%	8.7%	4.3%	21.7%	17.4%	8.7%	8.7%
13) Employment	21	13.1%	23.8%	19.0%	19.0%	19.0%	19.0%	28.6%	19.0%	23.8%	9.5%	9.5%	19.0%	14.3%		4.8%	14.3%	19.0%	14.3%	4.8%	4.8%	9.5%
14) Political System	20	12.5%	20.0%	40.0%	30.0%	10.0%	25.0%	20.0%	15.0%	25.0%	5.0%	20.0%	15.0%	20.0%	5.0%		5.0%	15.0%	10.0%	10.0%	5.0%	0.0%
15) Education	19	11.9%	21.1%	31.6%	26.3%	15.8%	26.3%	5.3%	26.3%	52.6%	5.3%	15.8%	21.1%	10.5%	15.8%	5.3%		10.5%	21.1%	21.1%	10.5%	5.3%
16) Housing	19	11.9%	36.8%	36.8%	26.3%	21.1%	21.1%	15.8%	21.1%	10.5%	10.5%	5.3%	21.1%	5.3%	21.1%	15.8%	10.5%		0.0%	15.8%	5.3%	15.8%
17) Public Finance	17	10.6%	47.1%	23.5%	35.3%	5.9%	23.5%	17.6%	17.6%	35.3%	5.9%	41.2%	29.4%	29.4%	17.6%	11.8%	23.5%	0.0%		5.9%	0.0%	5.9%
18) Culture	17	10.6%	29.4%	5.9%	11.8%	29.4%	17.6%	11.8%	11.8%	23.5%	23.5%	11.8%	5.9%	23.5%	5.9%	11.8%	23.5%	17.6%	5.9%		0.0%	5.9%
19) Energy	15	9.4%	20.0%	73.3%	26.7%	13.3%	26.7%	6.7%	13.3%	20.0%	13.3%	13.3%	26.7%	13.3%	6.7%	6.7%	13.3%	6.7%	0.0%	0.0%		13.3%
20) Social Policy	9	5.6%	11.1%	44.4%	33.3%	11.1%	33.3%	11.1%	11.1%	44.4%	11.1%	0.0%	44.4%	22.2%	22.2%	0.0%	11.1%	33.3%	11.1%	11.1%	22.2%	
Total # Dates	160																					

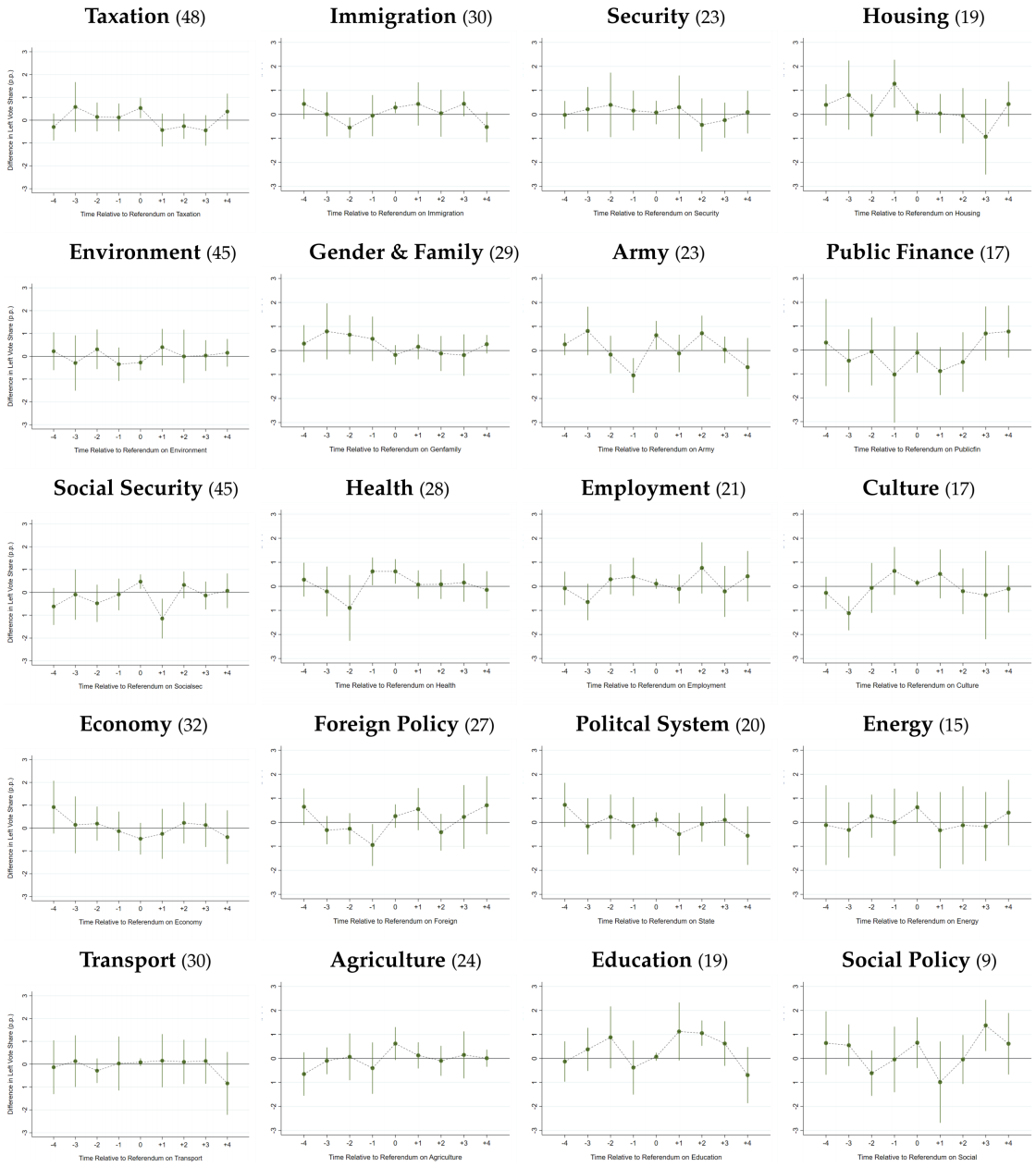
Notes: For each policy theme, **table (a)** shows the **percentage of referendums** associated with a given policy theme (rows) that are also classified under another policy theme (columns). For example, of the 63 referendums related to taxation, 12.7% were also categorized under social security. Among the 457 federal referendums in our dataset, 267 (58.4%) are classified under a single theme, 189 (41.4%) under two themes, and 1 referendum (0.2%) under three themes. **Table (b)** displays the **percentage of voting dates** with a referendum on a given theme (rows) that also featured referendums on other themes (columns). For instance, of the 48 voting dates involving taxation referendums, 25% also included environmental referendums. Theme concurrency can result from either multiple referendums on different topics held on the same date or from individual referendums being classified under multiple themes. Cells are shaded to highlight higher percentages of co-occurrence.

Figure A5: Validity Check: Municipalities Split in Two Groups at Random, Effects on Turnout.



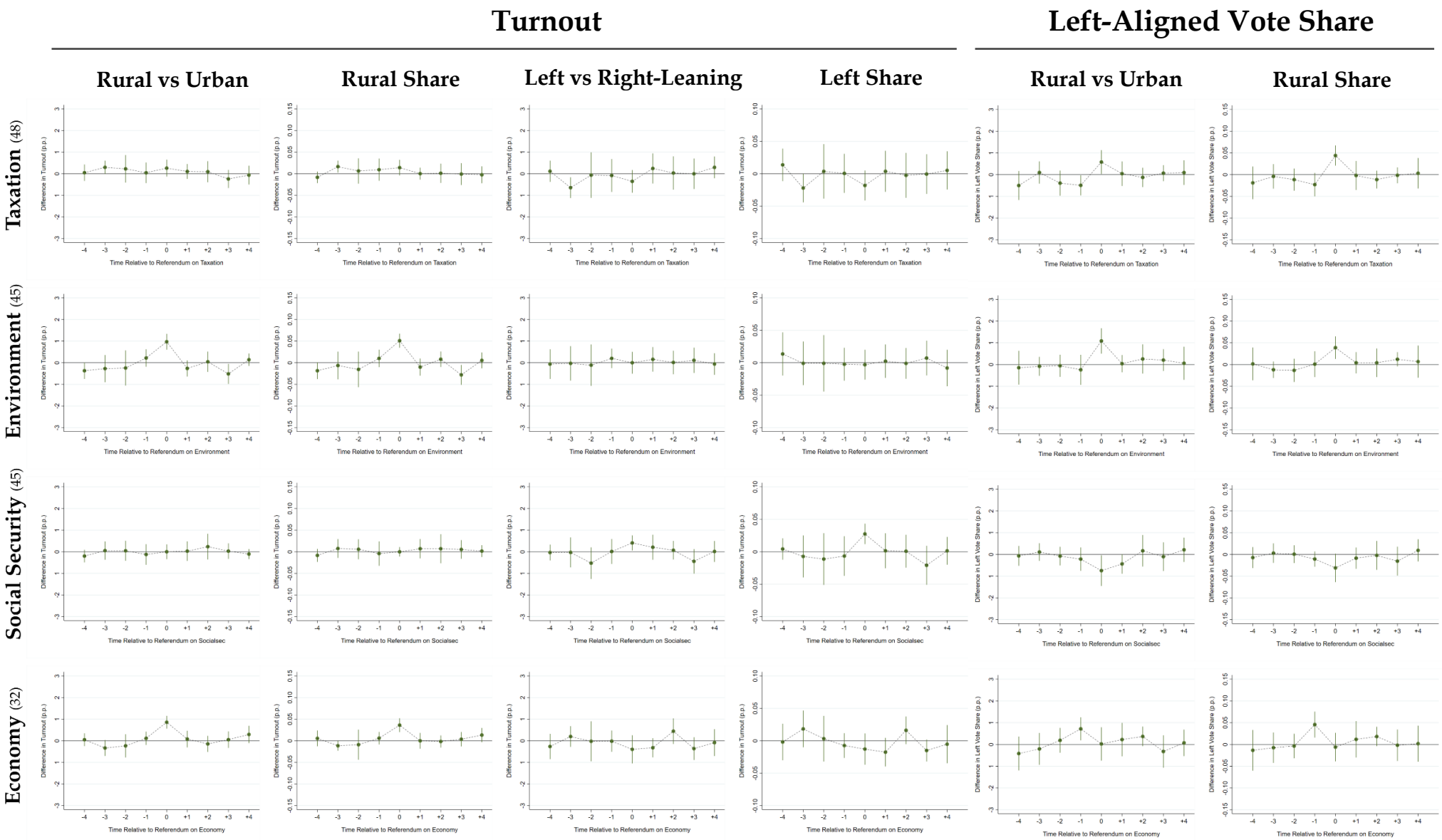
Notes: This figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1, modified such that instead of comparing rural versus urban municipalities, it compares two equal-sized groups of municipalities created by random assignment. Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to a given policy theme occurred. The outcome variable is average turnout (0 to 100) across concurrent referendums, excluding those related to the policy theme under study. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year. Numbers in parentheses next to the theme names indicate the number of voting dates in the 1970-2022 period that featured each policy theme.

Figure A6: Validity Check: Municipalities Split in Two Groups at Random, Effects on Vote Shares.



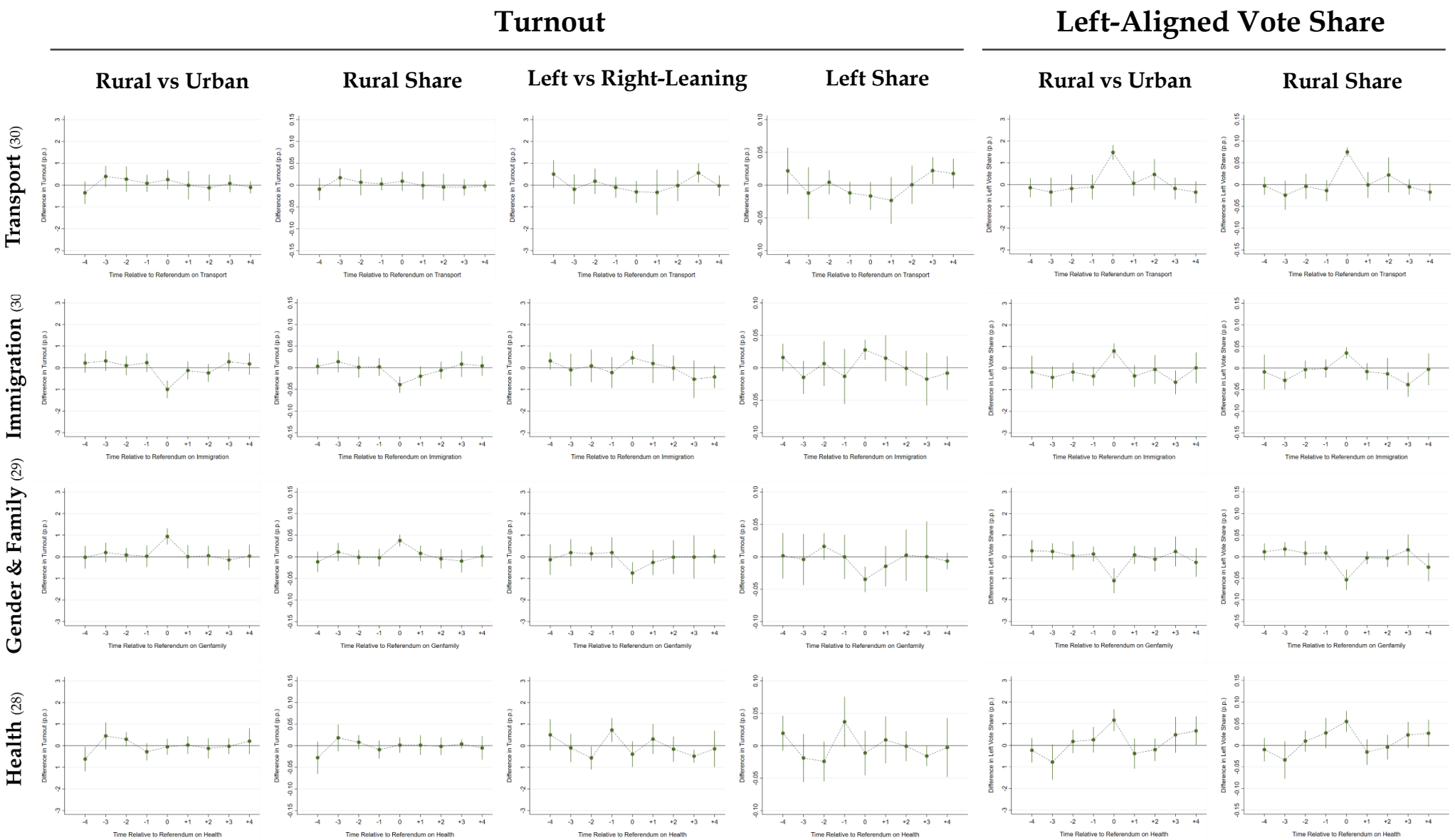
Notes: This figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1, modified such that instead of comparing rural versus urban municipalities, it compares two equal-sized groups of municipalities created by random assignment. The outcome variable is the share of votes aligned with the Social Democratic Party: for each referendum, this is either the proportion of "yes" or "no" votes out of all "yes" and "no" votes, depending on which option is supported by this party. This is then averaged across referendums held in the same voting date, excluding those related to the theme under study. Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to a given policy theme occurred. The outcome variable is average turnout (0 to 100) across concurrent referendums, excluding those related to the policy theme under study. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year. Numbers in parentheses next to the theme names indicate the number of voting dates in the 1970-2022 period that featured each policy theme.

Figure A7: Results for all Themes: Turnout and Left-Aligned Vote Share (1 of 5).



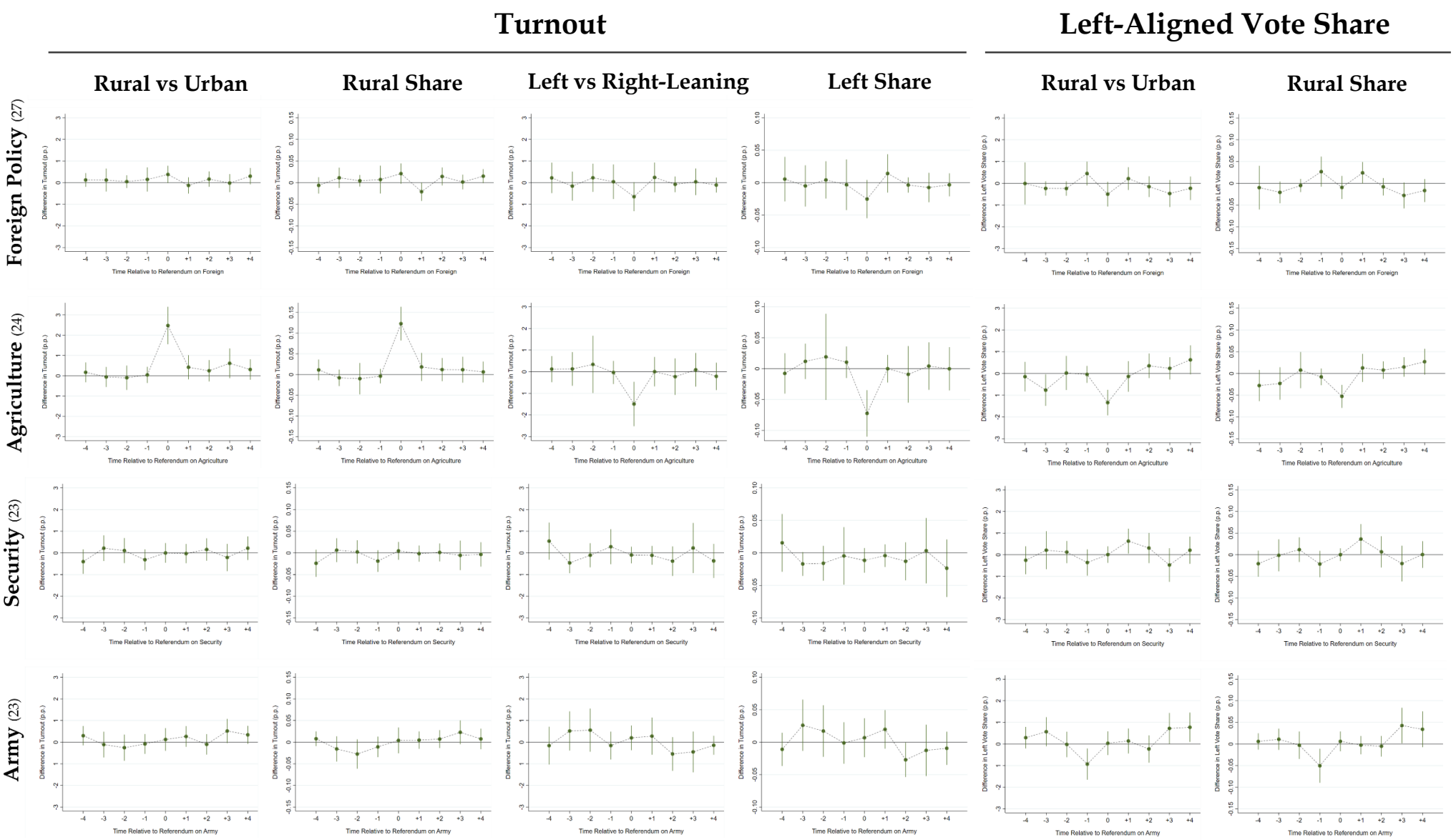
Notes: Each figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1, modifying the outcome and regressors to examine the effects of different policy themes on two outcomes of interest. The first four columns use turnout as the regressor (average turnout across concurrent referendums, excluding those related to the policy theme under study), while the last two columns use left-aligned vote shares as the outcome (averaged in the same way). The "Rural vs urban" columns compare outcomes in rural versus urban municipalities. "Rural share" columns use a continues treatment assignment variable representing the share of employment in the primary sector. "Left vs right-leaning" columns compare left-leaning against all other municipalities. "Left share" column uses a continuous treatment assignment variable representing the share of votes to left-leaning parties in the municipality in the most recent national council election. Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year. Numbers in parentheses next to the theme names indicate the number of voting dates in the 1970-2022 period that featured each policy theme.

Figure A8: Results for all Themes: Turnout and Left-Aligned Vote Share (2 of 5).



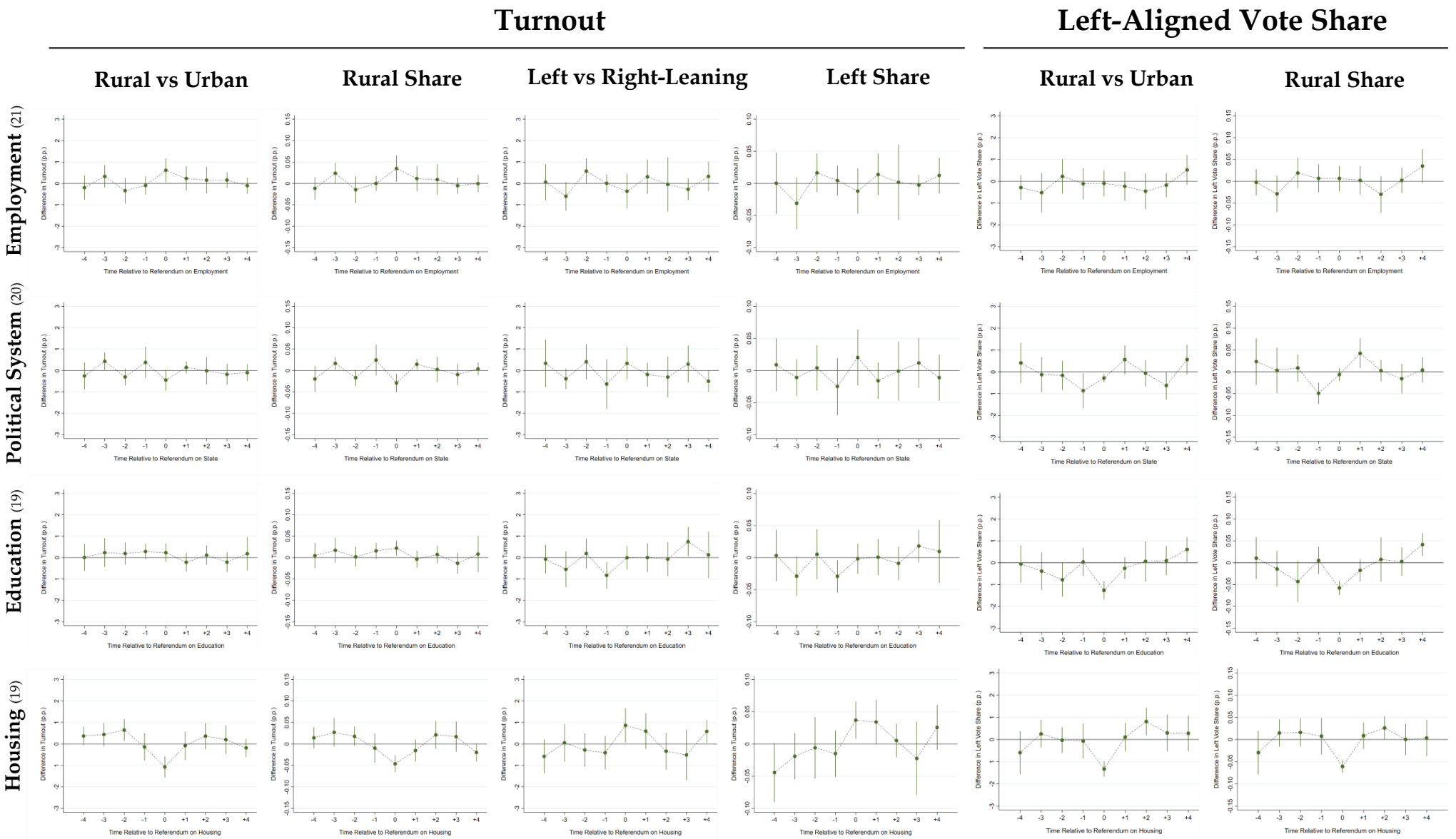
Notes: Each figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1, modifying the outcome and regressors to examine the effects of different policy themes on two outcomes of interest. The first four columns use turnout as the regressor (average turnout across concurrent referendums, excluding those related to the policy theme under study), while the last two columns use left-aligned vote shares as the outcome (averaged in the same way). The "Rural vs urban" columns compare outcomes in rural versus urban municipalities. "Rural share" columns use a continues treatment assignment variable representing the share of employment in the primary sector. "Left vs right-leaning" columns compare left-leaning against all other municipalities. "Left share" column uses a continuous treatment assignment variable representing the share of votes to left-leaning parties in the municipality in the most recent national council election. Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year. Numbers in parentheses next to the theme names indicate the number of voting dates in the 1970-2022 period that featured each policy theme.

Figure A9: Results for all Themes: Turnout and Left-Aligned Vote Share (3 of 5).



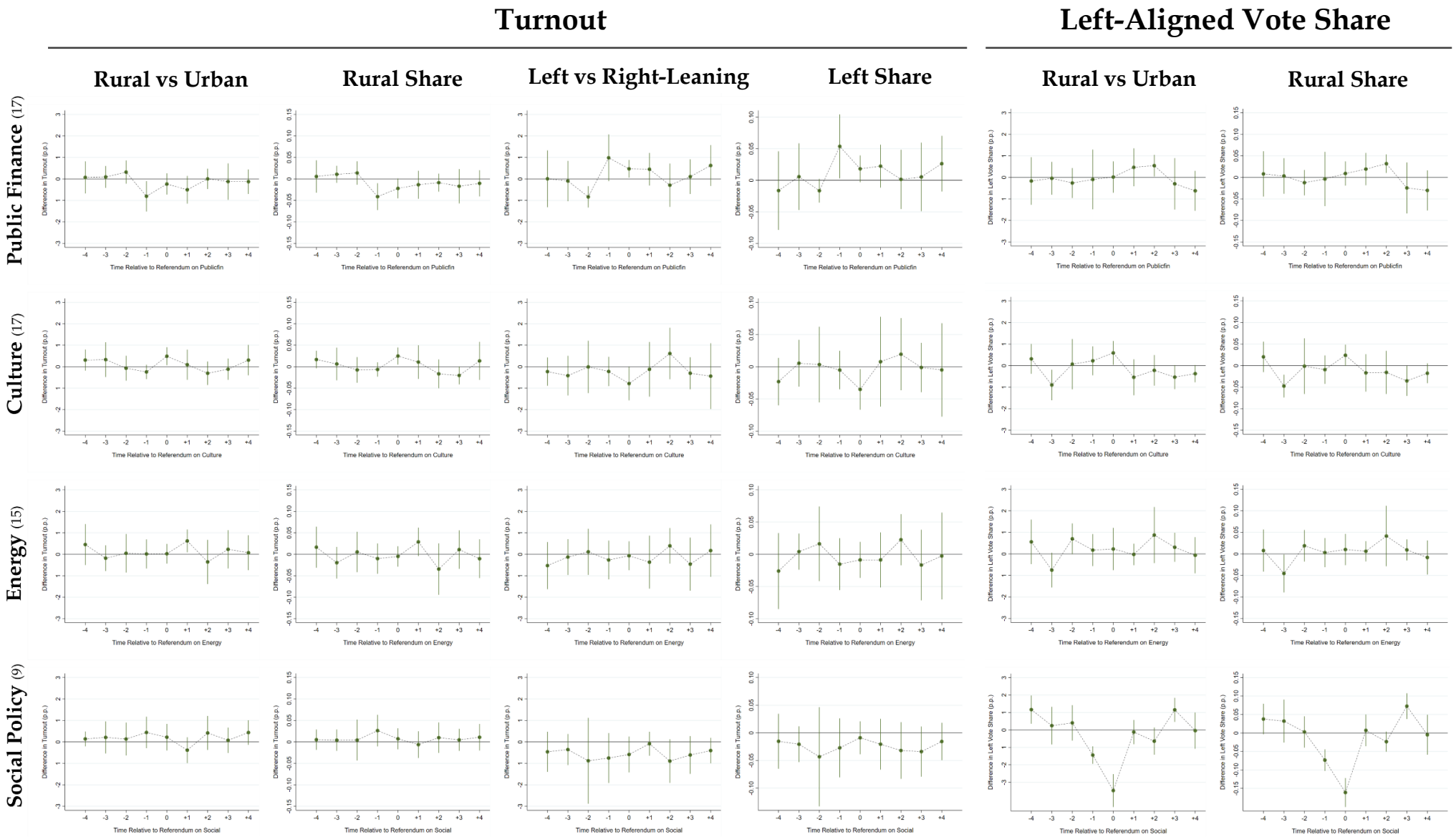
Notes: Each figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1, modifying the outcome and regressors to examine the effects of different policy themes on two outcomes of interest. The first four columns use turnout as the regressor (average turnout across concurrent referendums, excluding those related to the policy theme under study), while the last two columns use left-aligned vote shares as the outcome (averaged in the same way). The "Rural vs urban" columns compare outcomes in rural versus urban municipalities. "Rural share" columns use a continues treatment assignment variable representing the share of employment in the primary sector. "Left vs right-leaning" columns compare left-leaning against all other municipalities. "Left share" column uses a continuous treatment assignment variable representing the share of votes to left-leaning parties in the municipality in the most recent national council election. Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year. Numbers in parentheses next to the theme names indicate the number of voting dates in the 1970-2022 period that featured each policy theme.

Figure A10: Results for all Themes: Turnout and Left-Aligned Vote Share (4 of 5).



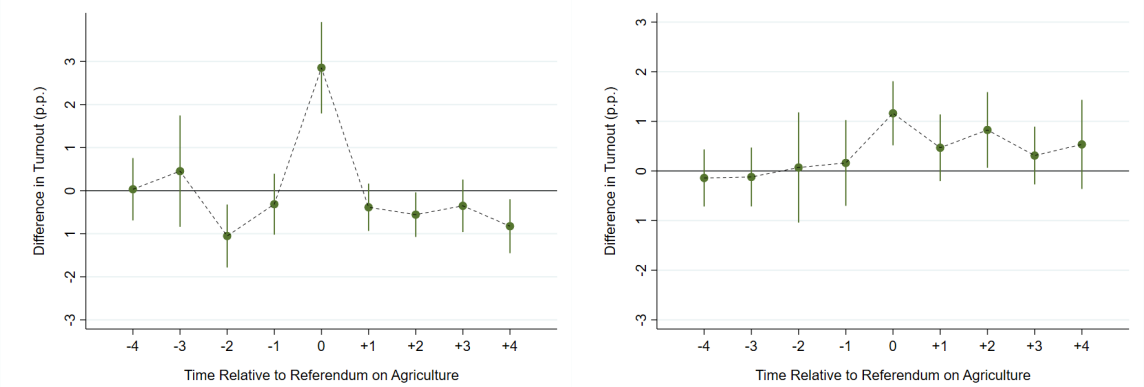
Notes: Each figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1, modifying the outcome and regressors to examine the effects of different policy themes on two outcomes of interest. The first four columns use turnout as the regressor (average turnout across concurrent referendums, excluding those related to the policy theme under study), while the last two columns use left-aligned vote shares as the outcome (averaged in the same way). The "Rural vs urban" columns compare outcomes in rural versus urban municipalities. "Rural share" columns use a continues treatment assignment variable representing the share of employment in the primary sector. "Left vs right-leaning" columns compare left-leaning against all other municipalities. "Left share" column uses a continuous treatment assignment variable representing the share of votes to left-leaning parties in the municipality in the most recent national council election. Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year. Numbers in parentheses next to the theme names indicate the number of voting dates in the 1970-2022 period that featured each policy theme.

Figure A11: Results for all Themes: Turnout and Left-Aligned Vote Share (5 of 5).



Notes: Each figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1, modifying the outcome and regressors to examine the effects of different policy themes on two outcomes of interest. The first four columns use turnout as the regressor (average turnout across concurrent referendums, excluding those related to the policy theme under study), while the last two columns use left-aligned vote shares as the outcome (averaged in the same way). The "Rural vs urban" columns compare outcomes in rural versus urban municipalities. "Rural share" columns use a continues treatment assignment variable representing the share of employment in the primary sector. "Left vs right-leaning" columns compare left-leaning against all other municipalities. "Left share" column uses a continuous treatment assignment variable representing the share of votes to left-leaning parties in the municipality in the most recent national council election. Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year. Numbers in parentheses next to the theme names indicate the number of voting dates in the 1970-2022 period that featured each policy theme.

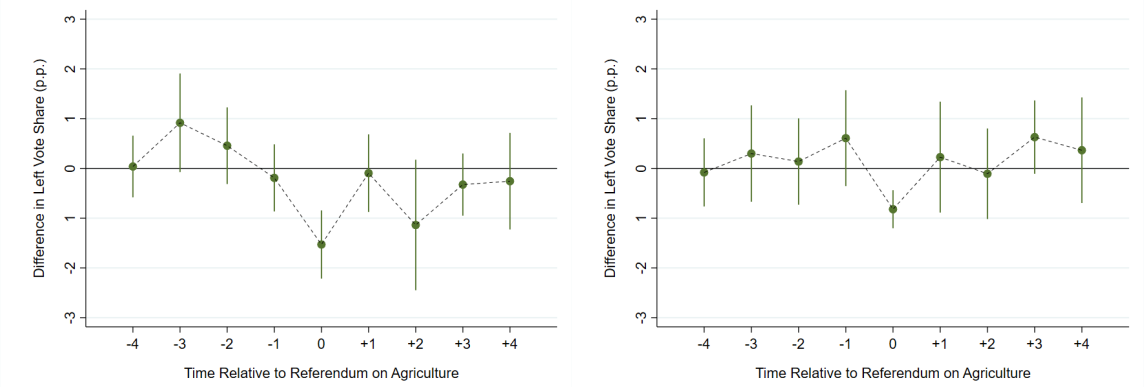
Figure A12: Effect of a Concurrent Referendum on Agriculture on **Turnout**: Rural vs Urban, and Intermediate vs Urban Municipalities



(a) Rural vs Urban (b) Intermediate vs Urban

Notes: This figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1. Instead of using a binary classification of municipalities as rural or urban, it uses an alternative classification that includes a third "intermediate" group, comprising "dense peri-urban areas and rural centers that exhibit both urban and rural characteristics" (Federal Statistics Office). Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. The outcome variable is average turnout (0 to 100) across concurrent referendums, excluding those related to agriculture. Panel (a) compares turnout in rural versus urban municipalities, excluding "intermediate" municipalities. Panel (b) compares turnout in "intermediate" versus urban municipalities, excluding rural ones. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year.

Figure A13: Effect of a Concurrent Referendum on Agriculture on **Left-Aligned Vote Share**: Rural vs Urban, and Intermediate vs Urban Municipalities



(a) Rural vs Urban (b) Intermediate vs Urban

Notes: This figure plots the $\beta_{1,t}$ coefficients and 95% confidence intervals from Equation 1. Instead of using a binary classification of municipalities as rural or urban, it uses an alternative classification that includes a third "intermediate" group, comprising "dense peri-urban areas and rural centers that exhibit both urban and rural characteristics" (Federal Statistics Office). Each observation represents a municipality on a specific voting date. The horizontal axis indicates the number of federal voting dates before and after a referendum related to agriculture occurred. The outcome variable is average turnout (0 to 100) across concurrent referendums, excluding those related to agriculture. Panel (a) compares turnout in rural versus urban municipalities, excluding "intermediate" municipalities. Panel (b) compares turnout in "intermediate" versus urban municipalities, excluding rural ones. Standard errors are clustered at the cantonal-date level. Regressions are weighted by municipality population size for the corresponding year.

Chapter 2

Challenges of Monitoring Tax Compliance by Multinational Firms: Evidence from Chile

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José Vila-Belda Montalt[3]
Gabriel Zucman[4]

Abstract

International tax avoidance by multinational corporations (MNCs) presents a key challenge for governments, particularly for emerging economies building tax capacity. This paper examines MNC tax compliance challenges using Chile as a case study. Analysis of administrative tax data reveals that MNCs, which constitute 40% of corporate sales in Chile, report lower profits and pay less tax than comparable domestic firms, suggesting significant profit shifting. This evidence is contextualized within the global policy debate, contrasting the OECD's "arm's-length" principle with alternatives like formulary apportionment. The research highlights the critical need for more evidence on the effectiveness of current international tax rules to inform policy.

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2.1 Introduction

International tax avoidance by multinational firms has been at the forefront of policy debates and news coverage in recent years. This paper provides a brief overview of the challenges and policy debates regarding taxation of multinational corporations and provides novel descriptive evidence on the case of Chile.

With growing globalization of ownership structures and financial flows, multinational enterprises account for an increasingly large share of the global economy (e.g. Narula and Dunning 2010; Clausing 2018). A growing body of evidence, building on Hines and Rice (1994), suggests that multinationals artificially shift a large fraction of their profits to low-tax locales (see Dharmapala 2014 for a review of the empirical literature). More than half of the foreign profits of US firms, for example, are booked in Bermuda, Luxembourg, Switzerland, the Netherlands, Singapore, Ireland, and Caribbean islands (e.g., Clausing 2016c). By one estimate (Wright and Zucman 2018), this shifting is on the rise and has reduced the effective corporate tax rate paid by U.S. multinationals on their foreign profits by more than 6 percentage points in 2015. Multinationals from other regions have similar incentives, suggesting that global revenue losses due to multinational corporate tax avoidance may be sizable.

Profit shifting is particularly concerning for developing countries and emerging economies, where building tax capacity is a key policy goal, both to finance public infrastructure and services and to reduce distortions in the economy (see Pomeranz and Vila-Belda 2019a). As economies grow, their number of multinationals tends to increase, and the question of how to monitor profit shifting becomes important (Johannesen, Tørsløv, and Wier 2018). Developing countries face a fundamental trade-off in dealing with multinationals. On the one hand, multinational firms are often believed to be an important vehicle to bring managerial best practices, innovation, investment, and increased productivity, and there are important debates about whether governments should therefore subsidize such firms' investments (e.g. Spencer 2008; Harrison and Rodríguez-Clare 2010; Kose et al. 2010; Alfaro and Chen 2018). On the other hand, multinationals often have more avenues and resources to avoid or evade taxation, compared to domestic firms that cannot rely on international networks. International tax arbitrage and tax havens can also affect the location of real economic activities (Mooij, Ruud, and Liu 2018; Serrato and Carlos 2018). Against this backdrop, how can governments improve their ability to attract investment by multinational firms without compromising their capacity to collect taxes?

There is a lively debate on how to curb multinational tax avoidance. The OECD encourages governments to spend more resources enforcing the rules that currently govern the taxation of multinationals. However, as discussed below, critics argue that the OECD framework is not ideally suited to today's globalized world (e.g. Reform of International Corporate Taxation 2015 and question its effectiveness to prevent profit shifting. In order to shed light on this debate, in ongoing work we study the recent experience of Chile in tackling profit shifting through transfer pricing legislation based on OECD recommendations.

2.2 Common Ways for Multinational Firms to Shift Profits

The key challenge of taxing multinational firms stems from the fact that profits are produced jointly by subsidiaries located in different countries but taxation is applied by each jurisdiction at the national level. The question then emerges, which parts of the global corporation's profit should be taxed by which country. Profits can be shifted from one country to another by manipulating prices of intra-firm transactions (so called "transfer-prices"). When a subsidiary in a high-tax country sells goods or services at artificially low prices to a subsidiary in a low-tax jurisdiction, this leads to a decrease in profits and a reduction in the taxes paid in the high-tax location, as well as in the total amount of taxes paid. Multinational firms can exploit discrepancies in tax rates and tax rules of different jurisdictions by strategically choosing the location of their affiliates and the transactions between them. The economics literature provides substantial evidence for the presence of tax-motivated transfer pricing (Bartelsman and Beetsma 2003a; Clausing 2003a; Clausing 2006a; Bernard, Jensen, and Schott 2006b; Johannesen and Hebous 2016; Davies et al. 2018b).

To counteract this tendency, many countries have agreed to use the so-called arm's-length principle to regulate intra-firm transactions (see Zucman 2014b for a description of the history and implications of these rules). This principle, established in the 1920s, stipulates that subsidiaries of a multinational firm in different countries have to set prices on transactions between each other as if they belonged to separate firms, i.e. as if they were market prices.

In practice, however, the arm's length principle can be hard to implement. Many goods and especially services involved in intra-firm trade can be firm-specific and may not be traded outside a given multinational group, therefore

lacking a clear market price. It is often hard to determine, for example, what the market price would be for the right to use intellectual property, if the patent is only used by other subsidiaries of the same multinational firm, or how much should be charged for marketing services provided internally between subsidiaries of a multinational corporation. Empirical evidence shows that the location of intangible assets is systematically distorted towards low-tax locations (Dischinger and Riedel 2011a; Karkinsky and Riedel 2012a; Griffith, Miller, and O'Connell 2014; Alstadsæter et al. 2015).

Another method used by multinational firms to shift profits involves intra-group loans (also known as "debt shifting"). Debt and equity are treated differently for tax purposes, as interest payments are deductible. This creates an incentive for financing with debt rather than equity. Multinationals can exploit this for profit shifting purposes without affecting the group's overall debt exposure by routing equity into low-tax affiliates, which then lend to high-tax affiliates, which in turn deduct their interest payments, thus reducing the group's overall tax liability. Several empirical studies provide evidence of debt shifting, e.g. Desai, Foley, and Hines (2007) or Mintz and Weichenrieder (2010b). A meta-analysis by Heckemeyer and Overesch (2017a) estimates that around 30% of overall income shifting can be attributed to debt shifting.

As companies have developed increasingly intricate ways to shift profits, the corresponding regulations have also grown more complex. In that context, devoting extra resources to enforcing the arm's length principle could potentially lead to a bad equilibrium: growing monitoring costs for tax authorities and compliance costs for corporations, with little increase in tax collection, resulting in possibly lower welfare. So far there exists relatively limited causal evidence on the impact of reforms to enforce arm's length pricing rules on compliance and tax collection. Measuring their impact is key to evaluate whether alternative approaches to international taxation should be favored.

Indeed, some fundamentally different approaches for international corporate taxation have been proposed (Devereux and Vella 2014). One prominent such approach would treat multinationals as a single entity for tax purposes. Avi-Yonah and Clausing (2008), Avi-Yonah, Clausing, and Durst (2009), and Zucman (2015), and the Reform of International Corporate Taxation (2015), among others, propose starting from the consolidated profits of multinationals and apportioning them across countries using an apportionment formula. This formula intends to reflect the real economic activity of multinational groups, for example based

on how much of the corporations' sales are made to different countries, or how much of its payroll or assets are located in different jurisdictions.

A similar approach is currently already in place within the United States for the taxation of corporations by different states. Proponents argue this unitary approach could better reflect how multinationals operate today, and would prevent them from shifting profits to tax havens where no real economic activity takes place (e.g. Janský and Prats 2015). Whether and to what extent firms would respond to factors in the apportionment formula is still debated (Altshuler and Grubert 2010; Clausing 2016a).

2.3 The Chilean Setting

In 2010, Chile became the first South American country to join the OECD. As part of this process, it committed to OECD transfer pricing rules. Starting in 2011, Chile made a number of changes to its tax enforcement policy regarding multinational firms. The reform was designed to address all forms 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. The reform strongly increased the reporting requirements on intra-group transactions, changed the burden of proof for the correct valuation of these transactions from the tax authority to the firms and boosted the monitoring of international transactions by increasing the number of specialized tax auditors devoted to these tasks. Chile is an ideal laboratory to study the impact of such changes, as it illustrates the challenges of taxation of multinational corporations for an emerging economy, and because the Chilean tax authority is known for having high implementation capacities and low corruption rates (Adimark-GfK 2006). While Chile has a long track-record of using effective and innovative enforcement methods for domestic taxes such as the VAT (Pomeranz 2015a), international profit shifting by multinational firms presents important and growing challenges for tax collection.

In order to study the extent of profit shifting and evaluate the impact of the new rules, we partnered with the Chilean tax authority to combine several administrative datasets, including corporate tax filings, filings on international transactions, and customs data. This data allows us to provide novel descriptions of multinational firms operating in Chile, discussed below. In ongoing work, we also analyze the reform's impact on tax collection and firm behavior.

Out of approximately 300,000 incorporated firms in Chile in 2010 , only around 5,300 had foreign affiliates, and around 630 had affiliates in countries that the tax authority classifies as tax havens. However, these firms account for a large share of total sales by Chilean firms. The firms with foreign affiliates account for around 40% of total sales by incorporated firms in the country, and firms with affiliates in tax havens make up around 13%.

Many of the firms with foreign affiliates have a network of affiliates in multiple countries. The mean number of countries in which they have affiliates is 4.1, with a median of 2 and a maximum of 96. Among firms with affiliates in tax havens, these numbers are even larger, with a mean of 8.6 countries with affiliates, and a median of 4. Such large and complex web of relationships may lead to both high monitoring costs for the tax authority and high compliance costs for the multinational firms.

In addition, the ownership structures of many of these relationships are complex and hard to track for the tax authority. Firms indicate in their tax forms whether the relationship with a given foreign affiliate is one in which a) the Chilean firm owns the foreign affiliate, b) the foreign firm owns the Chilean affiliate, or c) both are owned by the same third party. 50% of multinational firms list affiliates with relationships of type (a), 59% of type (b), and 45% of type (c). 13% have foreign affiliates of all three types.

Our descriptive analysis provides suggestive evidence consistent with profit shifting by multinational firms in Chile (See Figure 1). Their tax filings indicate that multinational firms have lower profit rates (as a ratio of EBIT /wages) compared to local firms similar in size, industry and region. This is consistent with the notion that they shift part of their profits to lower tax countries, and in line with the findings of Tørsløv, Wier, and Zucman (2018) who show that multinational firms in higher-tax jurisdictions tend to have lower profit rates, and those in low-tax countries tend to have higher profit rates compared to purely domestic firms. This lower profitability leads to a lower probability of paying corporate income tax in Chile, and a lower rate of taxes/payroll.

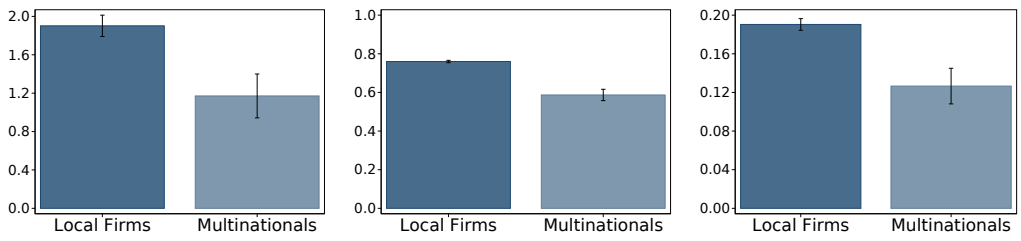

Figure 1: Profit Rates and Tax Payments of Multinationals vs Local Firms

Note: OLS estimates from the pre-reform period (2007-2010) on a dummy for whether a firm has foreign affiliates. To compare firms with similar characteristics, observations are weighted by the inverse propensity score for being a multinational using firms' size category, region and industry. Outcomes in panels *a* and *c* winsorized at the 99^{th} percentile. Vertical bars show 95% confidence intervals. Sample restricted to firms with positive costs and wages, excluding firms in the first and last percentiles of the propensity score.

In ongoing work, we investigate the channels used by multinationals to lower their tax payments in Chile, and analyze whether the reform had an impact on profit shifting and tax collection. It is clear that the reform increased both monitoring costs for the Chilean tax authority and compliance costs of firms with foreign affiliates, boosting demand for tax advisory services. We conducted interviews with tax advisors of the four largest tax consulting firms in Chile, which revealed that their number of employees dedicated to supporting firms on "tax planning strategies" to comply with transfer pricing regulation increased about 15-fold.

2.4 Conclusion: Open Questions for Research

In an increasingly globalized corporate world, the debate on how to effectively tax multinational corporation has become of first order importance for many governments around the world. The magnitudes involved are large. In Chile, about 40% of sales come from the 2% of corporations that have affiliates in foreign countries. Many countries try to attract investment by multinational firms, as this is often thought to bring positive spillovers for economic development. However, multinationals often have more avenues to avoid taxes, which can undermine countries' goal of building tax capacity. Guidance by the OECD on how to reduce international profit shifting has been subject to controversial debate, but empirical evidence on its effectiveness is limited.

In 2011, Chile implemented an OECD-inspired reform that strongly increased reporting requirements for multinational firms and created a specialized unit to monitor transfer pricing. This led to higher monitoring costs and higher compliance costs for firms, and increased demand for tax consulting services. It is, however, unknown so far whether it led to more tax collection. The growing number of collaborations between researchers and tax authorities, leveraging administrative tax data, has the potential to shed empirical light on this type of pressing questions and to help improve international tax policy.

Chapter 3

The Race Between Tax Enforcement and Tax Planning: Evidence From a Natural Experiment in Chile

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Gabriel Zucman[5]

Abstract

Profit shifting by multinational corporations is thought to reduce tax revenue around the world. This paper provides a comprehensive analysis of the introduction of standard regulations aimed at limiting profit shifting. Using administrative tax and customs data from, we find that the reform was ineffective in reducing multinationals' transfers to lower-tax countries and did not significantly raise tax payments. At the same time, interviews with tax advisors reveal a drastic increase in consulting services. Our results illustrate that when enforcement can be circumvented by sophisticated tax planning, it can benefit tax consultants at the expense of tax authorities and taxpayers.

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3.1 Introduction

It is a long-standing concern that multinational corporations avoid paying taxes by shifting profits to low-tax countries. The global policy discussion on this issue has featured two competing perspectives. According to the first view, profit shifting can be reduced by improving and harmonizing the complex rules of transfer pricing that govern the taxation of multinational firms. Following this view and under the leadership of the OECD, many countries have implemented regulations that require increasingly granular information on intra-firm transactions. According to a second view, a more fundamental change is needed because the complexity of transfer pricing regulations makes them vulnerable to sophisticated tax planning by multinationals and the tax advisory industry.

This paper provides a comprehensive analysis of whether reforms that strengthen transfer pricing information reporting standards effectively reduce profit shifting. We provide a simple model characterizing how the tax advisory industry impacts the effectiveness of such reforms through its dual compliance and tax planning roles. Using rich tax and customs data, we study the effects of a large reform in Chile on all potential channels of profit shifting and tax revenue. Finally, we conduct extensive qualitative interviews with transfer pricing experts to understand how the tax advisory shapes how multinationals respond to the reform.

The reform we study is the introduction of OECD transfer pricing standards in Chile in 2011. The reform significantly expanded information reporting requirements on international transfers by multinationals, changed legal rules to make it easier for the tax authority to enforce transfer pricing rules, and increased resources devoted to the enforcement of these rules. As a result, the reform transformed the country in one year from a laggard to a leader in the implementation of OECD transfer pricing standards.[4] This reform provides a rare natural experiment to evaluate whether the program to strengthen monitoring and information reporting around the world can effectively reduce profit shifting.

Contrary to expectations that the reform would limit profit shifting and increase tax collections, we document that it did not reduce the propensity of multinationals to make tax-motivated payments to their foreign affiliates, neither for intellectual property nor interests or services. We also find no evidence that the

[4]Chile's low corruption and high administrative capacity make it an ideal setting to study such reforms, as they are more likely to succeed there than in other countries. Transparency International (2012) has ranked Chile the 20^{th} least corrupt out of 180 countries, similar to the United States (which is 19^{th}).

reform impacted the prices of traded goods. Consistent with these results, we find no effect on corporate tax payments.

Our semi-structured qualitative interviews uncover the mechanisms behind this puzzling result. Demand for transfer pricing experts exploded after the reform. The global nature of the regulation makes transfer pricing expertise portable across countries, and large consulting firms were therefore able to quickly meet the increase in demand by relocating experts from abroad. This led to a 12-fold increase in the number of transfer consultants in the country within three years. While firms initially sought advisory services to comply with the complex new reporting requirements, consultants used these new relationships to identify and up-sell firms on tax planning opportunities. Interviewees shared some specific tax planning strategies with us, which we can test for and validate with the quantitative tax data.

Overall, we find that the reform had no effect on any of the channels of profit shifting nor on tax payments, while it created a strong boost to the tax advisory industry. We therefore conclude that in the race between tax enforcement and tax planning, tax planning won.

We develop these results in three steps: we build a conceptual framework, implement quantitative analysis using administrative micro-data, and conduct in-depth qualitative interviews. First, to understand the mechanism by which the advisory industry can affect the effectiveness of transfer pricing reforms, we develop a conceptual framework in which multinationals can employ tax advisors to minimize compliance costs as well as to engage in tax planning. The framework connects our quantitative and qualitative empirical evidence and shows that reforms that increase compliance costs may backfire if they facilitate the adoption of more sophisticated tax planning strategies. These dynamics showcase the importance of taking the tax advisory industry into account when designing tax monitoring reforms.

In the second step, we evaluate the effects of the reform using administrative tax and customs data. We start by confirming that multinationals engage in tax-motivated transactions. Intra-group payments for royalties, interest, and services flow disproportionately to affiliates in lower-tax countries.[5] To establish this fact, we exploit changes in tax rates of the countries where a multinational firm has foreign affiliates. This within-firm research design allows us to include destination-country and firm-year fixed effects as well as controls for destination

[5]Intra-group payments are transactions within the worldwide group of affiliates of one multinational.

country GDP so that results are not contaminated by constant features or economic fluctuations of destination countries or by firm-level shocks. We find that, before the reform and relative to non-affiliates, a one percentage point reduction in the tax rate of a destination country is associated with an increase in payments to affiliates of between 4.5–4.9%. In contrast, payments to non-affiliated firms are not sensitive to the tax rate in the destination country.[6]

We then use a difference-in-differences event-study design to study whether the reform was effective at reducing multinationals' propensity to make intra-group payments to lower-tax countries. The identifying assumption behind this analysis is that (conditional on the controls mentioned above), absent the reform, the tax sensitivity of payments by a given firm to affiliates and to non-affiliates would have evolved in parallel. In support of this assumption, we show that these semi-elasticities evolved in parallel before the reform. The reform was motivated by the belief that a significant part of these transactions are due to profit shifting and that monitoring would allow the tax authority to curtail this behavior and increase revenues. However, the reform did not have this effect. There is no reduction in the sensitivity of intra-group payments of royalties, interests, or services to changes in destination country tax rates. After the reform, the sensitivity is even somewhat higher, although this difference is not statistically significant.

In addition to analyzing payments for royalties, services, and interests, we also study the effects of the reform on the fourth potential channel for profit shifting: trade in goods. Combining customs data with data from tax filings, we can investigate prices of traded goods for transactions that are likely to be intra-group. Comparing the goods prices of these transactions to those of domestic firms, we find that the reform did not impact the prices for either imports or exports.

Consistent with the absence of effects on any of the channels for profit shifting, we also find no significant increase in tax payments by multinationals following the reform. We measure the effects on corporate income tax payments, comparing multinationals to other internationally active firms (i.e., those with exports, imports, or cross-border payments). The identifying assumption is that these domestic and multinational firms were not differentially affected by other

[6] As in prior work, we interpret these results as evidence of profit shifting (e.g., Hines and Rice 1994; Huizinga and Laeven 2008; Dharmapala and Riedel 2013; Clausing 2016b; Dowd, Landefeld, and Moore 2017; Heckemeyer and Overesch 2017b). While the results may arise from illegal manipulation of intra-group transactions, they can also be driven by legal tax planning structures.

shocks at the time of the reform. While multinationals differ from domestic firms, we show that they are comparable once we scale outcomes by firm size and control for pre-reform characteristics interacted with year fixed effects. Supporting this assumption, we show parallel pre-trends in tax payments and a placebo test indicating that domestic sales of both groups evolve in parallel before and after the reform.

The point estimate of the impact on corporate income taxes is far from statistically significant and ranges between -0.18% and $+0.58\%$, depending on the included post-treatment duration. For comparison, Tørsløv, Wier, and Zucman (2022) estimate that in 2015, Chile lost the equivalent of 20% of multinationals' corporate tax revenue to profit shifting. The finding that the reform did not increase tax payments is robust and holds across a number of subgroups of firms that might be expected to be more affected by the reform, such as Chilean-owned multinationals, multinationals with affiliates in tax havens, firms that had not revealed their multinational status to the government prior to the reform, or relatively smaller firms. Since we find no reduction in any of the main channels of profit shifting and no impact on tax payments, we conclude that the reform did not succeed at reducing profit shifting.

In a third step, we conducted in-depth interviews with transfer pricing experts both in Chilean multinationals and consulting firms. These semi-structured interviews were designed to uncover how multinationals responded to the reform.[7] The first big change was a strong increase in demand for transfer pricing consulting services. Within three years after the reform (2010–2014), the number of transfer pricing experts working at the Big Four consulting firms (i.e., Deloitte, EY, KPMG, and PwC) in the country increased from 8 to 95.[8]

Interviewees shared that tax consultants offer two types of services: compliance support and tax planning. While multinationals first approached consultants for compliance support, the process of systematizing their intra-group transactions for compliance made it easier for tax consultants to identify opportunities to reduce taxes through tax planning, which they then sold as additional services. An important tax planning strategy mentioned in the interviews was centralizing cost centers in fewer locations that were optimized from a business

[7] Finkelstein et al. (2021) discuss examples of the use of qualitative interviews in recent economics papers, including Starr (2014), Taubman et al. (2014), Alsan, Garrick, and Graziani (2019), and Bergman et al. (2023).

[8] This increase in external tax advisory support seems to have been additional to previous in-house tax accountants, not as substitute. Note that we cannot link individual firms to consultancies in the administrative data, since in contrast to US, tax filings in Chile do not include information on whether an external tax professional was involved in the preparation of the filing.

and tax-minimization perspective. We triangulate between the qualitative and quantitative data by testing this hypothesis with the administrative data and find a significant reduction in the number of non-tax haven countries to which multinationals make intra-group payments.

The interviews also uncover an interesting pattern of revolving doors and outmatched resources between the tax authority and the private sector. Consulting firms see any additional enforcement by the government as a business opportunity, leaving many experts with the conclusion that tax authorities are fighting a losing battle. Overall, the qualitative results show that the impact of monitoring regimes cannot be understood without taking into account the role of the tax advisory industry, which can benefit from these regulations while undermining their effectiveness.

This paper contributes to multiple strands of the literature. First, it is the first to provide a comprehensive evaluation of the effects of a transfer pricing reform by measuring its impact on each profit shifting channel as well as on tax payments. This builds on a large and growing literature, which documents how multinationals lower their tax payments through profit shifting (see, e.g., Jenkins and Wright 1975; Grubert, Mutti, et al. 1991; Hines and Rice 1994; Bartelsman and Beetsma 2003b; Huizinga and Laeven 2008; Koethenbuerger, Mardan, and Stimmelmayr 2019; Tørsløv, Wier, and Zucman 2020). The prior literature has established that firms make tax-motivated payments via intangible assets such as patents and trademarks (Dischinger and Riedel 2011b; Karkinsky and Riedel 2012b; Griffith, Miller, and O'Connell 2014; Alstadsæter et al. 2018; Delis et al. 2022), debt and interest payments (Desai, Foley, and Hines Jr 2007; Mintz and Weichenrieder 2010a; Buettner et al. 2012; Bilicka 2019), services such as finances, administration, IT, marketing or intellectual property (Hebous, Ruf, and Weichenrieder 2011; Hebous and Johannesen 2021), and trade in goods (Clausing 2003b; Bernard, Jensen, and Schott 2006a; Clausing 2006b; Cristea and Nguyen 2016; Davies et al. 2018a; Liu, Schmidt-Eisenlohr, and Guo 2019; Wier 2020). Prior work has also investigated the effectiveness of transfer pricing regulations. Using panel data of European multinationals, Lohse and Riedel (2013) find that when countries require some form of transfer pricing documentation,

the sensitivity of reported earnings to the tax rate falls.[9] See Dharmapala 2020 for a survey.

Second, our study contributes to the surprisingly small literature on tax advisory services (Slemrod 2019). Previous research has highlighted that tax advisors help shape compliance and avoidance behavior (e.g., Slemrod, Blumenthal, and Christian 2001a; Battaglini et al. 2020; Zwick 2021; Mayo 2022; Barrios and Gallemore 2023). While tax advisory firms play a crucial role in helping firms both comply with information requirements and undertake tax planning, their role in determining the effectiveness of tax monitoring reforms has not been studied. Our findings show that the tax advisory industry can benefit from efforts to increase tax compliance, and the in-depth interviews suggest important mechanisms through which tax consultants influence the practical effects of tax policy, some of which we are able to test and confirm with the administrative tax data.[10]

Third, this paper builds on the literature on information reporting as a tool to enforce tax compliance. Two key lessons emerge from that literature: the importance of paper trails for tax monitoring and the need for credible enforcement for them to be effective in reducing evasion (see, e.g., Kopczuk and Slemrod 2006a; Gordon and Li 2009a; Kleven et al. 2011c; Kleven et al. 2011b; Carrillo, Shahe Emran, and Anita 2012; Besley and Persson 2013a; Pomeranz 2015b; Kleven, Kreiner, and Saez 2016a; Carrillo, Pomeranz, and Singhal 2017a; Slemrod et al. 2017; Naritomi 2019; Kumler, Verhoogen, and Frías 2020; Bilicka et al. 2022; Jensen 2022). Our study suggests that, in contrast to what has been found for small firms with simple accounting structures, strengthening reporting requirements and paper trails may not be sufficient to increase tax collection from large firms, even when coupled with increased monitoring and enforcement, since their complex structures may provide them with more opportunities to respond with sophisticated tax planning.

Finally, our paper adds more broadly to the literature on tax capacity in developing countries (see Pomeranz and Vila-Belda 2019b for a review). Significant attention in this literature has been devoted to the taxation of small and medium-

[9] Wier (2020) documents the existence of transfer mispricing of trade in goods in South Africa and shows that an OECD reform was not followed by a significant reduction in mispricing. Brounstein (2023) studies the effects of an Ecuadorian financial transactions tax on payments made to tax haven recipients and shows that it significantly decreased dividend payments. Liu, Schmidt-Eisenlohr, and Guo (2019) studies the effects of a UK reform that changed the taxation of corporate profits from a worldwide to a territorial system and find that the reform led to a substantial increase in transfer mispricing.

[10] A related literature studies the role of tax preparers in disseminating information about the tax code, encouraging program participation, and mediating the impact of tax audits (Kopczuk and Pop-Eleches 2007; Chetty and Saez 2013; Boning et al. 2020).

sized firms (see, e.g., Best et al. 2015a; Mittal and Mahajan 2017b; Waseem 2018a; Brockmeyer et al. 2019; Weigel 2020; Basri et al. 2021; Jensen 2022; Okunogbe and Pouliquen 2022 and to property taxes see, e.g., Bergeron, Tourek, and Weigel 2020; Okunogbe 2021; Balán et al. 2022; Brockmeyer et al. 2022). Due mostly to data constraints and lack of exogenous variation, few papers so far have been able to analyze large corporations (with the notable exceptions of Holz et al. 2023 and Carrillo et al. 2023), even though they represent a large share of tax revenue.

Paper organization. Section 3.2 provides background on taxation of multinationals and the reform. The model in Section 3.3 clarifies the roles of information reporting, tax advisory services, and enforcement. Section 3.4 describes data and empirical strategy. Section 3.5 shows effects of the reform on intra-group transfers, trade prices, and tax payments, Section 3.6 discusses qualitative results and the role of the tax advisory industry. Section 3.7 concludes.

3.2 The Taxation of Multinational Firms

3.2.1 International Corporate Taxation and the Chilean Context

A key feature of taxing multinational firms stems from the fact that profits are generated jointly by a group of affiliated firms that are part of the multinational conglomerate and are located in different countries. According to standard regulations, taxation is applied separately by each jurisdiction on the profits of affiliates in that jurisdiction. This raises challenges, as multinational firms may circumvent taxation by shifting profits to affiliates in lower-tax countries, thereby substantially reducing their global tax payments. Profits can be shifted from one country to another by strategically manipulating payments for intra-group transactions for services, interests, intangibles such as royalties, and goods. For instance, a subsidiary in country A can buy services at high prices from an affiliate in a low-tax country B. This transaction reduces the tax bill in country A and increases it in country B, thereby lowering the overall tax payments of the multinational corporation. To limit such profit shifting, most countries require firms to follow the "arm's length principle" for intra-group transactions. This principle stipulates that subsidiaries of a multinational firm should transact as if they were separate entities and bill each other at prevailing market prices.[11]

[11] In addition, Chile—like most countries—has anti-avoidance provisions known as controlled-foreign corporation rules, whereby passive income (such as royalties or interests) earned by affiliates abroad can be subject to taxation in Chile. Multinationals may also be able to avoid these rules through tax planning.

Zucman (2014a) describes the history and implications of these rules. Today, the arm's length principle is embodied in Art. 9 of the OECD Model Tax Convention (OECD 2019a) and further detailed in the OECD's transfer pricing guidelines (OECD 2017).[12]

In practice, the arm's length principle can be hard to implement since many types of transactions, for instance, intellectual property, are never replicated between third parties and thus lack an observable market price. Similarly, it can be hard to determine the market price of services such as management advice, human resources, or marketing provided by one affiliate to another. Enforcing the arm's length principle is further complicated by the large number of transactions within multinationals, which can allow firms to choose strategic prices even when subject to substantial monitoring. To address these challenges, the OECD has developed an increasingly complex set of rules regulating how much affiliates can charge each other (e.g., the amount attributed to each affiliate for centralized services such as human resources) and how prices can be calculated when a market price is not available (e.g., by calculating the justifiable profitability of each transaction).

The Corporate Income Tax in Chile

The Chilean corporate income tax is a standard tax on corporate profits. In its detailed features, it is similar to the way the US corporate income tax worked before the Tax Cuts and Jobs Act was implemented in 2018.[13] Even though Chile is generally not a high-tax country, multinationals have incentives to shift profits out of the country because its corporate taxes are still higher than in many low-tax countries.

Multinational firms represent a large share of corporate income tax collection. Out of approximately 300,000 incorporated firms in Chile, only around 5,500 are multinationals, i.e., have foreign affiliates, but these firms pay over 60 % of all corporate income taxes (Servicio de Impuestos Internos 2021). Overall, the corporate income tax is a major source of tax revenue, accounting for 20% of government revenue in 2007–2015 (Bachas et al. 2022).

The statutory corporate income tax rate during our study period was 17% from 2007-2010, 20% from 2011-2013, 21% in 2014, and 22.5% in 2015. As we show below, these changes do not impact our analyses. They are either netted

[12] For a list of non-OECD countries that follow similar transfer pricing guidelines, see Table C1.

[13] It is a worldwide tax: global profits of multinationals headquartered in Chile are taxable in Chile, with tax credits to offset taxes paid abroad. Since foreign profits are only taxable once repatriated to Chile, the tax can be postponed by retaining earnings abroad.

out by destination-country year fixed effects in our intra-firm analyses (of the sensitivity of payments to destination country tax rates)[14] or impact both treatment and control firms in our inter-firm analyses (of the effects of the reform on goods prices and on tax payments).

3.2.2 The Transfer Pricing Reform

Starting in the late 1990s, the OECD has spearheaded efforts to strengthen reporting requirements of multinational firms and enforcement of the arm's-length principle e.g., Murphy 2009. The OECD strongly encouraged member countries to introduce legislation requiring firms to submit detailed documentation to justify their intra-group payments and transfer prices.[15] The reform incorporates the key elements of these OECD guidelines.

The reform had three main components. First, the law significantly expanded reporting requirements for multinationals, following the OECD (2010) guidelines. Under the new legislation, multinational firms are required to report all transactions with affiliates abroad and the methods used to price these transactions. These new reports had to be filed for the first time with tax declarations for the 2012 tax year. Second, the law shifted the burden of proof for compliance with transfer pricing regulations from the tax authority to the firms. Firms now need to be able to provide justification for the pricing of their intra-group payments. This paved the way for the tax authority to challenge the pricing of intra-group transactions. Finally, the reform substantially increased the resources devoted to enforcement. Starting in 2011, the tax authority hired specialized auditors and created a new unit to monitor and enforce transfer pricing rules and the arm's-length principle.

The regulatory and enforcement environment regarding transfer pricing became significantly more strict as a result of the reform. Data from Mescall and Klassen (2018) illustrate the extent to which the reform changed the ease of transfer mispricing for multinationals. They analyze the transfer pricing risk for multinationals in 32 countries based on assessments by transfer pricing experts from

[14] We also provide robustness analysis taking the changes in the Chilean tax rate into account.

[15] In a later stage, the OECD introduced the "base erosion and profit shifting" (BEPS) initiative that started in the mid-2010s. BEPS extends this approach by encouraging even more comprehensive information reporting (such as disclosing "aggressive tax planning arrangement"); it also covers other areas, such as the challenges specific to the digital economy and dispute resolution settlement (OECD 2015). This paper is not an evaluation of BEPS, but it is relevant for assessing the likely impacts of BEPS, since BEPS keeps the arm's length pricing while further strengthening reporting requirements.

Big Four consultancies.[16] Figure 1 shows that while Chile ranked second to last prior to the reform (2010), it was 4th highest afterward (2012).

Figure 1: Strictness of Transfer Pricing Enforcement Before and After the Reform

Notes: These figures show the country-level assessment of transfer pricing risk according to data from Mescall and Klassen (2018). The authors define this as the risk of a decrease in future cash flows that result from tax authorities' actions related to a corporation's transfer pricing activities. Chile had the second lowest risk in 2010 and the fourth highest in 2012, after the implementation of the reform.

[16]The risk is calculated based on answers from senior transfer pricing experts from around the world to the question "Based on your experiences, please rate the overall transfer pricing risk from 1 (least risky) to 5 (very risky). Transfer pricing risk includes the risk of a transfer pricing position being discovered and denied and the risk of penalties incurred." The paper then predicts the response to this score across countries and time based on observable regulation and enforcement variables.

3.3 A Conceptual Framework of Tax Enforcement Reforms and the Tax Advisory Industry

This section describes a model of the regulation as a change in the tax monitoring regime, where multinationals may respond by relying on tax advisors. The framework captures three key forces that emerged from our interviews and that may impact the effectiveness of the expansion of transfer pricing regulations around the world. First, the reform increases demand for external tax advisors to support compliance with the new, complex reporting requirements. Second, there is a complementarity between compliance and tax planning, as tax advisors can build on compliance work to sell tax planning services. Finally, the global nature of transfer pricing regulations allows multinational advisory firms to have an elastic supply response to the increased demand for transfer pricing experts. Based on these forces, the model identifies the circumstances under which regulations are more likely to be effective.

3.3.1 Model Setup

Firms may respond to increased monitoring by adjusting their real or reporting behavior and by seeking tax advice from consultants. We model these margins of adjustment by extending the classic models of profit shifting of Hines and Rice (1994) and Grubert and Slemrod (1998), following the setup in Suárez Serrato (2018). We assume that firms have affiliates in J countries. Production in country j is given by $f_j(\cdot)$, which is increasing in capital, $f_j'(K_j) > 0$, and exhibits decreasing returns to investment, $f_j''(K_j) < 0$. The firm pays a nondeductible cost of capital ρ.[17] Absent profit shifting, global after-tax profits are given by $\sum_j [(1 - t_j) f_j(K_j) - \rho K_j]$.

We consider two dimensions of tax monitoring regimes: compliance requirements F_1, and enforcement F_2. In the context of the OECD regulation we study, F_1 includes information reporting on intra-group payments of multinationals. The firm's compliance cost is $\theta_1 F_1$. To model the role of enforcement, we assume that firms can engage in profit shifting by misreporting profitability as r_j, while true profitability is $\bar{f}_j = f_j(K_j)/K_j$. Firms face fines when they are caught misreporting. The expected cost of misreporting is given by $\frac{F_2}{\theta_2} \frac{K_j (r_j - \bar{f}_j)^2}{2}$, where F_2 is the enforcement parameter controlled by the tax authority and θ_2 is the ability of

[17] We assume that the globally-determined cost of capital ρ is independent of the tax policies we consider.

the firm's accountants to structure intra-group transactions to avoid detection. We allow θ_1 and θ_2 to depend on whether firms rely on in-house or consulting accountants.

3.3.2 Profit Shifting and Production

We start by characterizing the profit shifting and production decisions of multinationals. We then consider how tax monitoring reforms affect the choice of accountants. Fixing (θ_1, θ_2) and the capital allocation $\{K_j\}$, firms set reported profits to solve

$$\max_{\{r_j\}} \sum_j K_j \left[(1-t_j) r_j - \rho - \frac{F_2}{\theta_2} \frac{(r_j - \bar{f}_j)^2}{2} \right] - \theta_1 F_1, \qquad \text{subject to: } \sum_j \bar{f}_j K_j = \sum_j r_j K_j,$$

where we constrain firms to report global profit truthfully.[18] Reported profits are then given by $r_j = \bar{f}_j + \frac{\theta_2}{F_2}(\tilde{t} - t_j)$, where $\tilde{t} = \frac{\sum_j t_j K_j}{\sum_j K_j}$ is the capital-weighted average tax rate. To reduce global tax liabilities, multinationals over-report profits in low-tax countries (i.e., $t_j < \tilde{t}$). Profit shifting is greater when θ_2—the ability to avoid detection through tax planning—is high and when enforcement is lax, i.e., F_2 is low.

Given this profit shifting strategy, firms solve the following capital allocation problem

$$\begin{aligned} \Pi(\theta_1, \theta_2, F_1, F_2) \equiv \max_{\{K_j\}} & \underbrace{\sum_j \left[(1-t_j) f_j(K_j) - \rho K_j \right]}_{\text{Real Profits} \equiv \pi(\theta_2, F_2)} \\ & - \theta_1 F_1 + \frac{\theta_2}{F_2} \underbrace{\sum_j K_j \left[(1-t_j)(\tilde{t} - t_j) - \frac{(\tilde{t} - t_j)^2}{2} \right]}_{\text{Profit Shifting} \equiv \psi(\theta_2, F_2)}, \end{aligned}$$

which follows from substituting the optimal profit shifting strategy into the profit function. This equation decomposes the value function, $\Pi(\theta_1, \theta_2, F_1, F_2)$, into real profits, $\pi(\theta_2, F_2)$, compliance costs, $\theta_1 F_1$, and the gains from profit shifting, $\frac{\theta_2}{F_2}\psi(\theta_2, F_2)$. Firms invest across countries to satisfy the condition

$$(1-t_j) f_j'(K_j) = \rho - \frac{\theta_2}{F_2} \frac{(\tilde{t} - t_j)^2}{2}. \tag{1}$$

[18] Firms would simply choose to not report any global profits absent such a constraint.

Profit shifting lowers the effective cost of capital in all locations. Thus, while increasing F_2 reduces profit shifting, it also increases the cost of investment. Firms pay taxes on reported profits in country j, denoted by $\tilde{\pi}_j = r_j K_j$.[19]

3.3.3 Tax Monitoring and Tax Planning

To analyze the tax planning response, we now consider how tax advisors may impact the effects of monitoring reforms. We assume the economy is populated by a continuum of firms i, which can have in-house accountants, denoted by I, or consult with a specialized firm, denoted by C. As in Brockmeyer et al. (2022), we model this decision as a discrete choice.

Consistent with information obtained in our interviews, specialized consulting firms can provide compliance support at a lower cost than in-house experts, i.e., $\theta_1^C < \theta_1^I$, and have more expertise in tax planning, i.e., $\theta_2^C > \theta_2^I$.[20] Implicit in this formulation is the notion that, while firms may initially establish a relationship with a consulting firm to support them in fulfilling compliance requirements, the consulting firm will "up-sell" the client firm on tax planning services.[21] Finally, not all multinationals use consultants because each firm has idiosyncratic costs and benefits from contracting such external services. These factors, which we denote $\theta_{0,i}^C \sim G(\cdot)$, include risks from sharing confidential business practices, costs of transitioning accounting systems, or particular tax planning benefits linked to a firm's intellectual property. For simplicity, we assume $\theta_2^I \approx 0$, implying that firms with in-house accountants do not engage in profit shifting.

An individual firm seeks the services of consulting firms whenever

$$\Delta\Pi \equiv \underbrace{\left[\pi(\theta_2^C, F_2) - \theta_1^C F_1 + \frac{\theta_2^C}{F_2}\psi(\theta_2^C, F_2)\right]}_{\Pi^C} - \underbrace{\left[\pi(0, F_2) - \theta_1^I F_1\right]}_{\Pi^I} > \theta_{0,i}^C.$$

[19] Additional enforcement (raising F_2) increases reported profits in high-tax countries but may lower K_j. Throughout, we assume that the reporting effect of F_2 on $\tilde{\pi}_j$ dominates the real effect. Thus, if j is a high-tax country (i.e., $t_j > \tilde{t}$), we expect that increasing enforcement raises reported profits, i.e., $\frac{\partial \tilde{\pi}_j}{\partial F_2} > 0$.

[20] As we discuss in Section 3.6, interviews with transfer pricing professionals reveal that in most cases it is too expensive for individual companies to hire leading experts in transfer pricing, as they tend to be highly specialized and are few in number. This is a feature of transfer pricing expertise that underlies the business model of large consulting firms and is not specific to Chile.

[21] This dynamic has been repeatedly described in our interviews with representatives of multinationals and consulting firms. While this dynamic may occur over time, the model assumes that multinationals obtain the benefits of tax planning services (higher θ_2) immediately upon contracting with the consulting firm.

The fraction of firms that rely on consulting firms is given by $N^C = G(\Delta\Pi)$.

We can now examine how policies F_1 and F_2 affect the choice of in-house vs. external tax accountants. Since consultants have lower compliance costs, increasing information reporting requirements F_1 increases the share of firms using consultants $\frac{\partial N^C}{\partial F_1} = G'(\Delta\Pi)(\theta_1^I - \theta_1^C) > 0$. In contrast, increasing enforcement penalties F_2 lowers the tax benefits from profit shifting, which reduces the share of firms that use consultants $\frac{\partial N^C}{\partial F_2} = -G'(\Delta\Pi)\frac{\theta_2^C}{F_2^2}\psi(\theta_2^C, F_2) < 0$.

Define average profits across firms as $\Pi = \mathbb{E}\left[\max\{\Pi^C - \theta_{0,i}^C, \Pi^I\}\right]$ and note that

$$\frac{\partial \Pi}{\partial F_1} = -(\theta_1^C N^C + \theta_1^I(1 - N^C)) \equiv -\bar{\theta}_1 \quad \text{and} \quad \frac{\partial \Pi}{\partial F_2} = -\frac{\theta_2^C}{F_2^2}\psi(\theta_2^C, F_2)N^C.$$

The first equation notes that increasing compliance requirements lower profits by the average compliance cost across firms, $\bar{\theta}_1$. The second equation notes that increasing penalties reduces profits of firms that use consulting accountants by limiting benefits from profit shifting. While the reduction in profit shifting may have real effects on capital investment (as in Eq. 1), this does not enter into the second expression above since firms had already jointly optimized investment and profit shifting decisions. Similarly, these expressions do not depend on the effects of F_1 and F_2 on the choice of accountants.[22]

3.3.4 Tax Monitoring and the Demand for Tax Planning

We now consider how the government's choice to monitor firms affects welfare, following a tax administration setup as in Keen and Slemrod (2017). A tax monitoring regime is a combination of compliance requirements F_1 and penalties F_2. To justify penalties F_2, the government needs to demand compliance requirements $F_1 = \gamma F_2$.[23] The government sets F_2 to maximize total profits subject to the constraint that corporate tax payments in their country ($j = 1$) exceed a revenue

[22] Even though consulting firms have lower marginal costs of compliance θ_1^C, firms that switch are indifferent between the savings from using a consulting firm and the idiosyncratic costs of switching $\theta_{0,i}$. Thus, the fact that the effects of the reform on investment and accounting choices do not have first-order effects on profits is a result of the envelope theorem. Busso, Gregory, and Kline (2013) formalize this logic for the case of extensive-margin decisions, such as the choice of accountants in our setting.

[23] More generally, assume F_1 is determined by a non-linear function of F_2, e.g., $F_1 = H(F_2)$. The derivations below can be interpreted by viewing γ as the local effect of F_2 on F_1, i.e., $\gamma = \frac{\partial H(F_2)}{\partial F_2}$.

requirement, R. The government's problem is:

$$\max_{F_2} \ \Pi \ \text{ subject to } \ t_1(N^C\tilde{\pi}_1^C + (1-N^C)\tilde{\pi}_1^I) - a(F_1,F_2) > R,$$

where taxes paid on reported profits are $t_1(N^C\tilde{\pi}_1^C + (1-N^C)\tilde{\pi}_1^I)$ and the costs of administering the information monitoring regime are given by $a(F_1,F_2)$.

The welfare effect of a tax monitoring reform that increases F_2 is then:

$$\underbrace{-\gamma\bar{\theta}_1 - \frac{\theta_2^C}{F_2^2}\psi(\theta_2^C,F_2)N^C}_{\text{(1) Effect on Profits}<0} \underbrace{- \lambda\left[\gamma\frac{\partial a}{\partial F_1} + \frac{\partial a}{\partial F_2}\right]}_{\substack{\text{(2) Administrative} \\ \text{Costs} > 0}} + \underbrace{\lambda t_1 N^C \frac{\partial \tilde{\pi}_1}{\partial F_2}}_{\substack{\text{(3) Effect on Reported} \\ \text{Profits} > 0}}$$
$$\underbrace{- \lambda\left[\gamma\underbrace{\frac{\partial N^C}{\partial F_1}}_{>0} + \underbrace{\frac{\partial N^C}{\partial F_2}}_{<0}\right]}_{\text{(4) Effect on Accounting Choice}} \underbrace{t_1\Delta\tilde{\pi}_1}_{\substack{\text{(5) Diff in Reported} \\ \text{Profits} > 0}}, \tag{2}$$

where λ is the Lagrange multiplier of the budget constraint and $\Delta\tilde{\pi}_1 = \tilde{\pi}_1^I - \tilde{\pi}_1^C > 0$ is the difference in reported profits between firms that use in-house accountants and those that use consultants.[24] The reform lowers profits by increasing compliance costs of all firms and reducing profit shifting for the fraction of firms, N^C, that engage in profit shifting.[25] Implementing the reform is costly: both F_1 and F_2 increase administrative costs for the government, $a(F_1,F_2)$. The third term shows that additional penalties reduce profit shifting along the intensive margin, which contributes to tax collections. The last two terms characterize the effects of the policy through the choice of accountants. The fourth term shows that the reform can increase or decrease the fraction of firms that rely on consulting firms.

The coefficient γ identifies when tax monitoring regimes are effective. When γ is small, the reform has smaller negative effects on profits through compliance costs and lower administrative costs. Moreover, a low value of γ may imply that

[24] λ captures the opportunity cost of government funds. Since revenue R is fixed, this value corresponds to the marginal social value of lowering taxes on everyone else.

[25] While compliance costs benefit consultants, these payments capture a welfare loss to the extent that they divert efforts from other worthwhile activities, even after including fiscal externalities for the taxes they would pay in Chile.

This calculation also abstracts from the possibility that in the process of complying with the reform, consultants may improve business practices in unrelated domains.

multinationals are *less* likely to rely on consultants, i.e., $\gamma \frac{\partial N^C}{\partial F_1} + \frac{\partial N^C}{\partial F_2} < 0$, which would increase tax revenue by decreasing the use of more potent profit shifting technologies.[26] Thus, reforms that have larger effects on enforcement and have lower compliance costs are more effective at raising welfare and revenue. Indeed, a reform that does not increase compliance requirements, F_1, but that increases penalties, F_2, would correspond to a case where $\gamma = 0$.[27]

In our empirical setting, the reform led to a substantial increase in the number of firms that use consultants. One interpretation is that this type of OECD-led transfer pricing reform has a large γ: high compliance costs paired with weak enforcement opportunities for the government.[28] Our model, therefore, highlights a reason why avoiding regulations that lend themselves to avoidance through tax planning is key. Compliance costs may lead firms to set up relationships with consultant accountants that—in addition to being better at complying with reporting requirements—may reduce tax revenue through tax planning.[29]

3.3.5 Tax Monitoring and the Supply of Tax Planning

The discussion above focuses on the demand side for tax planning services. Our interviews with transfer pricing specialists also revealed interesting features of the supply side. An important aspect of the global transfer pricing services industry is that the major tax advisory firms are themselves multinationals, which makes the supplies of these services elastic.

Since the reform followed internationally standardized guidelines, which had been adopted by other countries in prior years, international consultancies were able to import know-how about how to deal with such regulations. The major consulting firms have subsidiaries in these countries, which allows them to quickly import experts and move them from their global network to Chile. The structures and management methods of these consulting firms enable them

[26] N^C decreases when $\gamma \frac{\partial N^C}{\partial F_1} + \frac{\partial N^C}{\partial F_2} = G'(\Delta\Pi)\left[\gamma(\theta_1^I - \theta_1^C) - \frac{\theta_2^C}{F_2^2}\psi(\theta_2^C, F_2)\right] < 0$. That is when the additional compliance costs are smaller than the reductions in profit shifting.

[27] In our derivation above, we viewed γ as a feature of the environment. One could alternatively view it as a policy choice to the extent that governments can increase penalties without additional information.

[28] As we discuss in Section 3.6, interviews with consultants revealed that ex-ante pricing studies—a form of compliance cost F_1—significantly limited the enforcement risk from authorities (i.e., small change in F_2).

[29] This insight is consistent with results of Slemrod, Blumenthal, and Christian (2001a), who find that high-income taxpayers reduce tax payments in response to information that their returns will receive extra scrutiny, possibly as a result of engaging the services of tax professionals. Similarly, Bernheim (1987) notes that efforts to increase estate tax revenue can backfire by pushing high-wealth individuals to adopt estate-planning techniques.

to replicate and scale compliance and tax planning technologies relatively easily in new countries. Each senior consultant with long-term experience supporting multinationals with transfer pricing issues—in any country with similar regulations—can move to the new country and lead a team that effectively serves dozens of client companies within a matter of months. Our model captures this ability to transfer knowledge from other countries quickly to a new context in the relative differences between accounting technologies (i.e., $\theta_1^C < \theta_1^I$ and $\theta_2^C > \theta_2^I$). The ability to scale these services within consultancies meant that many firms could adopt tax planning strategies without bidding up the price of such services.

3.4 Data and Empirical Strategy

3.4.1 Data

We combine micro-level administrative data from the tax authority and from customs, information about multinational affiliations from Orbis and Dun & Bradstreet, and information on international corporate tax rates from various sources (described below). To complement the quantitative analysis, we conducted in-depth qualitative interviews with transfer pricing consultants and in-house tax accountants of multinational firms.

Administrative and Other Quantitative Data

The tax data cover the entire universe of internationally active firms between 2007–2015. We obtain firms' sales, payroll, and taxes from annual corporate income tax filings and merge this data with administrative information on firm characteristics, such as industry and size. Data on payments to foreign firms for intangibles, services, and interests stem from mandatory filings of tax annexes (*declaraciones juradas*) number 1850, 1912, and 1907, which accompany the income tax returns. We have information on the amounts of such payments, the country where the recipient firm is located, the relationship to the recipient firm (unaffiliated, subsidiary, owner of the Chilean firm, or jointly owned by a third party), and the purpose of the payment: royalties, services, interests, and "other."[30]

[30]Royalty payments include payments for intangibles such as copyright and patents. Most of the payments in the "other" category are unclassified, reported as "other income obtained by non-residents".

In terms of trade in goods, customs data contain transaction-level data on the universe of imports and exports, including information on the product, unit price, quantity, and country of acquisition (for imports) or country of destination (for exports). However, the customs data do not include information on whether or not the trade is with an affiliate firm. Starting in 2012, firms had to report total amounts of trade in goods with foreign affiliates by trading country. However, these data do not contain information about products or prices. As we discuss in Section 3.4.2, we combine information from these tax annexes with information from customs to identify prices of trade in goods that are likely intra-group.

We complement these administrative datasets with information on statutory corporate tax rates for countries where affiliates of multinationals are located, obtained from the Centre for Business Taxation Tax Database (Habu 2017). For countries for which this is not available, we use data from the OECD (2019b), and if neither of these sources has the data, we use KPMG (2019).[31] To identify firms with foreign affiliates that did not reveal their status as multinationals to the tax authority, we merge the administrative data to firm directories from Orbis and Dun & Bradstreet, where these firms are listed as multinationals.

Sample and Descriptive Statistics

The study sample includes all internationally active firms that are at least medium size (small firms are exempt from the reform).[32] Firms are classified as internationally active if they have imports, exports, or payments to foreign companies, and they are classified as multinationals if they have any affiliates abroad. To focus on economically active firms, we restrict the sample to firms with positive payroll and input costs for every year.

Table 1 provides summary statistics for 2010 (right before the start of the reform). Panel A presents key variables from the corporate income tax form. The sample includes 11,333 domestic and 2,755 multinational firms. As expected, multinationals tend to be larger. Their mean annual domestic sales are 35 million USD [median 8.9 million] compared to 5.5 million USD for the domestic sample [median 1.8 million].[33] There are similar differences in payroll, assets, profits, and taxes. Internationally active domestic firms pay an average of 64,000 USD

[31] We use data from Habu 2017 for 43 countries, OECD data for 30 countries, and KPMG data for 18.

[32] This means they have sales of at least 25,000 Chilean UF (Unidad de Fomento), corresponding to around 1 million USD.

[33] We convert amounts in tax filings from Chilean Pesos to current USD using annual exchange rates from the IMF. The customs data are already reported in USD.

in corporate income taxes [median 18,000 USD], while multinationals pay an average of 420,000 USD [median 40,000 USD]. As discussed below, we account for these differences by normalizing outcomes relative to firms' size in our empirical analysis.

Table 1: Firm-Level Summary Statistics, 2010

Panel A. Overall Descriptives
(Full Study Sample)

	(1) Domestic firms	(2) Multinational firms
Domestic sales	5,509	35,443
	(15,537)	(63,234)
	[1,824]	[8,883]
Payroll	881	4,577
	(2,355)	(7,521)
	[306]	[1,495]
Assets	10,834	121,904
	(48,272)	(262,342)
	[2,115]	[17,940]
EBIT	610	5,657
	(2,746)	(13,201)
	[169]	[770]
Taxes	64	420
	(219)	(1,028)
	[18]	[40]
Taxes/Payroll	0.162	0.163
	(0.330)	(0.395)
	[0.064]	[0.036]
Number of firms	11,333	2,755

Panel B. International Payments
(Sample with International Payments > 0)

	(1) Domestic firms	(2) Multinational firms
Total payments	199	1,446
	(554)	(5,977)
	[49]	[110]
Royalties	95	435
	(278)	(1,673)
	[0]	[0]
Interests	30	512
	(356)	(4,669)
	[0]	[0]
Services	57	330
	(191)	(1,065)
	[1]	[6]
Other	16	169
	(200)	(2,038)
	[0]	[0]
Number of firms	283	1,136

Notes: This table shows means, standard deviations (in parentheses), and medians [in brackets] for 2010, the last year before the start of the reform. Panel A shows data from corporate income tax filings and Panel B data from mandatory filings of tax annexes. Variables are in thousands of USD. All variables winsorized at the 99^{th} percentile of non-zero values. Total international payments are computed as the sum of its winsorized components. Our study sample includes firms that were at least medium size and internationally active as defined in Section 3.4.1. The number of firms in Panel B is smaller since it only includes firms that reported international payments on their tax annexes in 2010.

Panel B of Table 1 shows data from the tax annexes on payments for royalties, interests, and services to firms abroad (affiliates and non-affiliates combined). This panel only includes firms that report such payments in 2010. Few domestic firms make any such payments in a given year (283 out of 11,333), while more than 40% of multinationals do. On average, multinationals pay more than 1.4 million USD abroad for royalties, interests, services, and other payments, corresponding to 26% of their taxable profits (EBIT).

Qualitative Interviews

We complement the quantitative data with two rounds of semi-structured qualitative interviews with transfer pricing experts in Chile to better understand the roles of the tax advisory industry. In 2014, we carried out in-person interviews with senior transfer pricing consultants in the Chilean branches of Big Four consulting firms. In 2021–2022, we conducted a larger series of in-depth interviews via video conference, both with consultants and in-house tax professionals in multinational firms. These semi-structured interviews were conducted under confidentiality and designed to understand the role of tax advisors, how the reform changed their business, and their interactions with client firms.

We use open-ended questions, which allow for more detailed responses and unexpected answers than structured surveys (Boyd and DeLuca 2017). This enables us to gain deep information from experts' own knowledge and experience. When used in tandem with quantitative analysis, qualitative methods can allow researchers to gain a better understanding of the context and discover potential mechanisms that may drive findings. These methods may be particularly insightful when results are counter-intuitive and might provide more context on the setting, design, and implementation of a policy (Finkelstein et al. 2021). Recent examples of the use of these methods in economics research include work by Starr (2014), Taubman et al. (2014), Alsan, Garrick, and Graziani (2019), Alsan et al. (2022), and Bergman et al. (2023).

The basis for our semi-structured interviews is a roadmap to guide the conversation. In contrast to fixed scripts, an interview roadmap consists of a series of open-ended questions but leaves flexibility for the conversation to evolve, with the goal of potentially discovering unexpected aspects (i.e., "unknown unknowns"). Further details on the content of our roadmap and methods used can be found in Appendix D.2. In qualitative methods, the duration and depth of the conversations are key. Interviewing the same participant for a longer duration and on more than one occasion can provide more additional information

than increasing the number of respondents. Repeat interviews allow for clarifying questions and learning new details that would not have come up in a single interview. In addition, after identifying new themes in early interviews, the roadmap can be adapted to incorporate these new topics and circle back to other respondents, to learn whether they had similar or different experiences on these issues.[34] A further benefit of multiple interviews is that they can help build rapport and trust between researchers and subjects, thus increasing the quality of responses (Grinyer and Thomas 2012). We, therefore, conducted 2-3 lengthy interviews with several respondents.

A key feature of our research is the iterative combination of qualitative and quantitative analysis. Some of the hypotheses that emerge from the interviews are testable with our quantitative data. We are therefore able to triangulate information provided by interviewees with the administrative data, iterating between qualitative and quantitative analysis.

3.4.2 Empirical Strategy

We use the administrative data to first estimate whether multinationals in Chile make tax-motivated payments for royalties, services, and interests before assessing in a second step whether the reform impacted the extent of such payments. Third, we analyze the impact on prices in goods trade. Finally, we estimate the impact of the reform on tax payments.

Do Multinationals Make Tax-Motivated Payments out of Chile?

An important piece of analysis before investigating the impact of the reform is to examine whether multinationals engage in tax-motivated international transactions prior to the reform. If there were no tax-motivated payments out of Chile, this would explain the lack of impact of the reform. We, therefore, examine whether payments by multinationals to their foreign affiliates respond to changes in the destination country tax rate, i.e., we estimate the semi-elasticity of intra-group payments with respect to destination country tax rates. If payments of multinationals to their affiliates abroad systematically increase when the corporate income tax rate in the affiliate's country falls, this suggests a tax-reduction motive.

[34] Two topics that only emerged after our initial interviews were, for example, the practice of up-selling from tax compliance to tax planning and the centralization of cost centers as a common tax planning strategy.

This analysis uses intra-firm, intra-destination country variation, comparing payments to affiliates to payments to non-affiliates by the same firm in the same destination country. We leverage variation in tax differentials across destination countries of a given multinational. The administrative data allow us to undertake this analysis both for payments to affiliates ("intra-group")—which reduce tax liabilities—and for payments to non-affiliate firms abroad—which do not. If payments to affiliates are tax-motivated, we expect their semi-elasticity with respect to the destination country tax rate to be negative. At the same time, if there is no omitted variable bias, we expect this semi-elasticity to be zero for payments to non-affiliates. We use the following intra-firm difference-in-differences specification:

$$\begin{aligned}\ln(Y_{ijat}+1) = \beta_1 \text{Tax Rate}_{jt} + \beta_2 \text{Tax Rate}_{jt} \times \text{Affiliate}_a \\ + \beta_3 \ln(\text{GDPpc})_{jt} + u_{it} + \alpha_{ia} + \mu_j + e_{ijat}\end{aligned} \tag{3}$$

Y_{ijat} is the amount paid by firm i to firms in country j in year t. Outcomes include total payments, royalties, services, interests, and "other/unclassified".[35] Subscript a denotes whether payments were made to an affiliated or unaffiliated company abroad. Each observation therefore represents annual firm payments by destination country and affiliation status. $Affiliate_a$ is a dummy that equals one for payments to affiliates. $Tax\ Rate_{jt}$ is the statutory corporate tax rate of country j in year t.

Equation 3 is reminiscent of extensive work in international tax that studies how tax differentials impact reported profits across countries (see Heckemeyer and Overesch 2017b, for a survey). Our data have the advantage that we observe transactions between firms, both for payments to affiliates and non-affiliates abroad. In contrast to studies that use financial statements, our results are not contaminated by the double-counting problem pointed out by Blouin and Robinson (2020). While we see this as an advantage of our setting, our results are not directly comparable to prior estimates of the tax sensitivity of reported profits.

The sample for this analysis includes all multinationals that reported any payments to a foreign affiliate between 2007 and 2015. We use a balanced panel of all parent-affiliate-country-pairs to which a firm made any payments during this period. This ensures that the network is constant over time and that results are

[35] We use the log of $Y+1$ so that observations with null payment are not set to missing. Robustness checks show that results are qualitatively similar when using the inverse hyperbolic sine (IHS) of payments and when estimating a linear probability model for making any payments to country j.

not driven by changes in the network of affiliates. We control for the log of the destination country's annual GDP per capita $\ln(\text{GDPpc})_{jt}$ to avoid confounding changes in the tax rate of the destination country with changes driven by its economic developments. Company-year fixed effects u_{it} account for firm-level shocks and destination country fixed effects μ_j for potential correlations between countries' level of tax rates and their economic ties to Chile. We further include company-affiliation status fixed effects α_{ia} to capture any time-invariant difference in payments to affiliates vs. non-affiliates at the firm level.

For robustness, we also report analyses that use tax rate differences between Chile and a given country as well as specifications with firm-affiliation status-year fixed effects, destination country-year fixed effects, and destination country-firm fixed effects.[36] Moreover, we show results on the IHS transformation of outcome variables and on the extensive margin of whether a firm makes any payment to destination country j. Throughout this paper, we show three different post-treatment windows (up to 2013, 2014, and 2015), standard errors are clustered at the firm level, and to reduce the effect of outliers, we winsorize all continuous variables in levels at the 99$^{\text{th}}$ percentile of their non-zero values.

β_1 can be interpreted as the semi-elasticity of payments to non-affiliates with respect to destination country tax rates. β_2 captures the difference in the semi-elasticity of payments to affiliates vs. non-affiliates. e_{iajt} is the error term.[37] If payments by multinationals to their foreign affiliates are in part tax-motivated, we expect the semi-elasticity to be negative for affiliates. In contrast, we do not expect this to be the case when the recipient firm is a non-affiliate (β_1), as there is no tax-minimizing motive in that case.

Impact of the Reform on Intra-Group Payments

Next, we can evaluate whether the reform had an impact on the sensitivity of intra-group payments to changes in destination country tax rates. We extend the approach above to an event study design with annual estimates of Equation 3 for

[36] Both of these specifications account for changes in the domestic tax rate. Including country-year fixed effects prevents us from estimating the responsiveness to tax rates for payments to non-affiliates (β_1), as it is collinear with country-year tax rates, but we can still identify the differential responsiveness of payments to affiliates relative to non-affiliates (β_2).

[37] Over this period, there were corporate tax changes in 60 out of the 91 countries where firms in our sample reported having an affiliate. To show how these changes generate variation across multinationals, we residualize $\textit{Tax Rate}_{jt}$ from firm-year fixed effects and plot the magnitude of the changes in these residuals in Figure C1. This figure shows considerable variation in tax incentives across affiliates. A one standard deviation change in tax rates corresponds to a 1.98 percentage point change in the corporate rate and moving an affiliate from the 10$^{\text{th}}$ to the 90$^{\text{th}}$ percentile represents a tax increase of 4.38 percentage points.

2007-2015. Event study figures allow us to examine whether the parallel trends assumption is reasonable and whether there is a discontinuous change after the reform. Pre-reform data cover the years 2007–2010. To have a cleaner test of the pre-treatment parallel trend evolution, we use 2009 as the baseline for all event studies in this paper, leaving the coefficient in 2010 as a "placebo" year.

To compare the post- vs. the pre-treatment period overall, we also extend Equation 3 to the following triple difference intra-firm specification:

$$\begin{aligned}\ln(Y_{ijat}+1) = {} & \beta_1 \text{Tax Rate}_{jt} + \beta_2 \text{Tax Rate}_{jt} \times \text{Affiliate}_a \\ & + \beta_3 \text{Tax Rate}_{jt} \times \text{Affiliate}_a \times \text{Post}_t \\ & + \beta_4 \text{Post}_t + \beta_5 \text{Tax Rate}_{jt} \times \text{Post}_t \\ & + \beta_6 \text{Affiliate}_a \times \text{Post}_t \\ & + \beta_7 \ln(\text{GDPpc})_{jt} + u_{it} + \alpha_{ia} + \mu_j + e_{ijat}\end{aligned} \tag{4}$$

$Post_t$ equals one for years 2011 and beyond. β_2 captures the difference in the semi-elasticity of payments to affiliates vs. non-affiliates before the reform. If the policy change is effective in reducing profit shifting, one would expect the (negative) semi-elasticity to become smaller in absolute terms, that is, the coefficient β_3 on $\textit{Tax Rate}_{jt} \times \textit{Affiliate}_a \times \textit{Post}_t$ would be positive.[38]

As above, controls account for any firm-level shocks, destination country-level differences, time-invariant differences in firm payments to affiliates vs.non-affiliates, and changes in per capita GDP in the destination country. We also include $\textit{Affiliate}_a \times \textit{Post}_t$ to account for potential changes in levels of payments to affiliates before and after the reform that are not related to tax rate differentials. The identifying assumption is that conditional on these controls, absent the reform, a given firm's sensitivity to tax rates in destination countries would have evolved in parallel for payments to affiliates and to non-affiliates. Consistent with this assumption, we show that the tax sensitivity of intra- and extra-group payments evolved in parallel prior to the reform. This assumption is also supported by the robustness checks mentioned above.

[38] In Equation 4, the semi-elasticities β_2 and β_3 are identified by both cross-sectional differences in tax rates across countries and by changes in tax rates in each of the pre/post periods. We also estimate an event-study version of this regression where we estimate a semi-elasticity for every year in our sample; these semi-elasticities are identified by cross-sectional variation in tax rates within a given year.

Impact of the Reform on Trade in Goods

As discussed in Section 3.4.1, information on trade in goods is not recorded in the same way as trade in royalties, services, and interests. On the one hand, we have more information on trade in goods from the customs data, but on the other, there is less information in tax filings. We therefore combine customs and tax data to explore whether the reform impacted the prices of trade in goods by multinationals with their affiliates.

We analyze unit prices at the 8-digit product level.[39] While we would ideally want to compare prices of trade with affiliates to trade of the same firm with non-affiliates, customs data do not include the affiliation status of trading partners. We address this limitation by combining customs and tax data to identify trade with a high likelihood of being intra-group. We consider imports to be likely intra-group in firm-country cases where the amount of intra-group imports reported in tax data is close to the amount of total imports in the customs data (analogously for exports).[40] See Appendix D.1 for more details on this approach.

We compare the evolution of quarterly unit prices of multinationals in country-firm pairs with a high likelihood of being intra-group trade with prices of the same products traded by domestic firms, using the following difference-in-differences specification and its event study equivalent:

$$\ln(\text{Price})_{ipt} = \alpha_0 + \beta_1 \text{Multinational}_i \times \text{Post}_t + \mu_i + \nu_{pt} + e_{ipt} \tag{5}$$

$\ln(\text{Price})_{ipt}$ is the average unit price (weighted by trade volume) of imports/exports of product p by firm i in quarter t. Multinational_i is a dummy equal to 1 if the firm is a multinational, Post_t is a dummy equal to 1 for years 2011 and beyond, and μ_i and ν_{pt} are firm and product-quarter fixed effects. Observations are at the product-firm-quarter level.

By including product-quarter and firm fixed effects, we control for product-level shocks and time-invariant differences in price levels between domestic and multinational firms. Since the analysis of goods prices relies on *inter*-firm variation, its identification assumption is stronger than the previous ones using *in-*

[39] Product codes are generated by combining 6-digit Harmonized System (HS) codes with 2-digit codes for units of measurement. If a product with the same HS code is measured in several units, we treat the combined codes as separate products.

[40] For robustness, we show results for different bandwidths of intra-group trade relative to total trade: 80%–120%, 90%–110%, and 95%–105%. Intra-group trade reported in tax filings for a given firm-country pair can be larger than total trade in customs data due to measurement error, which can result, for example, from differences in timing between the payment for a given trade and the physical shipment.

tra-firm variation. The identifying assumption of this analysis is that absent the reform, the development of prices in multinationals' likely intra-group trade and in domestic firms' trade would have followed parallel trends. In support of this assumption, we show that they evolved in parallel prior to the reform.

Impact of the Reform on Tax Payments

Finally, we study the effects of the reform on corporate income tax payments. This analysis compares the evolution of taxes paid by multinationals to those of internationally active firms with similar characteristics but without foreign affiliates. An important challenge is that multinationals are larger than internationally active domestic firms and also tend to operate in different industries. To control for these differences and to make the groups comparable along observable characteristics, we follow Yagan (2015) by scaling each outcome by firms' size and by controlling for pre-treatment firm characteristics by year. As shown in the last two rows of Panel A in Table 1, while multinationals pay over 6.5 times more taxes than internationally active domestic firms, their tax/payroll ratios are very similar (0.162 vs. 0.163). We also control for a number of pre-treatment firm characteristics interacted with year fixed effects: industry dummies, pre-treatment average sales, pre-treatment average of sales/payroll, and of sales/assets (all in linear and quadratic terms). The latter two variables represent a proxy for firm technology. Since the pre-reform period is 2007 to 2010, and 2010 again serves as the placebo year, we use the years 2007 to 2009 to construct the pre-treatment variables. We then estimate the following difference-in-differences regression, as well as its event study equivalent:

$$\begin{aligned}\frac{Y_{it}}{\text{Payroll}_{it}} = \alpha_0 &+ \beta_1 \text{Multinational}_i + \beta_2 \text{Post}_t \\ &+ \beta_3 \text{Multinational}_i \times \text{Post}_t \\ &+ \beta_4 X_{it} + u_i + e_{it}\end{aligned} \tag{6}$$

Y_{it} denotes the outcome of interest for firm i in year t. $Multinational_i$ is a dummy equal to 1 if firm i is a multinational. $Post_t$ equals 1 for years 2011 and beyond. X_{it} is a vector of the pre-treatment characteristics interacted with year fixed effects. u_i indicates firm fixed effects and e_{it} is the error term. As in Yagan (2015), we express the outcome in event study figures in standard deviations.

We provide two pieces of evidence in support of the identifying assumption that, absent the reform, treatment and comparison groups would have evolved in parallel. First, we check whether they evolved similarly before the reform.

Second, we analyze the effect on a "placebo" outcome that is not expected to be affected by the reform: domestic sales. We also conduct a number of robustness tests to ensure that results are not driven by sample selection or the definition of outcome variables. First, as above, we look at a range of different post-treatment windows up to 2013, 2014, and 2015. Second, we investigate the impact on subgroups of firms that are more likely to be affected by the reform, including large firms, Chilean-owned firms, and those with affiliates in tax havens. Third, to ensure that we are comparing firms of similar sizes, we show a specification that imposes common support conditions, which ensures that treated and control firms have the same range of pre-treatment average sales and payroll. Fourth, we show a robustness test that scales the outcome by lagged rather than contemporaneous payroll.[41] Finally, we add payments collected as a result of audits to the voluntarily paid corporate income tax.

3.5 Results

3.5.1 Chilean Multinationals Make Tax-Motivated Payments to their Affiliates Abroad

We first analyze whether Chilean multinationals engage in tax-motivated payments to foreign affiliates for royalties, services, and interests. Following the empirical approach described in Section 3.4.2, this intra-firm analysis compares payments of a given firm to affiliates and non-affiliates in the same destination country in the same year.

Table 2 shows that payments to affiliates for royalties, services and interests indeed respond to tax rates in destination countries, while payments to non-affiliates do not.[42] Coefficients for non-affiliates (second row) are small and statistically insignificant (i.e., $\beta_1 \approx 0$), indicating that the results are unlikely to be driven by other confounding factors. In contrast, the first row shows a sizeable and highly significant semi-elasticity for payments to affiliates, compared to non-affiliates (i.e., $\beta_2 < 0$). Column (1) indicates that for total payments, a 1% reduction in the corporate tax rate of the destination country is associated with

[41] We use contemporaneous payroll in our main specification for two reasons. First, we cannot scale by lagged payroll in 2007 as our data start that year. Second, lagged payroll yields a smaller—in fact, slightly negative—point estimate for the impact on taxes. Thus, we view the main specification as more conservative.

[42] Payments for trade in goods are not included in the tax annexes, for this reason, we do not have data on affiliates vs. non-affilates, as discussed in section 3.4.2.

an increase in payments of 5.5 to 5.1 log points (significant at the 1% level). We further disentangle this analysis by type of transaction: payments for services, royalties, interests, and other/unclassified.[43] A large part of the effect is driven by royalties and services. This is consistent with the notion that payments for which it is harder to find comparable market prices are more likely to be subject to manipulation.

[43] Most of the payments in the "Other" category are unclassified and reported as "other income obtained by non-residents".

Table 2: Sensitivity of International Payments to Changes in the Destination Country Tax Rate

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate	-0.055***	-0.028***	-0.029***	-0.009**	-0.005
	(0.012)	(0.008)	(0.009)	(0.004)	(0.003)
Tax rate	0.011	-0.006	0.016	0.004	-0.005
	(0.014)	(0.009)	(0.013)	(0.006)	(0.005)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate	-0.051***	-0.027***	-0.027***	-0.009**	-0.005
	(0.011)	(0.007)	(0.009)	(0.004)	(0.003)
Tax rate	0.015	-0.014	0.034***	0.003	-0.009*
	(0.014)	(0.009)	(0.013)	(0.005)	(0.005)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate	-0.051***	-0.027***	-0.027***	-0.010**	-0.005*
	(0.011)	(0.007)	(0.009)	(0.004)	(0.003)
Tax rate	0.022	-0.008	0.037***	0.003	-0.009*
	(0.014)	(0.009)	(0.013)	(0.005)	(0.005)
Observations	58,176	58,176	58,176	58,176	58,176
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.178	0.821	1.283	0.238	0.220

Notes: This table shows the semi-elasticity of international payments with respect to changes in destination country tax rates, following Equation 3, over the full study period from 2007 onward. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. For example, the first coefficient indicates that a one percentage point reduction in the destination country tax rate is associated with 5.5% higher payments to affiliates in that country relative to non-affiliates, on average. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs. non-affiliates in country j. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is an affiliate of firm i. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1. Tables C2, C3, C4, C5, C6, and C7 show robustness checks by replacing the explanatory variable Tax Rate$_{jt}$ in the destination country with the difference between this tax rate and Chile's tax rate, controlling for firm-year-affiliation status fixed effects, destination country-year fixed effects, firm-destination country fixed effects, IHS transformation of outcome variables, and extensive margin, respectively.

These results are robust to a number of variations. Panels B and C of Table 2 show that results are similar for different lengths of the post-treatment period. Results are also not sensitive to changes in Chile's tax rate. We show this in Table C2 by replacing the explanatory variable Tax Rate$_{jt}$ in the destination country with the difference between this tax rate and Chile's tax rate. Moreover, results are robust to including firm-affiliation status-year fixed effects in Table C3, country-year fixed effects in Table C4, and firm-destination country fixed effects

in Table C5, which absorb the variation in Chile's tax rate. Finally, we also find similar results using IHS in Table C6 and a linear probability model to analyze extensive margin responses in Table C7.

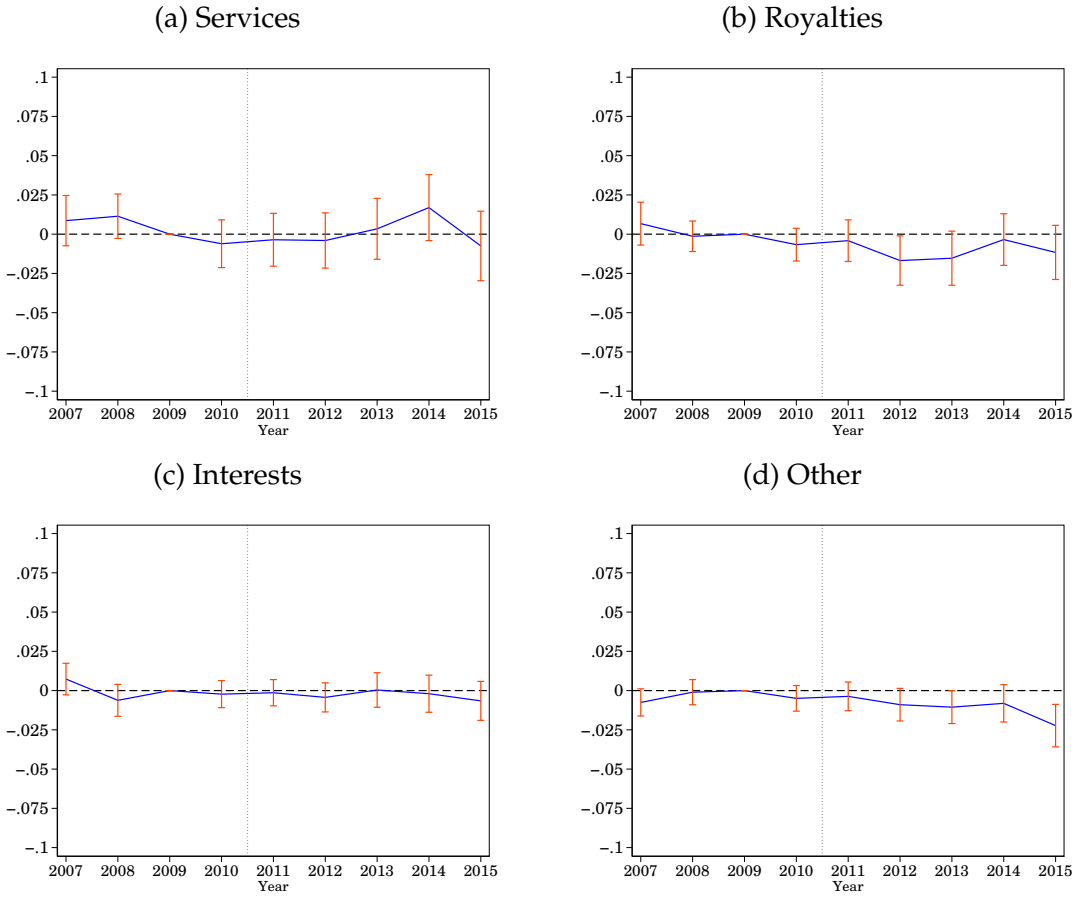
In sum, this section shows that intra-group payments of multinationals respond to tax differentials across countries—particularly for royalties and services. The reform was motivated by the belief that a significant fraction of these payments are due to profit shifting and that tax monitoring would allow the tax authority to curtail this behavior and increase tax revenues.[44]

3.5.2 Impacts on Intra-Group Payments for Royalties, Services and Interests

Next, we analyze whether the reform achieved the policy goal of reducing the propensity of multinationals to shift profits to lower-tax countries through intra-group payments. We estimate a triple-difference specification following Equation 4, allowing the sensitivity of intra-group payments to destination country tax rates to change after the reform. Figure 2 shows these results. First, in line with the identifying assumption, there is a parallel trend prior to the reform. Second, if the reform was effective at reducing the sensitivity of intra-group payments to destination country tax rates, we would expect the post-treatment coefficients to be positive—resulting in a smaller magnitude of the (negative) semi-elasticity in the post-treatment period. Figure 2 shows that this is not the case for any of the four channels (services, royalties, interests, or other). If anything, most panels show a decrease in the coefficient, indicating an increase in the sensitivity of intra-firm payments to tax differentials, although these differences are in most cases not statistically significant.

[44] An alternative possibility is that multinationals achieve this adaptation to destination country tax rates by adopting tax planning structures that conform with transfer price regulation. Establishing the legality of specific transactions requires in-depth audits, which are often debated in courts.

Figure 2: Impact of the Reform on the Sensitivity of International Payments to Changes in the Destination Country Tax Rates



Notes: These figures show the evolution of the semi-elasticity of international payments with respect to changes in destination country tax rates for payments to affiliates compared to payments to non-affiliates, following the event study specification of Equation 4. A negative semi-elasticity implies payments to a given country increase as tax rates fall, consistent with tax-motivated payments. This is the case in the pre-treatment period, as shown in Table 2. Since we do not see an increase in the semi-elasticity, these figures provide evidence that there is no significant decline in tax-motivated international payments. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs. non-affiliates in country j. It includes firm-year, firm-affiliate, and destination country fixed effects, as well as controls for destination country log(GDPpc). The dotted vertical line indicates the start of the reform. 2009 is normalized to zero, and 2010 serves as a placebo year. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. Vertical bars represent 90% confidence intervals. Table 3 shows the same analysis in regression form.

Table 3 presents these findings in regression form. The second row shows the semi-elasticity of payments to affiliates in the pre-treatment period and the first row shows the difference of that semi-elasticity in the post-treatment period. Again, we see no reduction of the semi-elasticity (which would be indicated by a positive coefficient) for any of the types of payments, and for all durations of included post-treatment years. If anything, the sensitivity to foreign tax rates is

even somewhat larger in the post-treatment period (not statistically significant for most specifications). Appendix Tables C8–C13 show that this is not sensitive to the same robustness checks as above: using tax rate differences between Chile and a given country, inclusion of firm-year-affiliation status fixed effects, destination country-year fixed effects, firm-destination country fixed effects, using an IHS transformation of the outcome variables, and extensive margin specifications.

Table 3: Impact of the Reform on the Sensitivity of International Payments to Changes in Destination Country Tax Rates

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate × post	-0.013	-0.011*	-0.004	-0.001	-0.004
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate × affiliate	-0.049***	-0.022***	-0.028***	-0.009*	-0.003
	(0.013)	(0.008)	(0.010)	(0.005)	(0.003)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate × post	-0.006	-0.009	-0.000	-0.001	-0.004
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate × affiliate	-0.047***	-0.022***	-0.027***	-0.009*	-0.002
	(0.013)	(0.008)	(0.010)	(0.005)	(0.003)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate × post	-0.010	-0.009	-0.003	-0.002	-0.007**
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate × affiliate	-0.045***	-0.021***	-0.025**	-0.009*	-0.001
	(0.012)	(0.008)	(0.010)	(0.005)	(0.003)
Observations	58,176	58,176	58,176	58,176	58,176
Tax rate	Yes	Yes	Yes	Yes	Yes
Tax rate × post	Yes	Yes	Yes	Yes	Yes
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.178	2.178	2.178	2.178	2.178

Notes: This table shows impact estimates of the reform on the semi-elasticity of international payments with respect to changes in destination country tax rates following Equation 4. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. A negative semi-elasticity implies payments to a given country increase as tax rates fall, consistent with tax-motivated payments. This is the case in the pre-treatment period, as shown by the Tax rate × affiliate coefficient. If the reform was effective at reducing tax-motivated payments to affiliates abroad, we would expect the coefficient for the post-treatment period in the first row to be positive. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs. non-affiliates in country j. *Post* is a dummy equal to 1 from 2011 onward. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is a foreign affiliate of a Chilean firm. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1. These results correspond to those in Figure 2. Tables C8, C9, C10, C11, C12, and C13 show robustness checks by replacing the explanatory variable Tax Rate$_{jt}$ in the destination country with the difference between this tax rate and Chile's tax rate, controlling for firm-year-affiliation status fixed effects, destination country-year fixed effects, firm-destination country fixed effects, IHS transformation of outcome variables, and extensive margin, respectively.

One way to understand the magnitude of these effects is to compare the change in the sensitivity to the baseline estimate. Panel A, Column (1) of Table 3 shows a baseline semi-elasticity of -0.049. This column also reports an

estimated change in the semi-elasticity of -0.013, which has a 95% confidence interval between -0.034, and 0.007. At the highest value of this range, the reform would have decreased this semi-elasticity from $-0.049$to -0.042.[45] 95% confidence intervals reject substantial reductions in this tax sensitivity.

3.5.3 Impacts on Trade in Goods

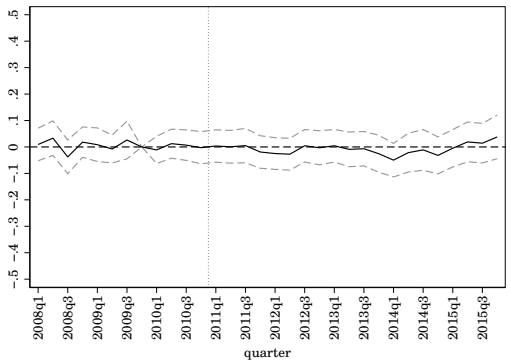
We now analyze whether the reform affected unit prices of likely intra-group trade in goods, using customs data matched with information from tax annexes, as described in Section 3.4.2. Multinationals can shift profits to low-tax countries by over-pricing imports and under-pricing exports. A reduction in profit shifting would therefore imply lower import prices and higher export prices. Figure 3 shows the quarterly evolution of the log of unit prices of imports and exports based on the event study version of Equation 5, comparing prices of a given product in likely intra-group trade by multinationals to those of the same product in trade by domestic firms. There is no change for either imports or exports after the reform. Estimates for exports are less precise due to sample size.[46] Nevertheless, during the time when the reform took place (2009–2014), the point estimates for exports also remain flat.

[45] Similar calculations for other panels yield reductions from -0.047 to -0.033 for 2014, and from -0.045 to -0.034 for 2015.

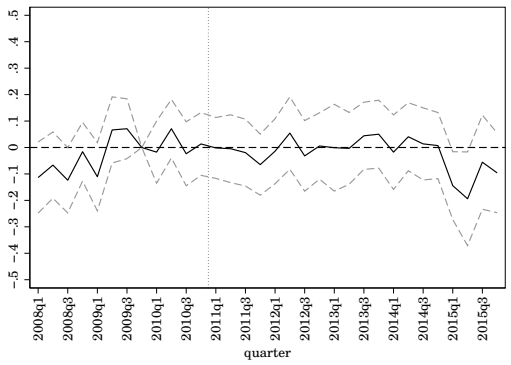
[46] Chile has substantially more importers than exporters, and, correspondingly, fewer multinationals and even fewer domestic firms that export goods compared to those that import.

Figure 3: Impact of the Reform on Unit Prices of Imports and Exports

(a) Impact on Unit Prices of Imports



(b) Impact on Unit Prices of Exports



Notes: These figures show the evolution of the log of unit prices of multinational firms' likely intra-group trade compared to domestic firms' trade of the same product, controlling for firm and product-quarter fixed effects, based on the event-study specification of Equation 5. The dotted vertical line indicates the start of the reform. 2009 q4 is normalized to zero, and 2010 serves as a placebo year. Likely intra-group trade (imports or exports) are defined as those in firm-country combinations for which the amount of intra-group trade in the tax data is between 80% and 120% of imports or exports in the trade data, respectively (see Section 3.4.2 for details). Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. Dashed lines represent 90% confidence intervals. Columns (1) and (4) of Table 4 show the same analysis in regression form. Figures C2 and C3 show robustness using different bandwidths for the definition of likely intra-group trade for imports and exports, respectively.

Table 4 presents corresponding regression estimates. Columns (1)–(3) show imports and Columns (4)–(6) exports. Results are robust both to varying the number of included post-treatment years and to varying the bandwidth for the definition of transactions that are likely to be intra-group.[47] Again, we find no impact of the reform on the pricing of likely intra-group trade in goods.

[47] Appendix Figures C2 and C3 display these robustness checks graphically.

Table 4: Impact of the Reform on Unit Prices of Imports and Exports Difference-in-Differences Estimates

	Imports			Exports		
	(1) 80% to 120%	(2) 90% to 110%	(3) 95% to 105%	(4) 80% to 120%	(5) 90% to 110%	(6) 95% to 105%
Panel A: Up to 2013						
Post × multinational	-0.013	0.010	0.012	-0.006	0.012	0.036
	(0.017)	(0.020)	(0.026)	(0.039)	(0.049)	(0.048)
Observations	999,485	948,294	891,709	92,817	83,927	67,822
Panel B: Up to 2014						
Post × multinational	-0.017	0.008	0.007	-0.003	0.019	0.045
	(0.019)	(0.021)	(0.029)	(0.039)	(0.047)	(0.048)
Observations	1,212,606	1,150,871	1,081,662	110,951	100,407	81,520
Panel C: Up to 2015						
Post × multinational	-0.011	0.019	0.015	-0.021	0.001	0.023
	(0.020)	(0.023)	(0.030)	(0.040)	(0.048)	(0.050)
Observations	1,420,110	1,348,004	1,266,980	128,065	115,820	94,272
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Product × quarter FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table shows impact estimates of the reform on log of unit prices of multinational firms' likely intra-group trade compared to domestic firms' price of the same product in the same quarter, following Equation 5. In Columns (1) and (4), likely intra-group trade (imports or exports) are defined as those in firm-country combinations for which the amount of intra-group trade in the tax data is between 80% and 120% of either imports or exports in the trade data (see Section 3.4.2 for details). Columns (2), (3), (5) and (6) use narrower bandwidths for the definition of these samples. *Post* is a dummy equal to 1 from 2011 onward. *Multinational* is a dummy equal to 1 for multinational firms. The sample starts in 2009 (due to imbalances in 2007-2008) and ends in the last quarter of the year shown in the respective panels. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1. Columns (1) and (4) correspond to Figure 3, Columns (2) and (3) to Figure C2 and Columns (5) and (6) to Figure C3.

3.5.4 Impacts on Tax Payments

Having found no impact on intra-group payments for any of the different channels—royalties, services, interests, or goods—we now investigate the overall effect on corporate tax payments resulting from all adjustments firms may make. Following Equation 6, this analysis compares tax payments by multinationals to those of domestic but internationally-active firms with otherwise similar characteristics.

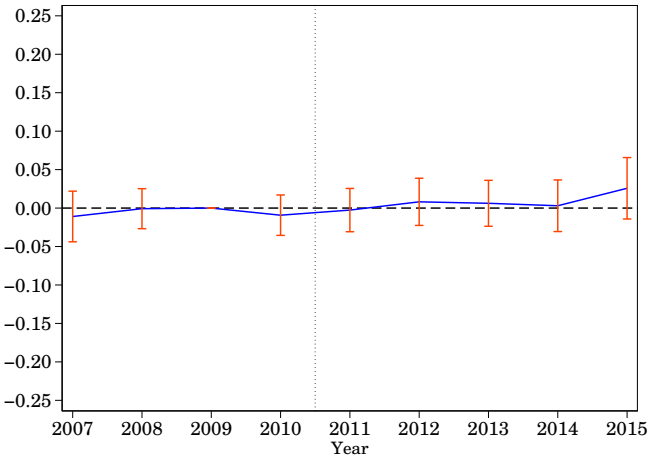
The identifying assumption of this estimation is that absent the reform, conditional on our control variables discussed in Section 3.4.2, the outcome variables

would have evolved along a parallel trend. Given that this part of the analysis relies on inter-firm comparisons (rather than intra-firm analysis as is the case for most of the preceding results), we conduct additional auxiliary tests of the plausibility of this assumption. First, we provide a "placebo" test with domestic sales as the outcome variable. Local sales are unlikely to be affected by the reform but may reflect differential responses to other economic shocks (e.g., the recovery from the global financial crisis, the Chilean Earthquake of 2010, or Chile's accession to the OECD). Panel (a) of Figure 4 shows this analysis graphically, and Appendix Table C14 in regression form. There are parallel trends in both the pre- and post-treatment periods, which rules out the potential concern that domestic and multinational firms operated on different trends during this time period. A second plausibility test for the parallel trend assumption is the pre-treatment evolution of tax payments. Panel (b) of Figure 4 shows these two groups indeed evolved similarly before the reform.[48] These results suggest that multinational and domestic firms were not differentially affected by other shocks that could confound our results.

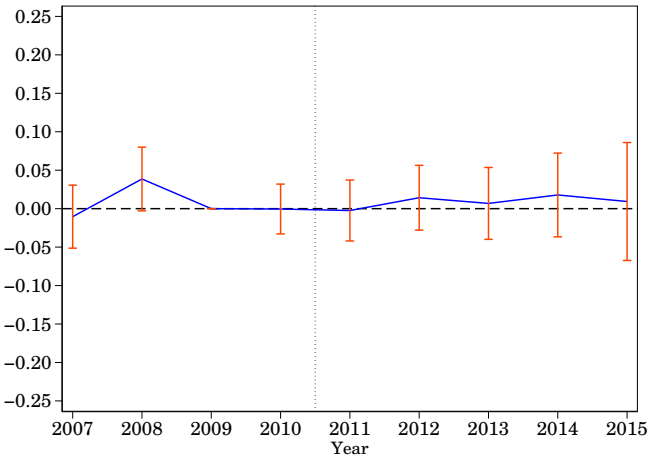
[48]We do not know why there seems to be a relative increase in tax payments in 2008, even though there is no such difference in sales. Potentially, it could be related to the global financial crisis, e.g. due to a reduction in tax reducing investments that year.

Figure 4: Impact of the Reform on Domestic Sales and Corporate Income Tax Multinational vs. Domestic Firms

(a) Placebo Test: Impact of the Reform on Domestic Sales



(b) Impact of the Reform on Corporate Income Tax



Notes: These figures show impact estimates of the reform on domestic sales/payroll (placebo test) and corporate income tax/payroll, expressed in standard deviations, respectively, following the event study specification of Equation 6, which compares multinationals to internationally active domestic firms. The dotted vertical line indicates the start of the reform. 2009 is normalized to zero, and 2010 serves as a placebo year. All continuous variables in levels are winsorized at the 99^{th} percentile of non-zero values. Standard errors clustered at the firm level. Vertical bars represent 90% confidence intervals. Tables C14 and 5 show the same analysis in regression form. For robustness, Figures C4 and C5 show results restricting the sample for common support in pre-treatment average sales and assets, respectively, and Figure C6 scales by lagged payroll. Additionally, Figure C7 includes tax payments resulting from audits.

Table 5: Impact of the Reform on Tax Payments

	(1) Tax paid up to 2013	(2) Tax paid up to 2014	(3) Tax paid up to 2015
Post × multinational	-0.00027	0.00084	0.00085
	(0.00704)	(0.00738)	(0.00820)
Effect in % change	-0.18 %	0.58 %	0.58 %
Pre-treatment avg sales/payroll × year	Yes	Yes	Yes
(Pre-treatment avg sales/payroll) squared × year	Yes	Yes	Yes
Pre-treatment avg sales/assets × year	Yes	Yes	Yes
(Pre-treatment avg sales/assets) squared × year	Yes	Yes	Yes
Pre-treatment avg sales × year	Yes	Yes	Yes
(Pre-treatment avg sales squared) × year	Yes	Yes	Yes
Industry × year	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	98,539	112,616	126,693
Mean outcome of multinational firms in 2009	0.146	0.146	0.146
Number of multinational firms	2,752	2,752	2,752
Number of control firms	11,325	11,325	11,325

Notes: This table shows impact estimates of the reform on corporate income tax/payroll, expressed in standard deviations, following Equation 6, which compares multinationals to internationally active domestic firms. *Post* is a dummy equal to 1 from 2011 onward. *Multinational* is a dummy equal to 1 for multinational firms. All continuous variables in levels winsorized at the 99th percentile of non-zero values. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1. These results correspond to those in Panel (b) of Figure 4. For robustness, Tables C15 and C16 show results restricting the sample for common support in pre-treatment average sales and assets, respectively, and Table C17 scales the outcome by lagged payroll. Table C18 shows the same results, but including tax payments resulting from audits.

Unsurprisingly, given that we found no reduction in profit shifting through any of the channels analyzed above, we also see no significant increase in tax payments by multinationals after the reform. The right-hand side of Panel (b) of Figure 4 shows that, contrary to the expectations of the government, the reform seems to have been ineffective at raising additional taxes from multinational corporations. Table 5 presents corresponding regression estimates. The point estimates of the impact on tax/payroll range from -0.00027 to 0.00085, depending on the post-treatment window. None of the estimates are close to statistical significance. In percentage terms from the baseline of 2009, these point estimates range from -0.18% to $+0.58\%$. Results are robust to imposing common support conditions that restrict the sample to domestic and multinational firms with the

same range of pre-treatment average sales (Figure C4 and Table C15) or assets (Figure C5 and Table C16) and to scaling the outcome variable by lagged payroll (Figure C6 and Table C17). Finally, we can also analyze whether the conclusion changes when including payments collected from audits.[49] Figure C7 and Column (2) of Table C18 show these results. The outcome changes only marginally and all point estimates remain far from statistically significant.

One advantage of our study is the ability to include estimates both on tax payments and on each of the potential channels through which multinationals shift profits abroad. The results that none of these channels are affected by the reform and that we find no effect on tax payments support the conclusion that the reform did not significantly limit the profit shifting opportunities of Chilean multinationals. Next, we analyze whether this overall conclusion hides important heterogeneities.

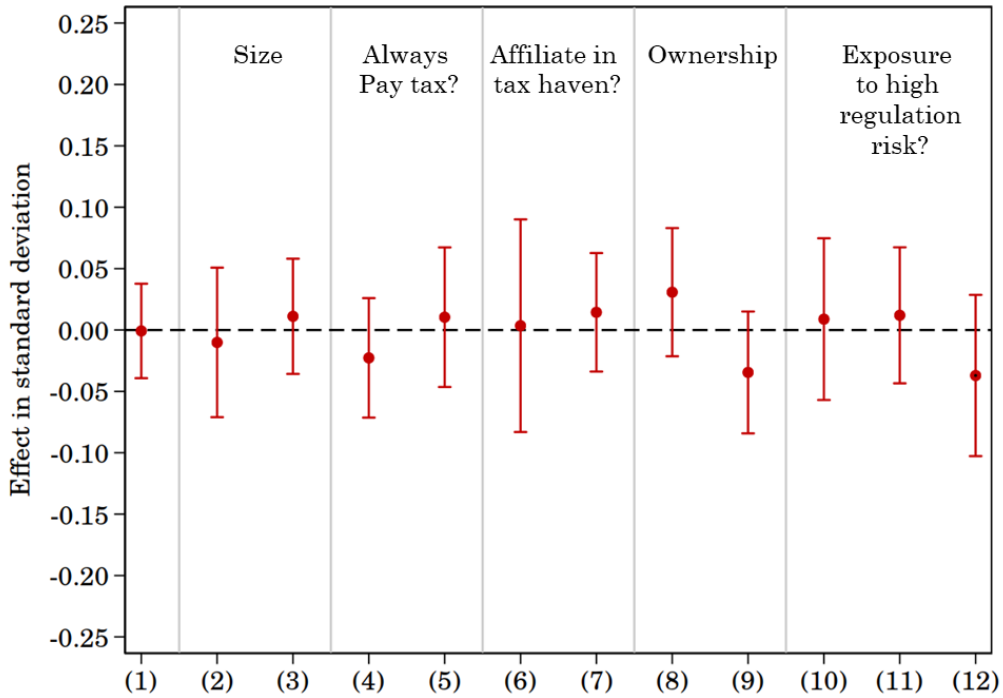
Heterogeneity Analysis

The overall null effect of tax payments may mask heterogeneities, as not all multinationals may be equally likely to respond to the reform. We therefore examine whether there are more significant effects for certain types of multinationals.

Figure 5 shows the impact on tax payments for the full sample as in Table 5 (Column 1) and for several subgroups for which one might expect a larger impact. Estimates (2) and (3) look at large vs. medium-size firms separately, as large-size firms might be more likely to have already been compliant with international transfer pricing norms before the reform. Estimates (4) and (5) analyze firms separately by whether they usually had positive tax payments pre-treatment. In Chile (as in most countries, including the US) many firms have no taxable profits after all deductions are taken. Such firms may have less need for tax-motivated transfers to further reduce reported profits. However, we also find no impact on multinationals that regularly had positive corporate income tax payments before the reform.

[49] Transfer pricing audits of firms in our sample led to 17.2 million USD in payments in 2010 and 68.1 million USD in 2011-2015. These payments stem from 224 audits of 211 unique firms, representing 7.66% of all multinationals in our sample. 33 of these firms paid additional taxes as a result of these audits.

Figure 5: Impact of the Reform on Corporate Income Tax: Subgroup Analysis



(1) All
(2) Large
(3) Medium
(4) Regularly paid taxes > 0 in the pre-treatment period
(5) Paid no tax multiple years in the pre-treatment period

(6) Made payments to tax havens
(7) Made no payments to tax havens
(8) Foreign-owned
(9) Chilean-owned
(10) Multinational status revealed pre-treatment
(11) Multinational status revealed post-treatment
(12) Multinational status from external sources

Notes: This figure shows point estimates of the impact of the reform on corporate income tax/payroll, expressed in standard deviation, following Equation 6, which compares multinationals to internationally active domestic firms. Column (1) shows the estimate for the full sample (as in Table 5). Estimates by firm size (2) and (3) compare large (medium) multinationals to large (medium) domestic firms. Estimates (4) and (5) compare multinationals that regularly paid corporate income taxes/paid no such taxes more than once to the corresponding subgroups of domestic firms. Estimates (6)-(12) compare the corresponding subgroups of multinationals to the full sample of domestic firms: (6) multinationals with payments to tax havens, (7) those without payments to tax havens, (8) foreign-owned multinationals, (9) Chilean-owned multinationals, (10)-(12) firms that revealed their multinational status to the tax authority pre-treatment, post-treatment, or never, respectively. The latter are identified as multinationals based on external sources, as described in Section 3.5.4. This figure shows estimates up to 2013. All continuous variables in levels are winsorized at the 99th percentile of non-zero values. Standard errors clustered at the firm level. Vertical bars represent 90% confidence intervals. Figures C8 and C9 show the same up to 2014 and 2015, respectively.

Another group of interest is multinationals with affiliates in tax havens. These firms may have been more aggressive in their tax planning behavior prior to the reform or may be more sophisticated in such planning. Estimate (6) compares multinationals with payments to tax havens with domestic firms, while estimate (7) does so for multinationals without such payments. The point estimates of both these groups are very similar to each other and again close to zero. Next, we analyze the impacts on tax payments separately for Chilean-owned multinationals (8) and Chilean subsidiaries of foreign-owned multinationals (9). One might expect foreign multinationals—most of which have their headquarters in countries that had already introduced the OECD standards before Chile did—to respond less to the reform. However, this does not seem to be the case.

Finally, estimates (10), (11), and (12) look at subgroups of multinationals based on when they revealed their multinational status to the tax authority. Estimate (10) includes firms that reported their multinational status prior to the reform, (11) those that revealed it only after the reform, and (12) those who never revealed their status in the tax forms during our study period, but whom we identified as multinationals based on data from Dun & Bradstreet and Orbis. Overall, Figure 5 shows that the null effect is quite general across many subgroups and not the result of hidden firm heterogeneity. For robustness, Appendix Figures C8 and C9 show the same analyses including the post-treatment period up to 2014 and 2015, respectively, with very similar results.

Taken together, the findings from the administrative tax and customs data show that the reform did not achieve its goal of reducing tax-motivated payments of multinational firms to their foreign affiliates and did not significantly increase tax payments. In the face of these results, which surprised both the tax authority and the research team, we reached out to transfer pricing experts who had personally experienced the time of the reform—be it as head of taxation within multinational firms, as tax consultants, or as officers of the tax authority. Through in-depth qualitative interviews, we hoped to learn more about potential reasons for this lack of impact. In this process, we discovered the important role that the tax advisory industry played. We discuss these findings in the next section.

3.6 Role of the Tax Advisory Industry

Tax advisors help multinational firms comply with complex national and international regulations, ease the administrative burden of complying with tax laws,

and help firms avoid paying more than what is due. The transfer pricing regulation aimed to shut down key tax-avoidance loopholes and evasion opportunities, but in doing so, it added legal complexity and administrative requirements.

To better understand the role of tax advisors, we carried out two rounds of in-depth qualitative interviews, with experts in different areas of the transfer pricing space. In 2014, we conducted in-person interviews with senior transfer pricing consultants in the Chilean branches of three of the Big Four consulting firms. In 2021–2022, after the implementation of much of the quantitative empirical analysis, we conducted video interviews with a wider range of specialists: transfer pricing experts in each of the Big Four as well as in smaller consulting firms and senior tax employees of multinationals. Section 3.4 and Appendix D.2 provide information on the methodological approach.

Our qualitative interviews yield six valuable insights:

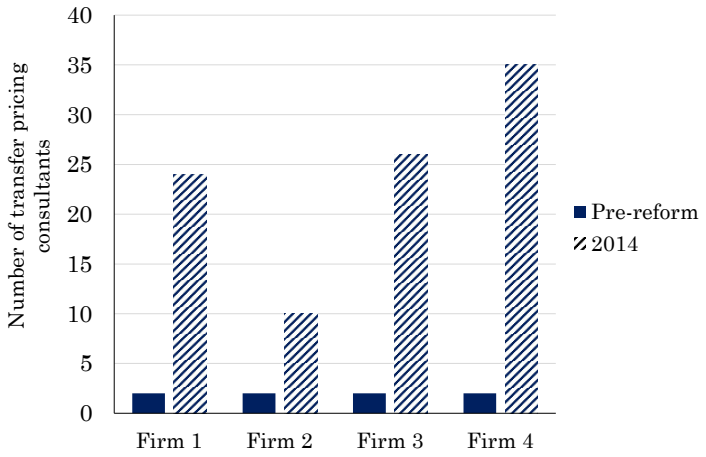
1. The reform was a large boon to the tax advisory industry, increasing the number of experts working in transfer-pricing consulting twelve-fold within three years.
2. The strong surge in demand was initially led by the complexity of the new reporting requirements, which drove many multinationals to seek compliance support from specialized consulting services.
3. There are strong complementarities between compliance support and tax planning services. Tax consultants had strong incentives to up-sell clients on additional tax planning services, and the marginal cost of such planning was lower, once the fixed costs of organizing the books for compliance had been paid.
4. The supply response was very elastic because the advisory industry was able to respond quickly to this demand shock by reallocating international experts to Chile and then training the next generation of local advisors.
5. An important piece of tax planning advice was to centralize cost centers in fewer locations, which is optimal both from a tax efficiency and business perspective. We corroborate these patterns using the quantitative data.
6. Tax administrators are outmatched by consulting firms both in the number of transfer pricing staff and their salaries, and there is a recurring pattern of revolving doors cycling transfer pricing experts between the two sectors. Consulting firms see additional enforcement actions by the government as a business opportunity, showing that tax authorities face an uphill battle in the race between tax enforcement and tax planning.

In what follows, we document these insights using quotes from our interviews that are representative of recurring themes, following the approach of DeLuca, Wood, and Rosenblatt (2019). These quotes are translated from Spanish and follow the colloquial style of the oral responses. Additional quotes can be found in Appendix D.2.

Growth in the Tax Advisory Industry

All interviewees mentioned that the transfer pricing reform represented a tremendous growth opportunity for the tax advisory market. To quantify these effects, we asked senior transfer-pricing consultants in each of the Big Four consulting firms how many consultants were employed in their unit prior to the reform (2010) and after (2014). Figure 6 shows the responses. Each of the four companies had two people working in that department before the reform and then expanded rapidly. This led to a 12-fold increase from 8 to 95 transfer pricing consultants across the four companies. As one expert working for a big consulting firm explained: *"There was very little demand for such services prior to the reform. Before the reform, the companies did little or nothing about transfer pricing, neither with external support nor internally. After the reform, the compliance cost for firms increased. It's not that clients often moved from smaller consulting firms to the Big Four. Most clients were newly taking outside council for this."* Each of the participants in the 2014 phase of interviews had personally experienced a promotion, going from working with one colleague in a small unit to being the head of an important group within the company. One described this process as *"a radical change,"* elaborating that *"the Big Four each had only one person who could make the link with other countries before the reform. But with the reform, this service exploded."*

Figure 6: Number of Transfer Pricing Consultants in Big Four Consulting Firms in Chile



Notes: Data obtained from interviews with representatives from the Big Four consulting firms in Chile.

The interviews also revealed that this growth in consulting services for transfer pricing was the result of three factors: a strong increase in the demand for compliance support, the complementarity of compliance support with tax planning services, and a very elastic supply of specialized consultants due to the international nature of this market. We now discuss these in turn.

Demand for Compliance Support

Both consultants and representatives of multinationals stated that most firms initially sought out the consulting firms because it was difficult to comply with the new reporting requirements without specialized assistance. One expert explained that *"The big majority of multinationals contracted the consultants for the new transfer-pricing tax annex. Some did it in-house in the beginning, but it was done poorly, and they received complaint notices from the tax authority. Following this, these firms also started relying on consultants."*

Many interviewees pointed out that, first and foremost, compliance with the new norms required many firms to reorganize their internal bookkeeping and recording of intra-group transactions. As one expert stated: *"Overall, there was a gigantic change in taxation. Now firms are much more orderly and organized."* Firms formalized their transactions with foreign affiliates much more rigorously. Consultants helped them in this process, including by providing information on how to calculate prices and how to attribute costs of different service functions (such as HR, management, branding, and accounting) to the different affiliates. The

consultants had prior experience based on jurisprudence and best practices from other countries and other firms.[50] Given the uncertainty of these new filings, top consulting firms also gave clients more confidence that filings would be "audit-proof." This confidence was bolstered by the use of transfer pricing studies that justify why a certain price is adequate for a given transaction.[51]

The implementation of the new requirements put a heavy burden on companies. One company representative stated: *"You spend the same on the preparation of documentation for transfer pricing as on the entire corporate income tax declaration."* Asked why multinationals did not acquire this expertise themselves in-house, firm representatives stated that on the one hand, Big Four consultants always had the most up-to-date information on the continuously evolving best practices and regulations, and on the other, it would be too expensive to hire such qualified senior experts full time, due to their scarcity and corresponding costs.[52]

Complementarity of Compliance Support and Tax Planning Services

Interviewees explained that transfer pricing advisors offered two broad categories of services: i) compliance support to help firms comply with the new legislation and ii) tax planning, which requires advisors to undertake more involved analyses to design transfer pricing strategies with tax savings potential, suggesting new strategies for their clients.

While clients initially approached consultants for compliance services, consultants often tried to up-sell them on tax planning, indicating to firms that they were not always operating in optimal ways and that consultants could support them in implementing more "tax efficient" strategies. In this context, one former Big Four consultant (who subsequently moved as an in-house expert of a

[50] This advantage is revealed by the following quotes: *"People need experts to have comparable benchmark databases that only the Big Four have. They also know how to classify transactions etc." "Firms need support for the new declaration because it is very specific. The declaration asks for so many things, so that they need help, for example, for comparables, etc."*

[51] According to one senior consultant: *"If firms get surprised by the tax authority and have not prepared how they organize and manage their pricing beforehand, it's sometimes hard to justify ex-post. But if we can plan ex-ante what the justifications are, it's not a problem."* And another consultant stated: *"Companies usually contract one of the Big Four to do the price study for them."* An in-house tax expert explained: *"In the past, prices were set without much research behind it. While some things can be done well with market comparisons (e.g., interest), pricing services that are shared across multiple locations, such as human resources, is more difficult."*

[52] A Big Four consultant noted that: *"It's hard to hire in this area. There are not enough experts with enough experience. Top experts have 15+ years of experience. There are only a handful in the country. It takes 4 to 5 years to even become productive."* Similarly, a senior tax expert at an MNC explained: *"We outsourced this service to a consulting firm. This is cheaper, and the consulting firm can share their best practices from other countries with us."*

multinational firm) described that *"In the first years, companies were only focused on compliance. We told them every year about tax planning services. For example, 'You are losing a lot of money in this transaction.' And sooner or later, they started to make changes to their transfer prices. Consulting firms see tax planning as a growth opportunity, so they focus on selling tax planning."*[53] Highlighting this new source of growth, another consultant who moved from abroad to a Big Four in Chile following the reform stated even more directly: *"In 2012, I came as an evangelizer, knocking on doors."*

Because the reform made firms incur the fixed cost of organizing their internal documentation and learning the transfer pricing rules, the new regulations lowered the marginal cost of tax planning. As a result, management's demand for the strategic opportunity provided by transfer pricing increased. An in-house tax expert of a multinational described the process as follows: *"In principle, the optimization could have happened before the reform. But management often does not want to think about taxes. They are busy with other things. Due to the reform, management developed a more global vision of the company. Our area was able to show them that we do more than just comply. That the value of the area of taxation is not in filing the taxes, it is in how we can contribute to the sustainability of the firm. Before, we charged things the same to all branches. It was terrible; it meant fiscal inefficiency."*[54]

Overall, due to both the up-selling efforts by consultants and the increased know-how by management, many multinationals eventually moved from a focus on getting external support for compliance to more in-depth tax planning.

Supply Response

The rapid expansion of this industry was possible due to the elastic supply of transfer pricing experts from multinational consulting firms abroad. Interviewees shared that a substantial number of consultants who previously worked at Big Four subsidiaries in other countries—such as Argentina, Colombia, Peru, Spain, or Venezuela—moved to a Big Four in Chile around 2012 to meet this increased demand. As one consultant explained, *"At the beginning, all the tax planning experts were foreigners in the Big Four. We brought in the seniors from abroad,*

[53] Another consultant said: *"Because the firms were so ignorant and unorganized before, they did not even realize that they left money on the table. The better one knows the company, the more one learns about more efficient ways to deal with taxes."*

[54] This same in-house tax expert also shared that the consultants helped spur this change of perspective. *"The reform itself was the beginning. But then, the arrival of these people with a vision that was much more aligned with the OECD accelerated the process. It strengthened the knowledge of these matters in Chile a lot. Before, it was something very specific that nobody talked about. The reform produced this. Not sure this was the intention."*

Argentina, Venezuela, and Colombia, and then recruited assistants who were Chilean. Today [2021] about 40% of the senior transfer pricing experts are Chileans."

Since these foreign experts already had deep experience with similar transfer pricing regulations in other countries, they brought a wealth of knowledge applicable to the reform. In particular, since they knew how to ensure that intra-group transactions complied with OECD guidelines, they could avoid raising red flags with the tax authority. One senior consultant shared that *"The transfer pricing partners (of the Big Four) were all foreigners. Still, many of the partners are today. The advantage for transfer pricing specialists is that the rules are international, so people can move around."*

After the initial import of foreign experts, the industry was able to grow by hiring more junior team members locally, who were then trained in how to conduct transfer pricing studies as well as sophisticated transfer pricing strategies. Some newly trained local experts went on to start their own boutique consulting firms, catering to smaller client firms.[55]

Centralization of Cost Centers

We asked senior consultants, what strategies they advised their clients to use in their tax planning. A common recommendation that emerged turned out to be testable with our administrative data. Consultants frequently recommended consolidation of cost centers, especially for services such as human resources or marketing, in fewer—optimally chosen—countries. Cost center consolidation can reduce tax liabilities by concentrating costs in lower-tax locations. One consultant described that *"many companies started to centralize several activities, for example, instead of having a distributor present in all the countries, they order from one optimally-chosen location."* In-house tax specialists confirmed this phenomenon. One said: *"Centralizing cost centers is very common, not only from the point of view of taxes but efficiency in general."* Another consultant explained: *"We calculate taxes and also labor costs for the different possibilities to evaluate where it is preferable to put the cost center and concentrate everything there instead of having three countries."*

We analyzed with the administrative data whether there was indeed a reduction in the number of countries to which multinationals made payments to affiliates following the reform. Figure 7 shows that this was the case. Table 6 analyses this evolution in more detail. While there is a highly significant decrease in the

[55] A senior tax expert who came from a Big Four in Argentina stated: *"The expertise was very rare, with 90% of it coming from abroad. We started to train local people. Three to four years ago, some boutique consulting firms started up that are a bit less expensive. Before that, it was almost exclusively the Big Four."*

number of cost centers in non-tax havens (Column 3), there is no such change in tax havens (Column 2).[56] We can also test the statement of the tax advisors that this consolidation was mostly focused on services, and we find that, indeed the largest reduction was in services, followed by other/unclassified payments.

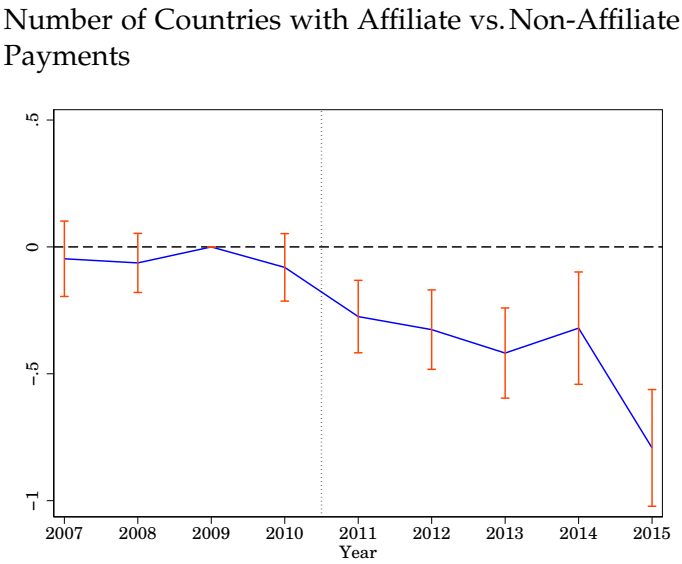
[56]In the first year after the reform, the number of cost centers already falls. This can be due to pure accounting changes as well as consolidating of relatively flexible cost-centers, such as provision of IT services across the global cooperation, etc. Over the following years, the consolidation progresses further, potentially both because more firms acquire specialized accounting services and because some real changes to the firms' internal organization take longer to implement.

Table 6: Impact of the Reform on the Consolidation of Cost Centers

	(1) All	(2) Tax havens	(3) Non tax havens	(4) Royalties	(5) Interests	(6) Services	(7) Other
Panel A: Up to 2013							
Post × affiliate	-0.292***	-0.001	-0.291***	-0.029	0.008	-0.179***	-0.051***
	(0.074)	(0.008)	(0.071)	(0.036)	(0.014)	(0.052)	(0.019)
Affiliate	-0.687***	-0.022**	-0.665***	-0.182***	-0.023	-0.637***	-0.006
	(0.121)	(0.009)	(0.116)	(0.044)	(0.024)	(0.108)	(0.013)
Observations	11,984	11,984	11,984	11,984	11,984	11,984	11,984
Panel B: Up to 2014							
Post × affiliate	-0.287***	-0.002	-0.285***	-0.017	0.016	-0.165***	-0.060***
	(0.072)	(0.008)	(0.069)	(0.035)	(0.014)	(0.052)	(0.018)
Affiliate	-0.687***	-0.022**	-0.665***	-0.182***	-0.023	-0.637***	-0.006
	(0.121)	(0.009)	(0.116)	(0.044)	(0.024)	(0.108)	(0.013)
Observations	13,696	13,696	13,696	13,696	13,696	13,696	13,696
Panel C: Up to 2015							
Post × affiliate	-0.379***	-0.006	-0.372***	-0.026	0.021	-0.223***	-0.074***
	(0.076)	(0.009)	(0.073)	(0.035)	(0.014)	(0.053)	(0.019)
Affiliate	-0.687***	-0.022**	-0.665***	-0.182***	-0.023	-0.637***	-0.006
	(0.121)	(0.009)	(0.116)	(0.044)	(0.024)	(0.108)	(0.013)
Observations	15,408	15,408	15,408	15,408	15,408	15,408	15,408
Firm FE × year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of firms	856	856	856	856	856	856	856
Pre-treatment average affiliates	1.050	0.022	1.028	0.332	0.093	0.473	0.095
Pre-treatment average non-affiliates	1.689	0.051	1.638	0.436	0.126	1.110	0.097

Notes: This table shows impact estimates using an event study specification that compares the number of countries to which firms make payments to affiliates to the number of countries in which they make payments to non-affiliates. The estimation only includes multinational firms and controls for firm, year, and firm-year fixed effects. Column (1) shows the number of countries to which firms make any payment. Columns (2) and (3) show the number of tax haven and non-tax haven countries to which firms make any payments. Columns (4), (5), (6), and (7) refer to the number of countries to which firms make payments for royalties, interests, services, and other payments, respectively. *Post* is a dummy equal to 1 from 2011 onward. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is an affiliate of firm *i*. Data start in 2007. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1. These results correspond to those in Figure 7.

Figure 7: Impact of the Reform on the Consolidation of Cost Centers



Notes: This figure shows impact estimates using an event study specification that compares the number of countries in which firms make payments to affiliates to the number of countries in which they make payments to non-affiliates. The estimation only includes multinational firms and controls for firm, year, and firm-year fixed effects. The dotted vertical line indicates the start of the reform. 2009 is normalized to zero, and 2010 serves as a placebo year. Standard errors clustered at the firm level. Vertical bars represent 90% confidence intervals. Table 6 shows the same analysis with more details on heterogeneous treatment effects in regression form.

Fighting a Losing Battle

Many of our interviewees also described that the tax authority is outmatched both in terms of the number of staff and in terms of salaries. As one consultant put it: *"There are many many more people in the consulting firms, and they are better trained than the team in the tax authority."* One consultant from a Big Four explained the situation as follows: *"The tax authority has a less qualified team. Recently their top expert has also left to a Big Four. It's a big challenge for the public sector to have high-level professionals. Both because the salaries are much lower and the most entrepreneurial types of people get bored. Therefore, the tax authorities are lacking tools for enforcement, both in quality and quality of their staff."* Even though the tax authority also hired international experts from Big Four consultancies abroad to lead their auditing team, another added that *"In Chile, the tax authority has a decent salary, but working at a Big Four, you can earn brutally high amounts. So the best experts are in the private sector."*

This mismatch is accompanied by a dynamic of revolving doors, with frequent moves of transfer pricing specialists between consulting companies, the

tax authority, and in-house advisor positions within multinationals.[57] As a prime example of this phenomenon, one of the interviewees stated that *"The guy who wrote the regulation for Chilean transfer-pricing reform was subsequently hired for a very high salary by a Big Four."* Another noted that *"The tax authority has a lot of experts who came from consulting firms. Because internally, they didn't have the expertise."* Several experts commended the tax authority for hiring leading experts. *"Chile is an exemplary country with regard to how they implemented this change. They brought experts from the private sector, who could do aggressive audits and speak the same language as the tax preparers of the firms."*

At the same time, internal knowledge from the tax authority is also of value to the private sector. One of the interviewees stated: *"Being in the tax authority helps for the career. So people go to the tax authority and then leave to the Big Four. This creates a big retention problem for the tax authority."* However, it can also be risky for former bureaucrats without consulting experience to move to a Big Four. As one consultant from a Big Four put it: *"In our company, we had one person from the tax authority, one ex-judge from customs, and also someone from the international tax division. They come to the Big Four, and you take advantage of their know-how. But then they don't stay because the demanded output is too high. They come, share their knowledge, then fail to achieve the targets, and leave."*

This pattern of revolving doors is not unique to Chile. The transfer pricing setting is particularly vulnerable to this dynamic because there is a small number of experts with specialized knowledge. Moreover, this specialized knowledge is critical in all aspects of transfer pricing: for writing transfer pricing regulations (in the OECD or in tax authorities), for helping firms comply with or circumvent such regulations (in consulting firms or in multinationals), and for auditing and monitoring firms' compliance (in the tax authority). For this reason, there are similar dynamics in other countries. Notably, Pascal Saint-Amans, who was the OECD's Director for Tax Policy and who played a leading role in the BEPS project and other international tax policy negotiations, recently moved to a business consulting firm (Brunswick Group 2023).

A related report from the British Parliament (Public Accounts Committee 2013) also describes this dynamic and the large mismatch in resources between tax authorities and consulting firms:

[57] The phenomenon of revolving doors and its impacts has been widely studied in other contexts, for example, in legislative and regulatory lobbying in the US (Blanes i Vidal, Draca, and Fons-Rosen 2012; Lucca, Seru, and Trebbi 2014; McCrain 2018; d'Este, Draca, and Fons-Rosen 2020; Strickland 2020).

> HM Revenue & Customs (HMRC) appears to be fighting a battle it cannot win in tackling tax avoidance. Companies can devote considerable resources to ensure that they minimize their tax liability. There is a large market for advising companies on how to take advantage of international tax law, and on the tax implications of different global structures. The four firms employ nearly 9,000 people and earn £2 billion from their tax work in the UK, and earn around $25 billion from this work globally. HMRC has far fewer resources. In the area of transfer pricing alone there are four times as many staff working for the four firms than for HMRC. [...] We have seen what look like cases of poacher, turned gamekeeper, turned poacher again, whereby individuals who advise the government go back to their firms and advise their clients on how they can use those laws to reduce the amount of tax they pay.

A central question for the usefulness of transfer pricing reforms is whether they can be made more effective by empowering tax authorities with higher budgets to hire more specialists and conduct more audits. On the one hand, several consultants said this would be a good idea. As one stated, *"There would be a high tax enforcement return from doing more audits. There is a ton of money to recover if they had the capacity. They are not aware of the amount of money that is there."* On the other hand, such an increase in enforcement power would not be met without a response from the private sector and would likely further fuel the race between tax enforcement and tax planning. As one Big Four consultant put it *"The Big Four of course benefit when the tax authority audits. The more audits, the better it is for the Big Four."*

3.7 Conclusion

Our paper provides evidence of the effectiveness of a prominent tax monitoring reform, using rich administrative data on tax collections, intra-group payments, and international trade prices. The reform—based on standard OECD guidelines—combines increased information reporting requirements, resources devoted to enforcement, and a change in the burden of proof for justifying the legitimacy of intra-group payments.

Multinational firms in Chile make payments to their affiliates abroad that suggest profit shifting for tax minimization purposes. Contrary to the government's expectations, the reform was not effective in reducing this practice: we

observe no reduction in the sensitivity of intra-group payments for royalties, interests, and services with respect to changes in the destination country tax rates, and no effect on unit prices in intra-group trade of goods. Consistent with these results, we find no significant increase in tax revenue. This holds true for different subgroups of multinationals, such as those with affiliates in tax havens, Chilean- and foreign-owned ones, etc.

In-depth interviews with transfer pricing experts in consulting and in multinational firms suggest that while the reform did not increase tax payments, it did have a large effect on the tax advisory industry. The reform led to a twelve-fold increase in the number of transfer pricing experts working at Big Four consulting firms in Chile. This growth was possible, in part, because consulting firms brought in experts on similar regulations from other countries. When multinationals approach tax consultants for compliance support, consultants often upsell them on tax planning services. A tax planning strategy that was mentioned frequently in the interviews was the concentration of cost centers. Turning back to the administrative data, we indeed find such an effect: There is a sizeable reduction in the number of countries with affiliates to which multinationals make payments, particularly for services. Methodologically, our paper illustrates how combining administrative data analysis with systematic qualitative interviews can be fruitful in understanding the impacts of public policy changes.

Combined, our results cast doubt on the belief that regulations that require increasingly granular information on intra-firm transactions can effectively limit profit shifting. While our quantitative results show that this round of regulations was not effective at reducing profit shifting, our qualitative evidence shows that such reforms are generally vulnerable to sophisticated tax planning by multinationals and the tax advisory industry.

The reform thus appears to have benefited the tax-planning industry at the expense of multinationals (which pay more for tax-related services) and the government (which spends more on monitoring, without a concomitant increase in tax revenues).

The key role that the tax-planning industry plays for understanding the effects of tax-monitoring regimes on revenue and welfare has several possible policy implications. First, policymakers need to take into account the risk of an increase in sophisticated planning when setting reporting requirements. Second, they could consider strengthening the monitoring and regulation of the providers of tax planning services. These providers could, for instance, be asked to inform the tax authority of new tax-saving strategies they commercialize, or

penalties could be increased for providers that sell schemes that turn out to be illegal (for instance, because they have no economic substance). Studying the optimal policy response and the mediating role of the tax-planning industry in how policies turn into practice is a fruitful avenue for future research.

Chapter 3

Appendices

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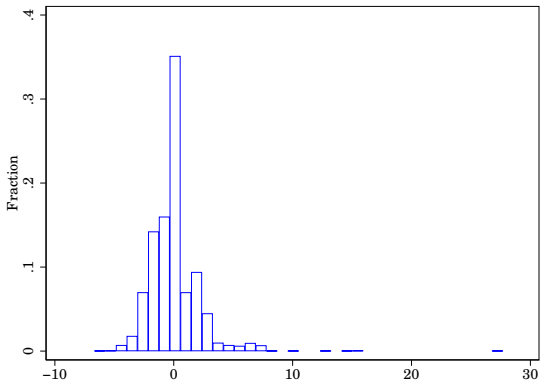
C Additional Figures & Tables

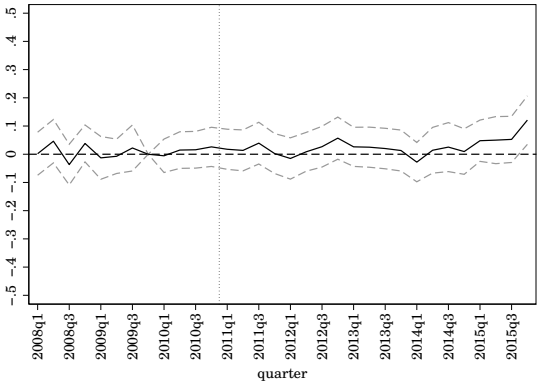
Figure C1: Histogram of the Difference of Tax Rate Residuals between 2007 and 2015 Firm-Country Level



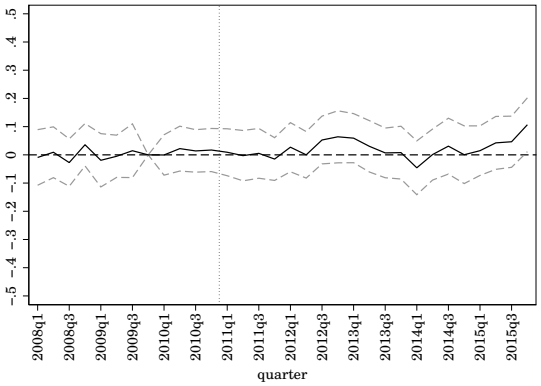
Notes: This histogram illustrates the over-time variation in statutory corporate tax rates leveraged in Equation 3. Observations are at the level of firm-year-affiliation status-country, i.e., payments by firm i in year t to an affiliate or a non-affiliate in country j. Destination country tax rates are regressed on firm-year fixed effects to obtain residualized tax rates. The histogram plots the magnitude of the changes in these residuals from 2007 to 2015, showing considerable variation in tax incentives across multinationals.

Figure C2: Impact of the Reform on Unit Prices of Imports Robustness Check: Country-Firm Pairs with Different Intra-Group Import Shares

(a) Sample: Country-firm pairs with an intra-group trade share between 90% and 110%



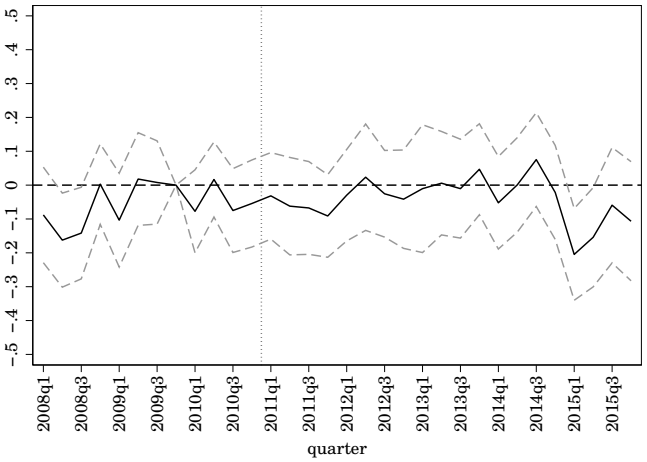
(b) Sample: Country-firm pairs with an intra-group trade share between 95% and 105%



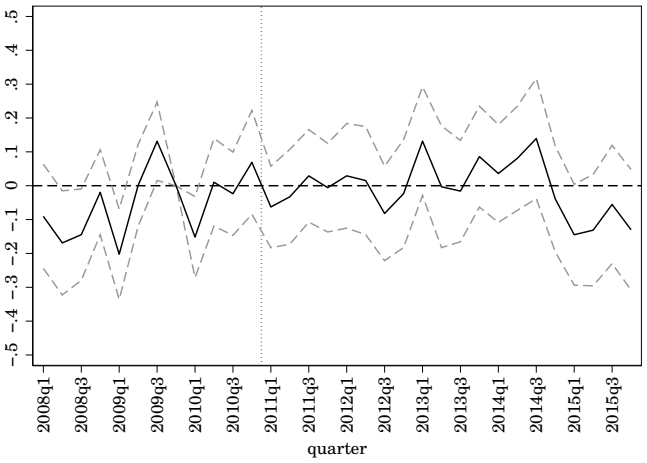
Notes: These figures examine the robustness of Figure 3 Panel (a) by considering different bandwidths for the definition of likely intra-group imports. They show the evolution of log of unit prices of multinational firms' likely intra-group imports compared to domestic firms' trade of the same product, controlling for firm and product-quarter fixed effects, based on the event-study specification of Equation 5. The dotted vertical line indicates the start of the reform. 2009 q4 is normalized to zero, 2010 serves as a placebo year. Likely intra-group trade (imports or exports) are defined as those in firm-country combinations for which the amount of intra-group trade in the tax data is between 90% and 110% and 95% and 105% of imports in the trade data, respectively (see Section 3.4.2 for details). Outcomes in $\log(Y + 1)$. Standard errors clustered at the firm level. Dashed lines represent 90% confidence intervals. Table 4 Column (2) and (3) show the same analysis in regression form.

Figure C3: Impact of the Reform on Unit Prices of Exports
Robustness Check: Country-Firm Pairs with Different Intra-Group Export Shares

(a) Sample: Country-firm pairs with an intra-firm trade share between 90% and 110%



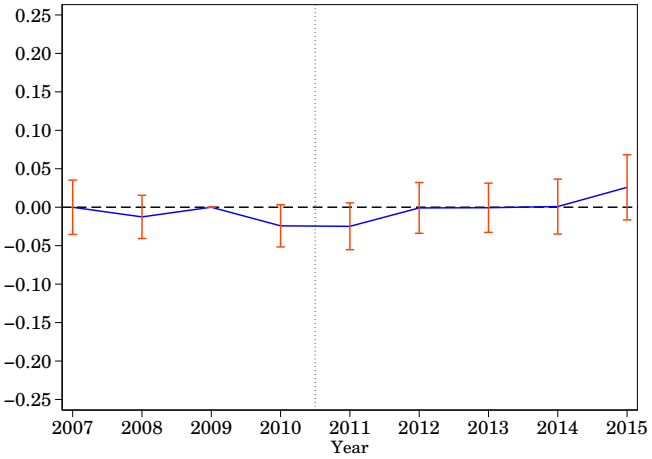
(b) Sample: Country-firm pairs with an intra-firm trade share between 95% and 105%



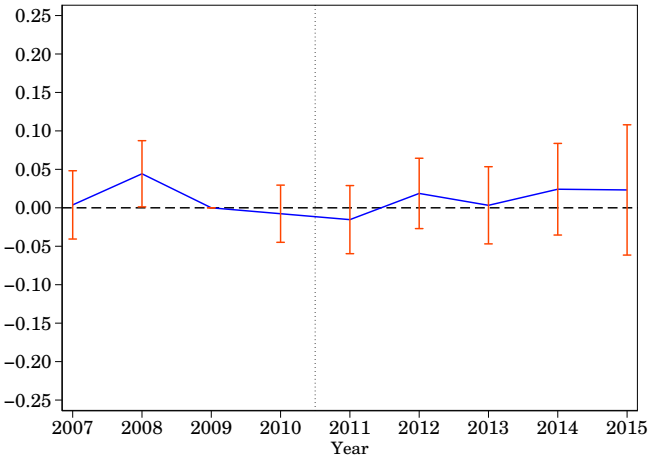
Notes: These figures examine the robustness of Figure 3 Panel (b), by considering different bandwidths for the definition of likely intra-group exports. These show the evolution of the log of unit prices of multinational firms' likely intra-group exports compared to domestic firms' trade of the same product, controlling for firm and product-quarter fixed effects, based on the event-study specification of Equation 5. The dotted vertical line indicates the start of the reform. 2009 q4 is normalized to zero, and 2010 serves as a placebo year. Likely intra-group exports are defined as those in firm-country combinations for which the amount of intra-group exports in the tax data is between 90% and 110% and 95% and 105% of the amount exports in the trade data (see Section 3.4.2 for details). Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. Dashed lines represent 90% confidence intervals. Table 4 Columns (2) and (3) show the same analysis in regression form.

Figure C4: Impact of the Reform on Corporate Income Tax and Placebo Test on Domestic Sales. Robustness Check I: Common Support in Pre-Treatment Average Sales

(a) Impact on Domestic Sales



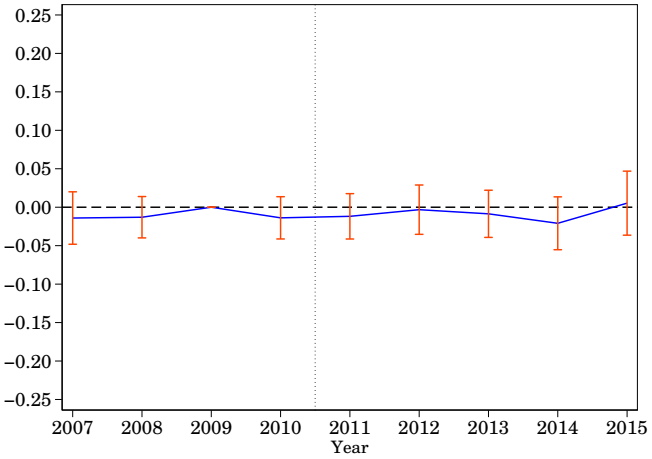
(b) Impact on Tax Payments



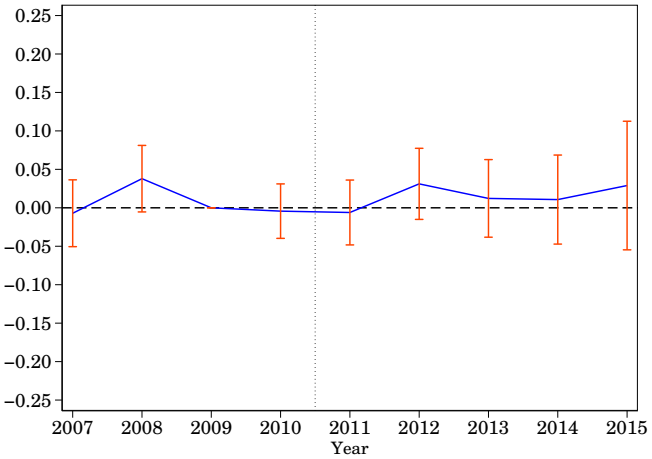
Notes: These figures examine the robustness of Figure 4, restricting the sample for common support in pre-treatment average sales. They show impact estimates of the reform on domestic sales/payroll (placebo test) and corporate income tax/payroll, respectively, expressed in standard deviations, following the event study specification of Equation 6, which compares multinationals to internationally active domestic firms. 2009 is normalized to zero, and 2010 serves as a placebo year. All continuous variables in levels are winsorized at the 99^{th} percentile of non-zero values. Standard errors clustered at the firm level. Vertical bars represent 90% confidence intervals. Table C15 shows the same analysis in regression form.

Figure C5: Impact of the Reform on Corporate Income Tax and Placebo Test on Domestic Sales. Robustness Check II: Common Support in Pre-Treatment Average Assets

(a) Impact on Domestic Sales



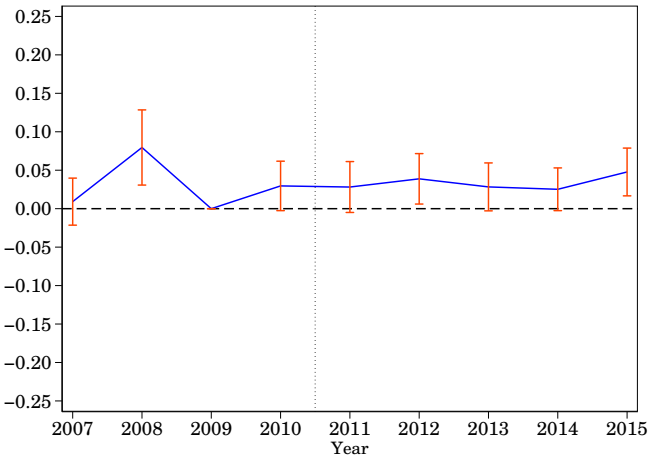
(b) Impact on Tax Payments



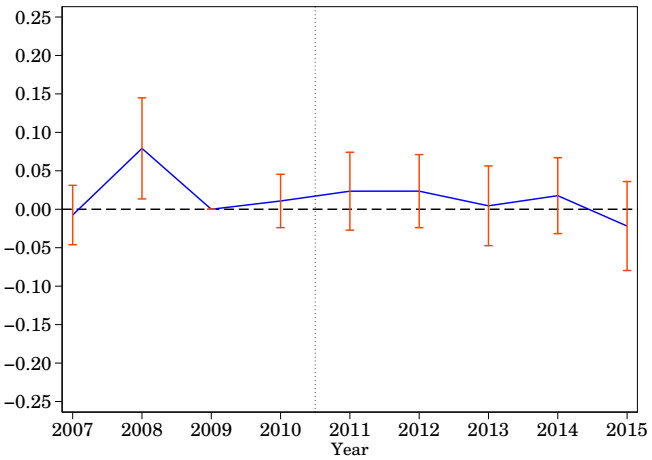
Notes: These figures examine the robustness of Figure 4, restricting the sample for common support in pre-treatment average assets. They show impact estimates of the reform on domestic sales/payroll (placebo test) and corporate income tax/payroll, respectively, expressed in standard deviations, following the event study specification of Equation 6, which compares multinationals to internationally active domestic firms. 2009 is normalized to zero, and 2010 serves as a placebo year. All continuous variables in levels are winsorized at the 99^{th} percentile of non-zero values. Standard errors clustered at the firm level. Vertical bars represent 90% confidence intervals. Table C16 shows the same analysis in regression form.

Figure C6: Impact of the Reform on Corporate Income Tax and Placebo Test on Domestic Sales. Robustness Check III: Scaling by Lagged Payroll

(a) Impact on Domestic Sales

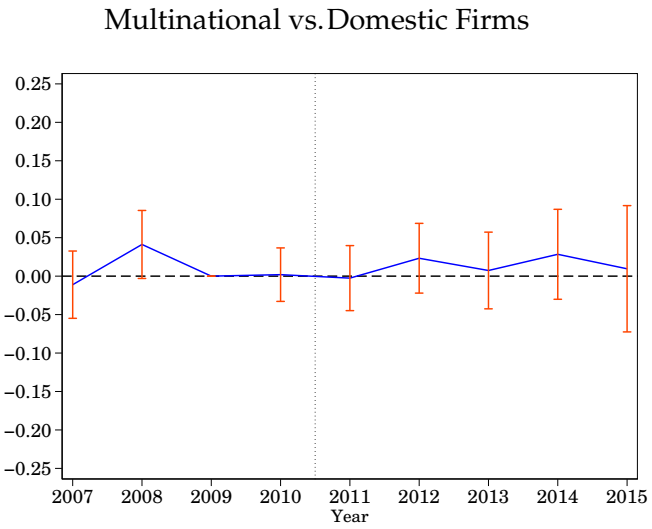


(b) Impact on Tax Payments



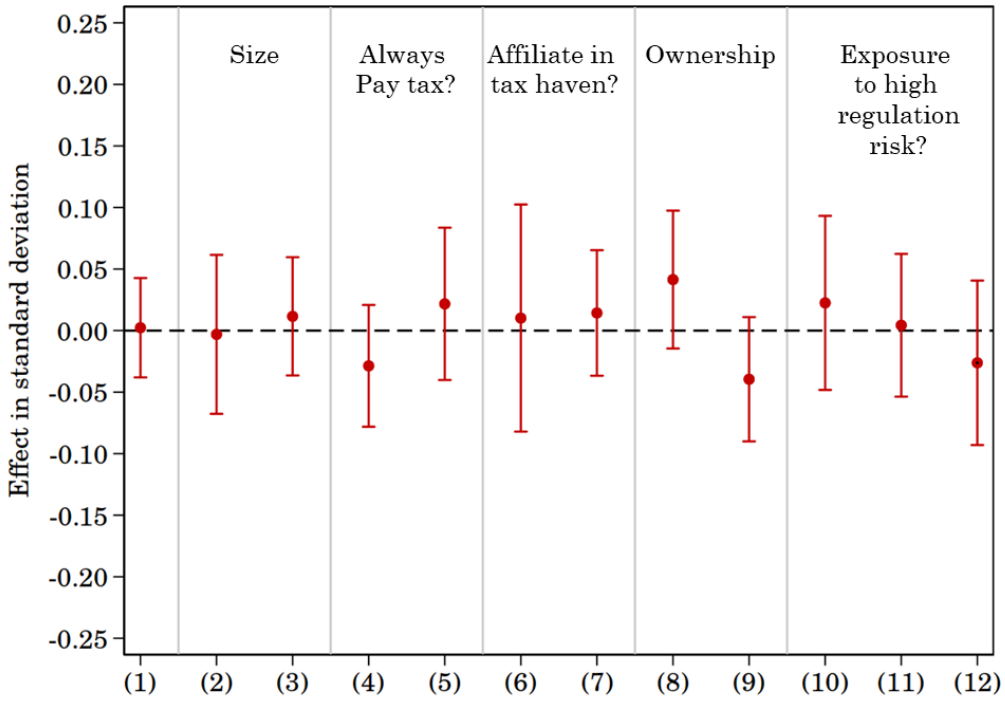
Notes: These figures examine the robustness of Figure 4, scaling the outcomes by lagged payroll. They show impact estimates of the reform on domestic sales/payroll (placebo test) and corporate income tax/payroll, respectively, expressed in standard deviations, following the event study specification of Equation 6, which compares multinationals to internationally active domestic firms. 2009 is normalized to zero, and 2010 serves as a placebo year. All continuous variables in levels are winsorized at the 99th percentile of non-zero values. Standard errors clustered at the firm level. Vertical bars represent 90% confidence intervals. Table C17 shows the same analysis in regression form.

Figure C7: Impact of the Reform on Corporate Income Tax, Including Audits



Notes: This figure shows impact estimates of the reform on corporate income tax/payroll including tax payments resulting from audits, expressed in standard deviations, following the event study specification of Equation 6, which compares multinationals to internationally active domestic firms. The dotted vertical line indicates the start of the reform. 2009 is normalized to zero, and 2010 serves as a placebo year. All continuous variables in levels are winsorized at the 99th percentile of non-zero values. Standard errors clustered at the firm level. Vertical bars represent 90% confidence intervals. Table C18 shows the same analysis in regression form.

Figure C8: Impact of the Reform on Corporate Income Tax: Subgroup Analysis
Robustness Check I: 2007-2014

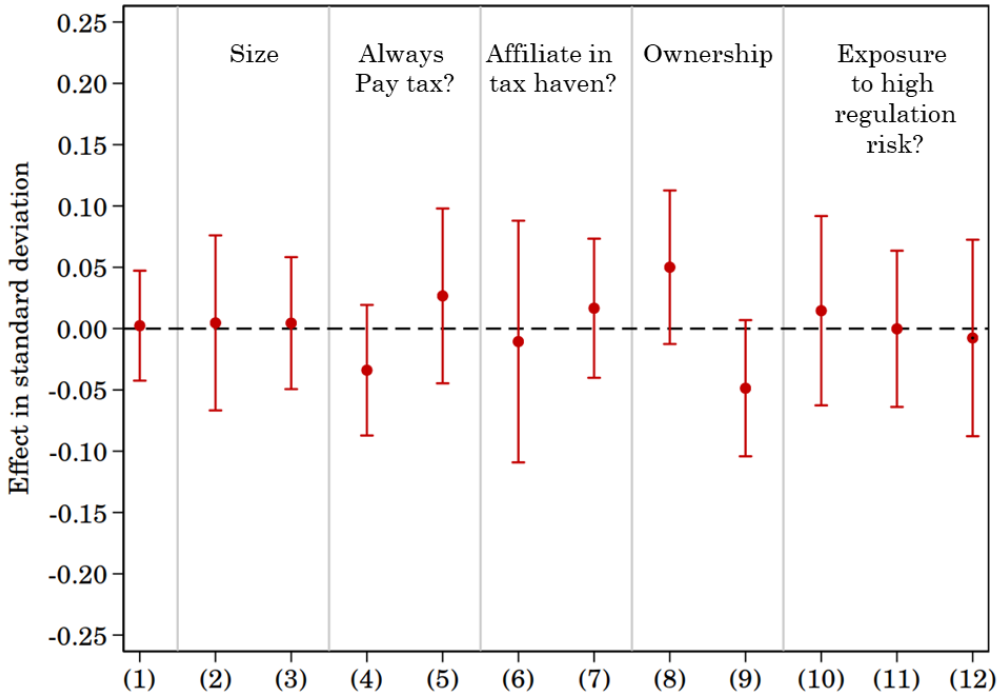


(1) All
(2) Large
(3) Medium
(4) Regularly paid taxes > 0 in the pre-treatment period
(5) Paid no tax multiple years in the pre-treatment period

(6) Made payments to tax havens
(7) Made no payments to tax havens
(8) Foreign-owned
(9) Chilean-owned
(10) Multinational status revealed pre-treatment
(11) Multinational status revealed post-treatment
(12) Multinational status from external sources

Notes: This figure examines the robustness of Figure 5, by including data up to 2014. This figure shows point estimates of the impact of the reform on corporate income tax/payroll, expressed in standard deviations, following Equation 6, which compares multinationals to internationally active domestic firms. Column (1) shows the estimate for the full sample (as in Table 5). Estimates by firm size (2) and (3) compare large/medium multinationals to large/medium domestic firms. Estimates (4) and (5) compare multinationals that regularly paid corporate income taxes/paid no such taxes more than once to the corresponding subgroups of domestic firms. Estimates (6)-(12) compare the corresponding subgroups of multinationals to the full sample of domestic firms: (6) multinationals with payments to tax havens, (7) multinationals without payments to tax havens, (8) foreign-owned multinationals, (9) Chilean-owned multinationals, (10)-(12) firms that revealed their multinational status to the tax authority pre-treatment, post-treatment, or never, respectively. The latter is identified as multinationals based on external sources, as described in Section 3.5.4. All continuous variables in levels are winsorized at the 99th percentile of non-zero values. Standard errors clustered at the firm level. Vertical bars represent 90% confidence intervals.

Figure C9: Impact of the Reform on Corporate Income Tax: Subgroup Analysis
Robustness Check II: 2007-2015



(1) All
(2) Large
(3) Medium
(4) Regularly paid taxes > 0 in the pre-treatment period
(5) Paid no tax multiple years in the pre-treatment period

(6) Made payments to tax havens
(7) Made no payments to tax havens
(8) Foreign-owned
(9) Chilean-owned
(10) Multinational status revealed pre-treatment
(11) Multinational status revealed post-treatment
(12) Multinational status from external sources

Notes: This figure examines the robustness of Figure 5, by including data up to 2015. This figure shows point estimates of the impact of the reform on corporate income tax/payroll, expressed in standard deviations, following Equation 6, which compares multinationals to internationally active domestic firms before and after the reform. Column (1) shows the estimate for the full sample (as in Table 5). Estimates by firm size (2) and (3) compare large/medium multinationals to large/medium domestic firms. Estimates (4) and (5) compare multinationals that regularly paid corporate income taxes/paid no such taxes more than once to the corresponding subgroups of domestic firms. Estimates (6)-(12) compare the corresponding subgroups of multinationals to the full sample of domestic firms: (6) multinationals with payments to tax havens, (7) multinationals without payments to tax havens, (8) foreign-owned multinationals, (9) Chilean-owned multinationals, (10)-(12) firms that revealed their multinational status to the tax authority pre-treatment, post-treatment, or never, respectively. The latter is identified as multinationals based on external sources, as described in Section 3.5.4. All continuous variables in levels are winsorized at the 99^{th} percentile of non-zero values. Standard errors clustered at the firm level. Vertical bars represent 90% confidence intervals.

Table C1: Non-OECD Countries Which Follow OECD Transfer Pricing Guidelines

1	Azerbaijan	32	Malawi
2	Bangladesh	33	Malaysia
3	Belarus	34	Malta
4	Bolivia	35	Morocco
5	Bosnia and Herzegovina	36	Namibia
6	Bulgaria	37	Nigeria
7	Cambodia	38	Pakistan
8	Cape Verde	39	Papua New Guinea
9	China	40	Peru
10	Colombia	41	Philippines
11	Congo Brazaville	42	Qatar
12	Costa Rica	43	Republic of Serbia
13	Cote d'Ivoire	44	Romania
14	Croatia	45	Russia
15	Dominican Republic	46	Saudi Arabia
16	Ecuador	47	Senegal
17	El Salvador	48	Singapore
18	Fiji	49	South Africa
19	Gabon	50	South Sudan
20	Georgia	51	Srilanka
21	Ghana	52	Taiwan
22	Gilbraltar	53	Tanzania
23	Guatemala	54	Thailand
24	Hong Kong	55	Tunisia
25	India	56	Uganda
26	Indonesia	57	Ukraine
27	Kazakhstan	58	Venezuela
28	Kenya	59	Vietnam
29	Kosovo	60	Zambia
30	Lebanon	61	Zimbabwe
31	Madagascar		

Notes: This table lists all non-OECD countries whose tax legislation follows OECD Transfer Pricing Guidelines (partly of fully). All OECD countries have adopted such guidelines. Source: Ernst & Young (2019).

Table C2: Sensitivity of International Payments to Changes in Destination Country Tax Rates, Robustness Check I: Difference Between Destination Country and Chile's Tax Rates

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate diff × affiliate	-0.051***	-0.027***	-0.026***	-0.008*	-0.005
	(0.011)	(0.007)	(0.009)	(0.004)	(0.003)
Tax rate diff	0.009	-0.006	0.014	0.003	-0.005
	(0.014)	(0.009)	(0.013)	(0.006)	(0.005)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate diff × affiliate	-0.050***	-0.027***	-0.026***	-0.009**	-0.004
	(0.010)	(0.007)	(0.008)	(0.004)	(0.003)
Tax rate diff	0.014	-0.014	0.033***	0.003	-0.009*
	(0.014)	(0.009)	(0.013)	(0.005)	(0.005)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate diff × affiliate	-0.048***	-0.025***	-0.026***	-0.010***	-0.004
	(0.010)	(0.006)	(0.008)	(0.004)	(0.003)
Tax rate diff	0.021	-0.009	0.036***	0.003	-0.009*
	(0.014)	(0.009)	(0.012)	(0.005)	(0.005)
Observations	58,176	58,176	58,176	58,176	58,176
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.178	0.821	1.283	0.238	0.220

Notes: This table examines the robustness of the results presented in Table 2 by replacing the explanatory variable Tax Rate$_{jt}$ in the destination country with the difference between this tax rate and Chile's tax rate. It shows the semi-elasticity of international payments with respect to changes in the difference between destination country and Chile's tax rates following Equation 3, over the full study period from 2007 onward. Coefficients indicate the change in international payments associated with a one percentage point increase in the gap between destination country and Chile's tax rate. For example, the first coefficient indicates that a one percentage point increase is associated with 5.1% higher payments to affiliates in the corresponding country, relative to non-affiliates. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs. non-affiliates in country j. *Tax rate diff.* indicates the difference between the statutory tax rate in the destination country and Chile's tax rate. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is an affiliate of firm i. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C3: Sensitivity of International Payments to Changes in Destination Country Tax Rates, Robustness Check II: Firm-Year-Affiliation Status FE

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate	-0.055***	-0.027***	-0.031***	-0.009*	-0.005
	(0.012)	(0.008)	(0.010)	(0.004)	(0.003)
Tax rate	0.011	-0.006	0.016	0.004	-0.004
	(0.014)	(0.009)	(0.013)	(0.006)	(0.005)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate	-0.051***	-0.027***	-0.027***	-0.009**	-0.005
	(0.012)	(0.007)	(0.009)	(0.004)	(0.003)
Tax rate	0.015	-0.014	0.034***	0.003	-0.009*
	(0.014)	(0.009)	(0.013)	(0.005)	(0.005)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate	-0.051***	-0.027***	-0.027***	-0.010**	-0.006**
	(0.011)	(0.007)	(0.009)	(0.004)	(0.003)
Tax rate	0.022	-0.008	0.037***	0.003	-0.009
	(0.014)	(0.009)	(0.013)	(0.005)	(0.005)
Observations	58,176	58,176	58,176	58,176	58,176
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes	Yes
Firm FE × year × affiliate	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.178	0.821	1.283	0.238	0.220

Notes: This table examines the robustness of the results presented in Table 2 by adding firm-year-affiliation status fixed effects. It shows the semi-elasticity of international payments with respect to changes in destination country tax rates following Equation 3, over the full study period from 2007 onward. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. For example, the first coefficient indicates that a one percentage point reduction in the destination country tax rate is associated with 5.5% higher payments to affiliates in that country, relative to non-affiliates. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs.non-affiliates in country j. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is an affiliate of firm i. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C4: Sensitivity of International Payments to Changes in Destination Country Tax Rates, Robustness Check III: Destination Country-Year FE

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate	-0.055***	-0.028***	-0.029***	-0.009**	-0.005
	(0.012)	(0.008)	(0.009)	(0.004)	(0.003)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate	-0.051***	-0.027***	-0.027***	-0.009**	-0.005
	(0.011)	(0.007)	(0.009)	(0.004)	(0.003)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate	-0.051***	-0.027***	-0.027***	-0.010**	-0.005*
	(0.011)	(0.007)	(0.009)	(0.004)	(0.003)
Observations	58,176	58,176	58,176	58,176	58,176
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Destination country FE × year	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.178	0.821	1.283	0.238	0.220

Notes: This table examines the robustness of the results presented in Table 2 by adding destination country-year fixed effects. It shows the semi-elasticity of international payments with respect to changes in destination country tax rates following Equation 3, over the full study period from 2007 onward. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. For example, the first coefficient indicates that a one percentage point reduction in the destination country tax rate is associated with 5.5% higher payments to affiliates in that country, relative to non-affiliates. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs.non-affiliates in country j. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is an affiliate of firm i. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C5: Sensitivity of International Payments to Changes in Destination Country Tax Rates, Robustness Check IV: Firm-Destination Country FE

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate	-0.055***	-0.028***	-0.029***	-0.009**	-0.005
	(0.012)	(0.008)	(0.009)	(0.004)	(0.003)
Tax rate	0.011	-0.006	0.016	0.004	-0.005
	(0.014)	(0.009)	(0.013)	(0.006)	(0.005)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate	-0.051***	-0.027***	-0.027***	-0.009**	-0.005
	(0.011)	(0.007)	(0.009)	(0.004)	(0.003)
Tax rate	0.015	-0.014	0.034***	0.003	-0.009*
	(0.014)	(0.009)	(0.013)	(0.005)	(0.005)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate	-0.051***	-0.027***	-0.027***	-0.010**	-0.005*
	(0.011)	(0.007)	(0.009)	(0.004)	(0.003)
Tax rate	0.022	-0.008	0.037***	0.003	-0.009*
	(0.014)	(0.009)	(0.013)	(0.005)	(0.005)
Observations	58,176	58,176	58,176	58,176	58,176
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Firm × Destination country FE	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.178	0.821	1.283	0.238	0.220

Notes: This table examines the robustness of the results presented in Table 2, by adding firm-destination country fixed effects. It shows the semi-elasticity of international payments with respect to changes in destination country tax rates following Equation 3 over the full study period from 2007 onward. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. For example, the first coefficient indicates that a one percentage point reduction in the destination country tax rate is associated with 5.5% higher payments to affiliates in that country, relative to non-affiliates. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs. non-affiliates in country j. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is an affiliate of firm i. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C6: Sensitivity of International Payments to Changes in Destination Country Tax Rates, Robustness Check V: IHS Transformation of Outcome Variables

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate	-0.058***	-0.029***	-0.032***	-0.009**	-0.005
	(0.012)	(0.008)	(0.010)	(0.005)	(0.004)
Tax rate	0.011	-0.006	0.017	0.004	-0.005
	(0.015)	(0.010)	(0.013)	(0.006)	(0.005)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate	-0.054***	-0.029***	-0.029***	-0.010**	-0.005
	(0.012)	(0.007)	(0.010)	(0.005)	(0.003)
Tax rate	0.016	-0.015	0.036***	0.003	-0.009*
	(0.015)	(0.010)	(0.013)	(0.006)	(0.005)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate	-0.054***	-0.029***	-0.029***	-0.011**	-0.005*
	(0.012)	(0.007)	(0.009)	(0.004)	(0.003)
Tax rate	0.023	-0.009	0.039***	0.003	-0.009*
	(0.015)	(0.010)	(0.013)	(0.006)	(0.006)
Observations	58,176	58,176	58,176	58,176	58,176
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.315	0.872	1.368	0.253	0.235

Notes: This table examines the robustness of the results presented in Table 2 by using the inverse hyperbolic sine (IHS) transformation of the outcome variables. It shows the semi-elasticity of international payments with respect to changes in destination country tax rates following Equation 3, over the full study period from 2007 onward. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. For example, the first coefficient indicates that a one percentage point reduction in the destination country tax rate is associated with 5.8% higher payments to affiliates in that country, relative to non-affiliates. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs. non-affiliates in country j. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is an affiliate of firm i. Outcomes in $\log(Y + sqrt(1 + Y^2))$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C7: Sensitivity of International Payments to Changes in Destination Country Tax Rates, Robustness Check VI: Extensive Margin

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate	-0.00487***	-0.00231***	-0.00298***	-0.00072*	-0.00042
	(0.00094)	(0.00059)	(0.00077)	(0.00037)	(0.00027)
Tax rate	0.00096	-0.00024	0.00128	0.00015	-0.00043
	(0.00133)	(0.00085)	(0.00117)	(0.00057)	(0.00044)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate	-0.00461***	-0.00226***	-0.00284***	-0.00079**	-0.00046*
	(0.00091)	(0.00055)	(0.00075)	(0.00036)	(0.00025)
Tax rate	0.00129	-0.00100	0.00282**	0.00009	-0.00083*
	(0.00128)	(0.00087)	(0.00117)	(0.00050)	(0.00044)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate	-0.00468***	-0.00226***	-0.00292***	-0.00089**	-0.00052**
	(0.00088)	(0.00053)	(0.00072)	(0.00035)	(0.00023)
Tax rate	0.00191	-0.00053	0.00299***	0.00000	-0.00081*
	(0.00129)	(0.00085)	(0.00115)	(0.00047)	(0.00045)
Observations	58,176	58,176	58,176	58,176	58,176
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	0.198	0.073	0.122	0.021	0.021

Notes: This table examines the robustness of the results presented in Table 2 by estimating a linear probability model, where the outcome equals to 1 when firm i makes a payment to the destination country j in year t and zero otherwise. It shows the semi-elasticity of international payments with respect to changes in destination country tax rates following Equation 3, over the full study period from 2007 onward. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. For example, the first coefficient indicates that a one percentage point reduction in the destination country tax rate is associated with a 0.49% higher probability of making payments to affiliates in that country, relative to non-affiliates. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs. non-affiliates in country j. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is an affiliate of firm i. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C8: Impact of the Reform on the Sensitivity of International Payments to Changes in Destination Country Tax Rates, Robustness Check I: Difference Between Destination Country and Chile's Tax Rates

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate diff × affiliate × post	-0.013	-0.011*	-0.004	-0.001	-0.004
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate diff × affiliate	-0.049***	-0.022***	-0.028***	-0.009*	-0.003
	(0.013)	(0.008)	(0.010)	(0.005)	(0.003)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate diff × affiliate × post	-0.007	-0.009	-0.001	-0.001	-0.004
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate diff × affiliate	-0.048***	-0.022***	-0.027***	-0.009*	-0.002
	(0.013)	(0.008)	(0.010)	(0.005)	(0.003)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate diff × affiliate × post	-0.009	-0.008	-0.003	-0.003	-0.006*
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate diff × affiliate	-0.044***	-0.021***	-0.026**	-0.009*	-0.001
	(0.012)	(0.008)	(0.010)	(0.005)	(0.003)
Observations	58,176	58,176	58,176	58,176	58,176
Tax rate diff	Yes	Yes	Yes	Yes	Yes
Tax rate diff × post	Yes	Yes	Yes	Yes	Yes
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.178	2.178	2.178	2.178	2.178

Notes: This table examines the robustness of the results presented in Table 3 by replacing the explanatory variable Tax Rate$_{jt}$ in the destination country with the difference between this tax rate and Chile's tax rate. It shows the semi-elasticity of international payments with respect to changes in the difference between destination country and Chile's tax rates following Equation 4. Coefficients indicate the change in international payments associated with a one percentage point increase in the gap between destination country and Chile's tax rate. A negative semi-elasticity implies payments to a given country increase as the gap between tax rates falls, consistent with tax-motivated payments. This is the case in the pre-treatment period, as shown by the Tax rate diff. × affiliate coefficient. If the reform was effective at reducing tax-motivated payments to affiliates abroad, we would expect the coefficient for the post-treatment period in the first row to be positive. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs. non-affiliates in country j. Data start in 2007. *Tax rate diff.* indicates the difference between the statutory tax rate in the destination country and Chile's tax rate. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is an affiliate of firm i. *Post* is a dummy equal to 1 from 2011 onward. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C9: Impact of the Reform on the Sensitivity of International Payments to Changes in Destination Country Tax Rates, Robustness Check II: Firm-Year-Affiliation Status FE

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate × post	0.000	-0.006	0.002	-0.002	-0.005
	(0.014)	(0.009)	(0.011)	(0.004)	(0.004)
Tax rate × affiliate	-0.055***	-0.025***	-0.032***	-0.008	-0.003
	(0.013)	(0.009)	(0.010)	(0.005)	(0.004)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate × post	0.009	-0.004	0.009	-0.003	-0.004
	(0.013)	(0.008)	(0.011)	(0.004)	(0.004)
Tax rate × affiliate	-0.055***	-0.025***	-0.032***	-0.008	-0.003
	(0.013)	(0.009)	(0.010)	(0.005)	(0.004)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate × post	0.008	-0.004	0.008	-0.004	-0.005
	(0.013)	(0.009)	(0.011)	(0.004)	(0.004)
Tax rate × affiliate	-0.055***	-0.025***	-0.032***	-0.008	-0.003
	(0.013)	(0.009)	(0.010)	(0.005)	(0.004)
Observations	58,176	58,176	58,176	58,176	58,176
Tax rate	Yes	Yes	Yes	Yes	Yes
Tax rate × post	Yes	Yes	Yes	Yes	Yes
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes	Yes
Firm FE × year × affiliate	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.178	2.178	2.178	2.178	2.178

Notes: This table examines the robustness of the results presented in Table 3 by adding firm-year-affiliation status fixed effects. It shows the semi-elasticity of international payments with respect to changes in destination country tax rates following Equation 4. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. A negative semi-elasticity implies payments to a given country increase as tax rates fall, consistent with tax-motivated payments. This is the case in the pre-treatment period, as shown by the Tax rate × affiliate coefficient. If the reform was effective at reducing tax-motivated payments to affiliates abroad, we would expect the coefficient for the post-treatment period in the first row to be positive. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs.non-affiliates in country j. Data start in 2007. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is an affiliate of firm i. *Post* is a dummy equal to 1 from 2011 onward. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C10: Impact of the Reform on Sensitivity of International Payments to Changes in
Destination Country Tax Rate, Robustness Check III: Destination Country-Year FE

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate × post	-0.013	-0.011	-0.004	-0.001	-0.004
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate × affiliate	-0.049***	-0.022***	-0.028***	-0.009*	-0.003
	(0.013)	(0.008)	(0.010)	(0.005)	(0.003)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate × post	-0.006	-0.009	-0.000	-0.001	-0.004
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate × affiliate	-0.047***	-0.022***	-0.027***	-0.009*	-0.002
	(0.013)	(0.008)	(0.010)	(0.005)	(0.003)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate × post	-0.010	-0.009	-0.003	-0.002	-0.007*
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate × affiliate	-0.045***	-0.021***	-0.025**	-0.009*	-0.001
	(0.013)	(0.008)	(0.010)	(0.005)	(0.004)
Observations	58,176	58,176	58,176	58,176	58,176
Tax rate	Yes	Yes	Yes	Yes	Yes
Tax rate × post	Yes	Yes	Yes	Yes	Yes
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Destination country FE × year	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.178	2.178	2.178	2.178	2.178

Notes: This table examines the robustness of the results presented in Table 3 by adding destination country-year fixed effects. It shows the semi-elasticity of international payments with respect to changes in destination country tax rates following Equation 4. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. A negative semi-elasticity implies payments to a given country increase as tax rates fall, consistent with tax-motivated payments. This is the case in the pre-treatment period, as shown by the Tax rate × affiliate coefficient. If the reform was effective at reducing tax-motivated payments to affiliates abroad, we would expect the coefficient for the post-treatment period in the first row to be positive. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs. non-affiliates in country j. Data start in 2007. *Post* is a dummy equal to 1 from 2011 onward. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is a foreign affiliate of a Chilean firm. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C11: Impact of the Reform on Sensitivity of International Payments to Changes in Destination Country Tax Rate, Robustness Check IV: Firm-Destination Country FE

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate × post	-0.013	-0.011*	-0.004	-0.001	-0.004
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate × affiliate	-0.049***	-0.022***	-0.028***	-0.009*	-0.003
	(0.013)	(0.008)	(0.010)	(0.005)	(0.003)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate × post	-0.006	-0.009	-0.000	-0.001	-0.004
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate × affiliate	-0.047***	-0.022***	-0.027***	-0.009*	-0.002
	(0.013)	(0.008)	(0.010)	(0.005)	(0.003)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate × post	-0.010	-0.009	-0.003	-0.002	-0.007**
	(0.010)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate × affiliate	-0.045***	-0.021***	-0.025**	-0.009*	-0.001
	(0.012)	(0.008)	(0.010)	(0.005)	(0.003)
Observations	58,176	58,176	58,176	58,176	58,176
Tax rate	Yes	Yes	Yes	Yes	Yes
Tax rate × post	Yes	Yes	Yes	Yes	Yes
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Firm × destination country FE	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.178	2.178	2.178	2.178	2.178

Notes: This table examines the robustness of the results presented in Table 3 by adding firm-destination country fixed effects. It shows the semi-elasticity of international payments with respect to changes in destination country tax rates following Equation 4. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. A negative semi-elasticity implies payments to a given country increase as tax rates fall, consistent with tax-motivated payments. This is the case in the pre-treatment period, as shown by the Tax rate × affiliate coefficient. If the reform was effective at reducing tax-motivated payments to affiliates abroad, we would expect the coefficient for the post-treatment period in the first row to be positive. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs. non-affiliates in country j. Data start in 2007. *Post* is a dummy equal to 1 from 2011 onward. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is a foreign affiliate of a Chilean firm. Outcomes in $\log(Y+1)$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C12: Impact of the Reform on Sensitivity of International Payments to Changes in Destination Country Tax Rate, Robustness Check V: IHS Transformation of Outcome Variables

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate × post	-0.014	-0.012*	-0.005	-0.001	-0.004
	(0.011)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate × affiliate	-0.052***	-0.024***	-0.030***	-0.009*	-0.003
	(0.013)	(0.009)	(0.011)	(0.005)	(0.004)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate × post	-0.006	-0.010	-0.001	-0.001	-0.004
	(0.011)	(0.007)	(0.008)	(0.005)	(0.004)
Tax rate × affiliate	-0.050***	-0.023***	-0.029***	-0.009*	-0.002
	(0.013)	(0.008)	(0.011)	(0.005)	(0.004)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate × post	-0.010	-0.010	-0.003	-0.002	-0.008*
	(0.011)	(0.007)	(0.008)	(0.004)	(0.004)
Tax rate × affiliate	-0.047***	-0.022***	-0.027**	-0.010*	-0.001
	(0.013)	(0.008)	(0.011)	(0.005)	(0.004)
Observations	58,176	58,176	58,176	58,176	58,176
Tax rate	Yes	Yes	Yes	Yes	Yes
Tax rate × post	Yes	Yes	Yes	Yes	Yes
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	2.178	2.178	2.178	2.178	2.178

Notes: This table examines the robustness of the results presented in Table 3 by using the inverse hyperbolic sine (IHS) transformation of the outcome variables. It shows the semi-elasticity of international payments with respect to changes in destination country tax rates following Equation 4. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. A negative semi-elasticity implies payments to a given country increase as tax rates fall, consistent with tax-motivated payments. This is the case in the pre-treatment period, as shown by the Tax rate × affiliate coefficient. If the reform was effective at reducing tax-motivated payments to affiliates abroad, we would expect the coefficient for the post-treatment period in the first row to be positive. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs. non-affiliates in country j. Data start in 2007. *Post* is a dummy equal to 1 from 2011 onward. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is a foreign affiliate of a Chilean firm. Outcomes in $\log(Y + sqrt(1 + Y^2))$. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C13: Impact of the Reform on Sensitivity of International Payments to Changes in Destination Country Tax Rate, Robustness Check VI: Extensive Margin

	(1) All	(2) Royalties	(3) Services	(4) Interests	(5) Other
Panel A: Up to 2013					
Tax rate × affiliate × post	-0.00127	-0.00095*	-0.00053	-0.00019	-0.00020
	(0.00090)	(0.00058)	(0.00073)	(0.00039)	(0.00031)
Tax rate × affiliate	-0.00433***	-0.00185***	-0.00280***	-0.00064	-0.00033
	(0.00104)	(0.00065)	(0.00086)	(0.00044)	(0.00030)
Observations	45,248	45,248	45,248	45,248	45,248
Panel B: Up to 2014					
Tax rate × affiliate × post	-0.00060	-0.00076	-0.00020	-0.00020	-0.00027
	(0.00088)	(0.00054)	(0.00070)	(0.00039)	(0.00031)
Tax rate × affiliate	-0.00427***	-0.00181***	-0.00275***	-0.00068	-0.00031
	(0.00103)	(0.00063)	(0.00086)	(0.00044)	(0.00030)
Observations	51,712	51,712	51,712	51,712	51,712
Panel C: Up to 2015					
Tax rate × affiliate × post	-0.00094	-0.00078	-0.00045	-0.00028	-0.00051
	(0.00087)	(0.00054)	(0.00070)	(0.00037)	(0.00033)
Tax rate × affiliate	-0.00410***	-0.00178***	-0.00267***	-0.00071	-0.00023
	(0.00101)	(0.00062)	(0.00085)	(0.00044)	(0.00031)
Observations	58,176	58,176	58,176	58,176	58,176
Tax rate	Yes	Yes	Yes	Yes	Yes
Tax rate × post	Yes	Yes	Yes	Yes	Yes
Log(GDPpc) in destination country	Yes	Yes	Yes	Yes	Yes
Firm FE × year	Yes	Yes	Yes	Yes	Yes
Firm FE × affiliate	Yes	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes	Yes
Number of firms	1,206	1,206	1,206	1,206	1,206
Pre-treatment average countries per firm	2.68	2.68	2.68	2.68	2.68
Mean outcome in 2009	0.198	0.073	0.122	0.021	0.021

Notes: This table examines the robustness of the results presented in Table 3 by estimating a linear probability model, where the outcome equals to 1 when firm i makes a payment to the destination country j in year t and zero otherwise. It shows the semi-elasticity of international payments with respect to changes in destination country tax rates following Equation 4. Coefficients indicate the change in international payments associated with a one percentage point increase in the destination country tax rate. A negative semi-elasticity implies payments to a given country increase as tax rates fall, consistent with tax-motivated payments. This is the case in the pre-treatment period, as shown by the Tax rate × affiliate coefficient. If the reform was effective at reducing tax-motivated payments to affiliates abroad, we would expect the coefficient for the post-treatment period in the first row to be positive. This analysis is at the level of firm-year-country-affiliation status, i.e., payments by firm i in year t to affiliates vs.non-affiliates in country j. Data start in 2007. *Post* is a dummy equal to 1 from 2011 onward. *Tax rate* indicates the statutory tax rate in the destination country. *Affiliate* is a dummy equal to 1 when the recipient firm of the payment is a foreign affiliate of a Chilean firm. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1

Table C14: Placebo Outcome: Impact of the Reform on Domestic Sales

	(1) Up to 2013	(2) Up to 2014	(3) Up to 2015
Post × multinational	0.208	0.203	0.303
	(0.292)	(0.289)	(0.301)
Effect in % change	1.70 %	1.66 %	2.47 %
Pre-treatment avg sales/payroll × year	Yes	Yes	Yes
(Pre-treatment avg sales/payroll) squared × year	Yes	Yes	Yes
Pre-treatment avg sales/assets × year	Yes	Yes	Yes
(Pre-treatment avg sales/assets) squared × year	Yes	Yes	Yes
Pre-treatment avg sales × year	Yes	Yes	Yes
(Pre-treatment avg sales squared) × year	Yes	Yes	Yes
Industry × year	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	98,539	112,616	126,693
Mean outcome of multinational firms in 2009	12.248	12.248	12.248
Number of multinational firms	2,752	2,752	2,752
Number of control firms	11,325	11,325	11,325

Notes: This table shows the placebo test for impact estimates of the reform on domestic sales/payroll, expressed in standard deviations, following the event study specification of Equation 6, which compares multinationals to internationally-active domestic firms. Standard errors clustered at the firm level. All continuous variables in levels are winsorized at the 99^{th} percentile of non-zero values. Standard errors clustered at the firm level. These results correspond to those in Panel (a) of Figure 4.

Table C15: Impact of the Reform on Tax Payments and Placebo Test on Domestic Sales Robustness Check I: Common Support Based on Pre-Treatment Average Sales

	(1) Tax Paid	(2) Domestic Sales
Panel A: Up to 2013		
Post × multinational	-0.00283	0.00896
	(0.00728)	(0.29735)
Effect in % change	-2.26 %	0.09 %
Observations	94,045	94,045
Panel B: Up to 2014		
Post × multinational	-0.00086	0.06197
	(0.00760)	(0.29054)
Effect in % change	-0.69 %	0.64 %
Observations	107,480	107,480
Panel C: Up to 2015		
Post × multinational	0.00025	0.20380
	(0.00857)	(0.30442)
Effect in % change	0.20 %	2.10 %
Observations	120,915	120,915
Pre-treatment avg sales/payroll × year	Yes	Yes
(Pre-treatment avg sales/payroll) squared × year	Yes	Yes
Pre-treatment avg sales/assets × year	Yes	Yes
(Pre-treatment avg sales/assets) squared × year	Yes	Yes
Pre-treatment avg sales × year	Yes	Yes
(Pre-treatment avg sales) squared × year	Yes	Yes
Industry × year	Yes	Yes
Firm FE	Yes	Yes
Mean outcome of multinational firms in 2009	0.125	9.692
Number of multinational firms	2,249	2,249
Number of control firms	11,186	11,186

Notes: This table examines the robustness of the results presented in Tables 5 and C14, by controlling for common support based on pre-treatment average sales. It shows impact estimates of the reform on corporate income tax/payroll, expressed in standard deviations, following Equation 6, which compares multinationals to internationally active domestic firms. All continuous variables in levels are winsorized at the 99th percentile of non-zero values. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1. These results correspond to those in Figure C4.

Table C16: Impact of the Reform on Tax Payments and Placebo Test on Domestic Sales Robustness Check II: Common Support Based on Pre-Treatment Average Assets

	(1) Tax Paid	(2) Domestic Sales
Panel A: Up to 2013		
Post × multinational	0.00208	0.05170
	(0.00732)	(0.28149)
Effect in % change	1.69 %	0.49 %
Observations	86,954	86,954
Panel B: Up to 2014		
Post × multinational	0.00193	-0.01994
	(0.00760)	(0.27675)
Effect in % change	1.57 %	-0.19 %
Observations	99,376	99,376
Panel C: Up to 2015		
Post × multinational	0.00314	0.05219
	(0.00847)	(0.28923)
Effect in % change	2.55 %	0.49 %
Observations	111,798	111,798
Pre-treatment avg sales/payroll × year	Yes	Yes
(Pre-treatment avg sales/payroll) squared × year	Yes	Yes
Pre-treatment avg sales/assets × year	Yes	Yes
(Pre-treatment avg sales/assets) squared × year	Yes	Yes
Pre-treatment avg sales × year	Yes	Yes
(Pre-treatment avg sales) squared × year	Yes	Yes
Industry × year	Yes	Yes
Firm FE	Yes	Yes
Mean outcome of multinational firms in 2009	0.123	10.585
Number of multinational firms	2,292	2,292
Number of control firms	10,130	10,130

Notes: This table examines the robustness of the results presented in Tables 5 and C14, by controlling for common support based on pre-treatment average assets. It shows impact estimates of the reform on corporate income tax/payroll, expressed in standard deviations, following Equation 6, which compares multinationals to internationally active domestic firms. All continuous variables in levels are winsorized at the 99th percentile of non-zero values. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1. These results correspond to those in Figure C5.

Table C17: Impact of the Reform on Tax Payments and Placebo Test on Domestic Sales Robustness Check III: Scaling by Lagged Payroll

	(1) Tax paid over lagged payroll	(2) Domestic sales over lagged payroll
Panel A: Up to 2013		
Post × multinational	-0.0014	0.0552
	(0.0093)	(0.3989)
Effect in % change	-0.93 %	0.46 %
Observations	98,539	98,539
Panel B: Up to 2014		
Post × multinational	-0.0013	0.0148
	(0.0090)	(0.3772)
Effect in % change	-0.90 %	0.12 %
Observations	112,616	112,616
Panel C: Up to 2015		
Post × multinational	-0.0044	0.1034
	(0.0091)	(0.3671)
Effect in % change	-3.01 %	0.85 %
Observations	126,693	126,693
Pre-treatment avg sales/payroll × year	Yes	Yes
(Pre-treatment avg sales/payroll) squared × year	Yes	Yes
Pre-treatment avg sales/assets × year	Yes	Yes
(Pre-treatment avg sales/assets) squared × year	Yes	Yes
Pre-treatment avg sales × year	Yes	Yes
(Pre-treatment avg sales) squared × year	Yes	Yes
Industry × year	Yes	Yes
Firm FE	Yes	Yes
Mean outcome of multinational firms in 2009	0.147	12.118
Number of multinational firms	2,752	2,752
Number of control firms	11,325	11,325

Notes: This table examines the robustness of Tables 5 and C14, scaling by lagged payroll. It shows impact estimates of the reform on corporate income tax/payroll, expressed in standard deviations, following Equation 6, which compares multinationals to internationally active domestic firms. All continuous variables in levels are winsorized at the 99^{th} percentile of non-zero values. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1. These results correspond to those in Figure C6

Table C18: Impact of the Reform on Tax Payments, Including Audits

	(1) Tax paid	(2) Tax paid including audits
Panel A: Up to 2013		
Post × multinational	-0.00027	0.00048
	(0.00704)	(0.00705)
Effect in % change	-0.18 %	0.33 %
Observations	98,539	98,539
Panel B: Up to 2014		
Post × multinational	0.00084	0.00219
	(0.00738)	(0.00740)
Effect in % change	0.58 %	1.50 %
Observations	112,616	112,616
Panel C: Up to 2015		
Post × multinational	0.00085	0.00186
	(0.00820)	(0.00822)
Effect in % change	0.58 %	1.27 %
Observations	126,693	126,693
Pre-treatment avg sales/payroll × year	Yes	Yes
(Pre-treatment avg sales/payroll) squared × year	Yes	Yes
Pre-treatment avg sales/assets × year	Yes	Yes
(Pre-treatment avg sales/assets) squared × year	Yes	Yes
Pre-treatment avg sales × year	Yes	Yes
(Pre-treatment avg sales) squared × year	Yes	Yes
Industry × year	Yes	Yes
Firm FE	Yes	Yes
Mean outcome of multinational firms in 2009	0.146	0.146
Number of multinational firms	2,752	2,752
Number of control firms	11,325	11,325

Notes: This table shows the same analysis as in Table 5, but including tax payments resulting from audits. It shows impact estimates of the reform on corporate income tax/payroll, expressed in standard deviations, following Equation 6, which compares multinationals to internationally active domestic firms. All continuous variables in levels are winsorized at the 99th percentile of non-zero values. Standard errors clustered at the firm level. ***p<0.01, **p<0.05, *p<0.1. These results correspond to those in Figure C7.

D Interviews

D.1 Identifying Likely Intra-group Trade Using Tax and Customs Data

To identify trade that is likely to be intra-group, we proceed as follows: We use the customs data to calculate total amounts of imports and exports at the firm-country level (i.e., how much a given firm imports from and exports to a given country). We then compare these amounts to reported intra-group imports and exports by country, which firms are required to provide in tax annexes starting in 2012 as part of the reform.[1]

Matching these two sources, we compare a firm's total amount of trade by country from the customs data with the total amount of trade with affiliates in that country from the tax data. We consider imports to be likely intra-group in firm-country cases where the amount of intra-group imports in the tax data is close to the amount of total imports in the customs data (and analogously for exports).

One challenge of combining the trade data from taxes and customs records is that there can be discrepancies due, for example, to differences in the timing when transactions are recorded. This can lead to the amount of trade recorded in the tax data exceeding the amounts reported in the customs data. To ensure that our results are not driven by these potential discrepancies, we report results for three different bandwidths of the shares of intra-group trade relative to total trade—80% to 120%, 90% to 110%, and 95% to 105%—to define likely intra-group trade.

D.2 Qualitative Interviews: Methods

This appendix contains further information on the qualitative interviews discussed in Section 3.1. We conducted in-person interviews in November 2014

[1] These tax annex data provide information on the affiliation of the trading partner but no information about products or prices.

with senior transfer pricing consultants in three of the Big Four consulting firms in Chile and a larger number of interviews over video conference between May 2021 and May 2022. This second round was much more exhaustive and included consultants both from all Big Four firms and smaller consulting firms as well as senior in-house tax experts at multinational corporations.

In line with common sample selection criteria for qualitative research, we aimed to reach interviewees who span the range of key experts related to the transfer pricing reform. We identified potential respondents through publicly available information on company websites and LinkedIn and a partial snowball sample of referrals from previous respondents. While the goal in quantitative empirical analysis is generally to get a large enough sample size to have the power to detect statistically significant effects, qualitative interview approaches usually determine adequate sample size by considering "saturation". After interviewing enough participants (for a long enough duration each), answers tend to converge, and adding new participants no longer provides additional insights. This is when the process is said to "have reached saturation". Therefore, sample sizes are usually considerably smaller than those in quantitative analyses (see, e.g., Beitin 2012).

In our analysis, saturation is applied to a purposive (also called purposeful or nonprobability) sample, which is commonly used in qualitative research. Purposive sampling selects respondents based on their individual characteristics to identify themes common to a heterogeneous group of respondents (Shaheen, Pradhan, and Ranajee 2019). Overall, we conducted 20 interviews with an average duration of about an hour. At the time of the interviews, 31% of our respondents worked at one of the Big Four, another 31% were in-house consultants, 13% worked at smaller boutique consulting firms, and 25% were tax authority officials. The gender distribution was 25% women and 75% men. 37% had worked for the tax authority at some point in their career. The experts had a combined 252 years of professional experience in transfer pricing.

A roadmap guiding the conversation formed the basis for the semi-structured interviews. In contrast to fixed scripts, an interview roadmap leaves the flexibil-

ity for the conversation to evolve with the goal of potentially discovering unexpected findings. Moreover, it can be adapted to incorporate new topics that emerge during the interviews with future interviewees. After identifying such new themes and topics in early interviews, we adapted the roadmap to incorporate these new themes explicitly and to learn whether other respondents had similar or different experiences on these issues. This was one way in which conducting multiple interviews with the same respondents was helpful, as it allowed us to follow up and corroborate points raised by other interviewees.

The roadmap was similar for all respondents but differed in some parts based on their role (consultants vs.in-house tax experts). The questions in the roadmap were kept quite broad and open, designed to allow the flow of the conversation to follow inputs brought up by respondents (following the method described, for example, in Krueger and Casey 2014). Accordingly, we used an approach of curious engagements, using open-ended follow-up questions such as: *"How come?"*, *"Can you tell me more about this?"*, *"How did this work?"*, *"How did others respond?"*, *"Could you explain further"*, *"Could you give me an example?"*, *"And then, what happened?"*, *"Is there anything else we did not touch on yet in our conversation?"*, etc.

Roadmap of the interviews

We started all interview by introducing ourselves, describing the scope of the study, explaining that all answers would be subject to confidentiality, and confirming participants' consent. We then continued by asking respondents broad background questions, both as a warm-up and in order to get to know them better: *"How long have you been working in transfer pricing/international taxation?"* In response, participants usually told us a summary of their professional history in the industry.

Next, we asked open-ended questions about the general perception of the impact of the reform:*"What is your general perception of the impact of the transfer pricing legislation change, both from a government and business perspective?"* Thereafter, the roadmap differed slightly depending on whether the respondent was an ex-

ternal consultant or an in-house expert. To better understand the main mechanisms underlying the changes in response to the reform and to explore whether we could identify any testable hypotheses emerging during the interviews, we asked consultants: *"What were the main changes companies undertook in response to this reform?"*, followed by a number of follow-up questions to ask about changes in specific areas, such as the location of activities, intra-company trade prices, as well as any changes in their debt, interest, royalties, or service payments. For example, a testable hypothesis that emerged from these conversations was the centralization of cost centers described in Section 3.6.

Respondents from multinational companies were asked: *"Could you describe a little bit how transfer pricing decision-making works in your company? Has this changed with the transfer pricing reform?"* and *"We would like to understand how companies reacted to the new transfer pricing legislation. What were the main changes observed in the companies you know?"*. In response, participants usually described at length the different types of internal changes that occurred in their company following the reform, and sometimes additional things they had heard from other companies or experienced in other firms they worked in previously.

During conversations with both in-house experts and external consultants, we aimed to gain a better understanding of how demand for tax advisory services changed after the reform. We asked respondents from multinational companies: *"Did the transfer pricing reform cause the companies you know to increase their transfer pricing-related tax management expense (internal/external/both)?"*. If the answer to this question was *yes*, we followed up with a series of questions asking what changes were made regarding in-house or external tax expertise, what motivated these changes, what additional work was undertaken, etc.

In conversations with representatives from consulting companies, we explained that *"We are interested in better understanding the evolution of the transfer pricing advisory industry following the reform. We heard that there was a lot of growth in this industry after the reform."* and then asked: *"What do you think was the impact of the reform on this industry?"*. This was followed by a number of more specific questions about where the additional transfer pricing experts came from, what

type of work they undertook in terms of compliance support and tax planning, as well as the dynamics in client relations.

Finally, we ended the conversation by asking for any additional perspectives we might have missed: *"Are there any other aspects of the transfer pricing taxation situation or legislative change that we should be aware of?"*.

Additional Quotes

In the following, we list additional quotes from the interviews by topic:

Growth in the Tax Advisory Industry

- "For the tax advisors, this whole thing is great. In 2011, we were a team of two. Now, we are 26."

- "Even before the change, there was work on this topic in Chile. This was often pushed from the headquarters of the firm, but it was much less than now. For a long time, they had only 1-2 people at big consulting firms working on transfer pricing advisory."

- "Before the reform, the tax authority had no tools to implement the arm's-length principle in practice. For example, it had neither references nor documentation requirements. I worked in the department that negotiated this in 2009, after which the tax authority created a specialized department, which I joined. There we realized that the perception was that there was no of risk in this area. Many corporate taxpayers had recurring losses from related party transactions. They thought they could do whatever they wanted. The information that we asked for as a result of the reform was a revolution in the country."

- "Before the reform, some companies did not do price studies. They only used the accountant's information, and the accountants had no idea of the transfer pricing rules. Consequently, there was a significant risk of violating the arm's length principle, because pricing was totally out of place. Nowadays, companies that do not carry out price studies are rare."

- "The cost of compliance has increased dramatically. Now you need a specialist for everything, and then the firms start to see the risks. Subsequently, they need more consulting, and costs increase."

- "With the new system, there is much more work for consulting firms, while before the reform, the Big Four did not have a substantial team specialized in transfer pricing."

Demand for Compliance Support

- "The main change companies undertook following the reform was to formalize and systematically document the intra-group transactions, in order to be able to fill out the form correctly. They look for consultants to know how to price these transactions."

- "A consulting firm helps us with the comparables. They have to find the best form in which we need to report to the tax authority, as it keeps changing."

- "The introduction of the transfer pricing reform was a surprise and extremely expensive for companies. The risk of making a mistake was considerable, and the fines were costly. Now a company can either pay 5k to KPMG for compliance services or 10k and more to the SII in penalties."

- "The external support helps a lot with the new requirements."

- "Pricing studies are not mandatory to prepare, but absolutely recommended. In my opinion, filling out the new tax forms well without doing a pricing study as technical support is impossible."

- "The internal person in our company collects all the internal information, while the consultancy assures that the transactions are compliant."

- "The main change of the reform was that we formalized many of the transactions within the international group that we usually did not explicitly charge before the reform. We now need more for consultants to learn how to set prices."

Complementarity of Compliance Support and Tax Planning Services

Supply Side

- "In the beginning, the firms were focused on complying. Later we started selling more products. We tell them every year about the opportunity of tax planning, for example, 'you are losing a lot of money in this transaction.' Sooner or later, they start to be motivated to look at their transfer prices. The consulting firm grows with tax planning. Therefore, we focus on selling planning."

- "Approximately 15% of our clients do not want planning. Around 25% come directly to us for planning, while the remaining 60% 'graduate' to planning."

- "Often, a firm is newly a client of the consulting firm with the goal of compliance, and then they start learning about strategies."

- "You can plan. It is so easy to plan that arm's-length does not work. It is very easy to circumvent it. There is no higher tax collection because now the firms comply, but at the same time, the consultants offer you the product that helps you to plan."

- "I really like providing transfer pricing services when it relates to planning. Compliance is a little less interesting."

- "I totally agree with the hypothesis that the increased availability of expert consultants in Chile helped firms optimize their tax strategies such that even though there is more monitoring, they don't end up paying more taxes. This is exactly what I see with my clients, too. This one company came for compliance, but we detected an ineffciency. It's common sense. I see it in my work."

- "The reform is the worst of both worlds. The mandatory reporting pushed firms to the consultants, who in turn taught them how to be more tax efficient. At the same time, the monitoring capacity is limited."

Demand Side

- "In Chile, the reform was a beginning of a change in thinking. Before, it was something very particular, and nobody talked about it. What accelerated the process was the arrival of these people with a vision that was much more aligned with the OECD. They showed us how it's done, for example, in Spain, and helped us reach the same level. They helped us to get a more global view, not only considering local compliance. The reform produced this, but I am not sure this was the intention."

- "Our company now sees that there is a strategic opportunity here. Previously, management thought, 'Why should I get involved in tax problems.' As they only focus on complying, they only see the risk, not the opportunity. Hence, the internal management needs first to understand that there is an opportunity here, then they pay more attention. "

- "Under the old system, the firms didn't pay much attention to transfer pricing. Now they do pay attention and do much more planning for transfer pricing."

- "Advisors came from abroad from countries that knew about transfer pricing. New bosses in the companies understood this, and they changed the incentives. Many firms went to consulting firms as a result of the reform. Due to this change, firms realized that there is a whole methodology and opportunity there."

- "We learned that for our company, the reform is an opportunity, not just an issue of tax compliance. We have to see transfer pricing as a strategy. For example, in the case of royalties, we learned that we can be smarter than we were before. Often, it makes sense to charge subsidiary for using the brand, if it is profitable in the destination country. But when the subsidiary is making losses, it can be justified to actually pay the subsidiary to introduce the brand in another country, rather than charging it. Before we learned about this possibility, the subsidiary had losses. But now it doesn't, while

the Chilean firm has more expenses, which is efficient from a tax point of view. Before, most firms would charge the same fees to all branches, which was terrible and resulted in fiscal inefficiency."

- "First, we start with compliance and our firm sends the information in the format and time required. Then comes a second phase where we say, let's do the compliance, but at the same time correct things that are inefficient."

- "Companies are more organized now, so there has been some impact. Some may have adjusted their taxes downward, seeing the reform as an opportunity rather than a problem. This may a criticism of the reform, it may lead to more awareness of the issue. As comparables the firms used before were not perfect from a tax optimization standpoint, when they went through their books, they realized: 'Ah, look, here's an opportunity to use more beneficial comparables."'

- "We as a company have over 30 inter-company services. We work with the consulting firm to define the policy, and they make suggestions. The external team prepares master files for us, and we review them and disseminate them internally. We have meetings with the consultancy every week. The cost is lower externally, and in general, we try to externalize everything that is not the core of the business. In the first moment, it is not cheaper, but in complex situations, they can share best practices they see elsewhere."

Supply Response of Consulting Services

- "I arrived in Chile in 2012 from Argentina because of the transfer pricing reform. In Argentina, I worked at a Big Four firm. Before that, I spent a year in Spain, working at a Big Four firm."

- "Given that the OECD standards are general, there is a lot of mobility."

- "Experts came from Argentina, Venezuela, Spain, and Colombia. Both to the Big Four and to the tax authority. They tended to come from Big Four affiliates in these other countries. By now, there are a few Chilean experts as well."

- "I'm originally from Argentina and came to a Big Four in Chile from a Big Four in Argentina. Then, I moved to be an in-house expert at an MNC in international taxation."

Centralization of Cost Centers

- "Many times, we advise companies to determine a country where all payments are concentrated, such as the United States, Mexico, or the Netherlands."

- "Usually, concentrating the cost centers does not involve a change in the location of subsidiaries, just a change in some activities, such as centralizing procurement and supplies. Companies then use a commission-based model for centralizing things. On the one hand, this leads to business advantages, economies of scale of having a single team. But, in addition, having a unified location in a single country is also beneficial for transfer pricing purposes."

Revolving doors

- "I am originally from Colombia, where I learned about transfer pricing. Then I joined a Big Four in Chile before working for the Chilean tax authority for a couple of years. I helped the tax authority with the creation of the new form and with the first round of audits they conducted."

- "The tax authority strengthened its transfer pricing team. They brought in experts from consulting from the market. Now they have a very powerful team at the tax authority."

- "In a couple of years, the Chilean tax authority got to a level of implementation that is better than other countries that have had the OECD norms for many more years."

- "Many of the experts that were at the Chilean tax authority were subsequently contracted by the private sector and have left again. Only one person is still there."

- “Moving from consulting to the tax authority and vice versa happens a lot. For example, one consultant from a Big Four company in Columbia came to the Chilean tax authority and then left for a Big Four company in Chile before going back to a Big Four company in Colombia. Another one went from the Chilean tax authority to a Big Four company and then to a multinational.”

- “The transfer pricing rules are international so that people can move. The Chilean tax authority brought in a Chilean and a Colombian specialist, both from the Big Four. Later they returned to the Big Four after 4-5 years.”

- “Often when there is a very good person [in the SII], the private sector snatches that person away.”

Chapter 4

Taking State-Capacity Research to the Field: Insights from Collaborations with Tax Authorities

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Abstract

No modern state can exist in the long term without effective taxation. Recent research emerging from close collaboration of academics with tax authorities has shed new light on how states can build such tax capacity. Using both randomized and natural experiments, these partnerships have not only opened access to new types of data, but have also stimulated new perspectives and research questions. While much of research in public finance had historically assumed that a tax in the law is a tax that is collected, exciting new research takes an empirical look inside the black box of tax administration. It addresses issues ranging from the role of information and digitalization, to taxpayer behavior or the link between taxation and citizens' relationship to the state. This paper provides a brief overview of some of this research, as well as practical advice for those interested in implementing research in partnership with tax authorities or other large public entities.

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4.1 Introduction

Strengthening state capacity and the ability to effectively and fairly collect taxes is a key priority for many governments around the the world. Modern states execute a broad range of roles, ranging from assuring security, rule of law, and infrastructure to providing services in the areas of education and health, or social programs. In order to be able to effectively implement these policies, countries need to acquire the ability to enforce compliance with tax obligations. A growing literature in economics stresses the importance of such state capacity for the development of a functioning state and a functioning economy (e.g. Besley and Persson 2009; Besley and Persson 2013b).

Four key considerations provide impetus for policy makers and researchers to focus increasingly on tax capacity and domestic resource mobilisation, particularly in low- and middle-income countries:

1. Obtaining funding for government services and infrastructure investments.
2. Reducing distortions in the economy between different types of firms and economic activities, which can have negative impacts both on economic efficiency and societal fairness.
3. Strengthening and improving the relationship between citizens and the state.
4. Reducing dependence on international aid and donors.

While much of the research in public finance has historically assumed that a tax in the law directly leads to a tax in the treasury, in practice there can be a wide gap between those two (see Slemrod 2007; Slemrod 2018). Tax evasion is a fundamental challenge for developing countries, where the informal sector often accounts for a substantial share of the economy. Even in the US, evasion is estimated to be 16-18% (IRS 2016), and among high net worth individuals, it can be particularly high, even in rich countries with strong monitoring systems (Alstadsæter, Johannesen, and Zucman 2018).

Through close partnerships of researchers with tax authorities, a recent strand of literature has focused more closely on understanding this gap and ways to reduce it. These collaborations have infused the public finance literature not only with a new wealth of data but also with a fresh set of questions, based on the exchange of ideas with the policy partners. One key topic that has gained prominence relates to the information extraction problem that tax authorities face. A major obstacle to converting a tax in the law into a tax in the treasury is the ability of the authorities to obtain reliable information about the amount of taxes that are due. Lack of such information is thought to be a major reason why tax collection as a share of GDP was historically much lower than in today's highly developed countries. This paper discusses some recent research on this question, both historically for rich countries and currently for emerging economies.

Access to information is a crucial and necessary, but not sufficient element of fiscal capacity. Other elements such as legal enforcement capacity, political constraints, corruption, citizen tax morale, and taxpayers' ease and ability to comply also play a crucial role. All these issues today represent active and exciting areas of research, many of which are being studied in close collaboration with authorities around the world. This paper provides an overview of some of these recent research projects and situates them both in a historical and practical perspective.

The paper is structured as follows. Section 4.2 discusses some stylized facts about taxation around the world and over time. Section 4.3 delves more in depth into one aspect that has made the historic increase in tax collection possible: access to information for the tax authority about taxable activities in the economy. Section 4.5 includes a review of some of the research conducted with tax authorities on a range of related topics.[1] Section 4.6 provides some practical advice on building and maintaining fruitful research collaborations with tax authorities, based on personal interviews as well as responses from an anonymous online survey with experienced academics. Section 4.8 concludes.

[1]Due to space constraints, this review focuses on research collaborations relating to topics of mutual interest between academics and tax authorities. We therefore do not include research conducted with tax authorities on issues unrelated to taxation and public finance or studies that rely on standardized tax data available through private institutions or national statistical offices.

4.2 Some Facts about Taxation around the World

In today's rich countries, the state fulfills a large variety of functions that go far beyond what it did a century ago. The state builds and maintains advanced public infrastructures, manages a wide reaching set of social programs such as in the areas of health and education, implements substantial economic redistribution, and oversees regulation of complex industries. A century ago, states did not have the capacity or resources to take on all these roles.

Figure 1 shows tax revenue as a share of GDP in four of today's rich countries over the last century and a half. In all of these countries, tax revenue as a share of GDP was near or below 10% until the early 20th century. This is a similar share to that of today's low-income countries.

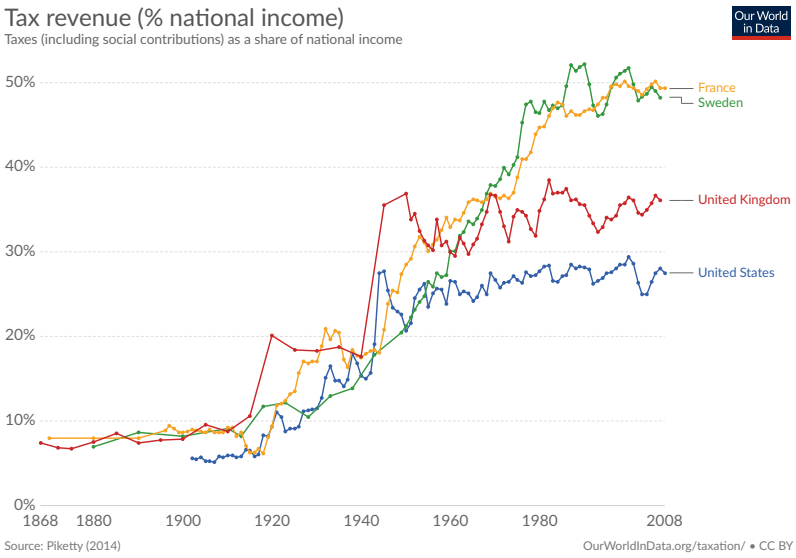


Figure 1: Tax revenue (% national income).
Source: Ortiz-Ospina and Roser (2018)

Lower tax collection a century ago was not merely a political choice. Countries simply lacked the capacity to collect significantly more taxes (e.g. Kleven, Kreiner, and Saez 2016b). Throughout the 20th century, some countries acquired a much higher tax collection capacity and most high-income countries today have shares of tax/GDP between 25% and 50%.

Figure 2 shows today's tax collection as a share of GDP around the world. Countries with lower incomes per capita generally tend to have a smaller tax/GDP

ratio. Combining a low GDP per person with less taxes collected as a share of GDP means the tax revenues of these states are much lower than those in rich countries.

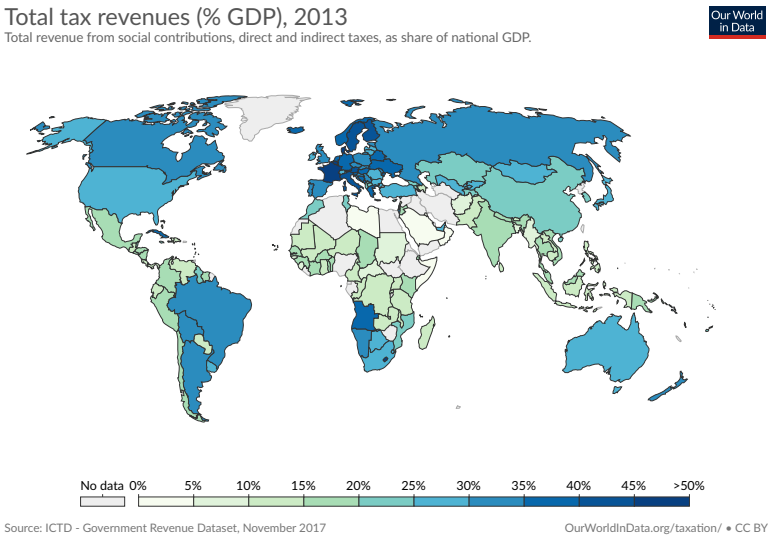


Figure 2: Tax revenues (% GDP).
Source: Ortiz-Ospina and Roser (2018)

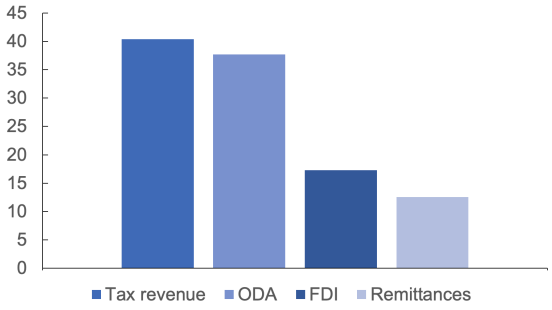
Strengthening tax capacity is therefore a key priority for many governments in low and middle-income countries. Four main reasons drive these efforts: First, as discussed above, many governments aim to build a larger tax base in order to raise money to fund infrastructure development and public services.

Second, the unequal tax enforcement that is prevalent in many low and middle-income countries can lead to large distortions in the economy between economic activities that are taxed, and other activities that effectively escape taxation through evasion (Skinner and Slemrod 1985). For a given size of government revenue, the burden on those who (have to) comply is correspondingly larger the less the rest of the population contributes. This can lead to very large tax rates for certain economic activities that are easier to tax (e.g. Gordon and Li 2009b). Overcoming these distortionary tax systems could therefore lead to substantial economic gains, as well as increase economic fairness.

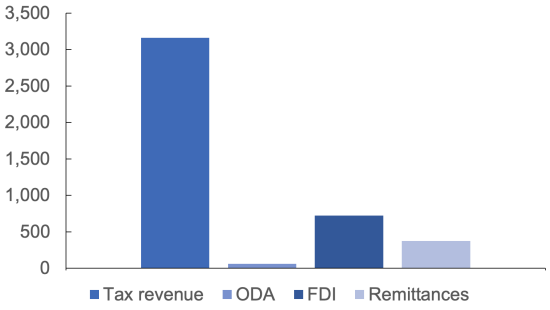
Third, building a wider tax net may be a way to strengthen the ties and transform the relationship of citizens with the state (e.g. Tilly 1985; Bates and Lien

1985; Ross 2004). A recent fascinating field experiment in the Democratic Republic of Congo tested this hypothesis (Weigel 2019). Weigel worked closely with a Provincial Government to implement a randomized strategy of tax enforcement. In randomly selected neighborhoods, tax collectors went door-to-door to collect the property tax, while neighborhoods in the control group kept the baseline system that relied on self-declaration. This intervention substantially increased tax collection. Furthermore, citizens in the treated neighborhoods were also more likely to engage politically, both by attending townhall meetings with government officials and by submitting anonymous suggestions to the provincial government.

Finally, raising tax collection capacity also allows countries to reduce their dependence on aid or "official development assistance (ODA)". In some countries, aid is larger than the total amount of domestic tax collected, and in low-income countries overall these two types of income are of similar magnitude. In contrast, in middle-income countries tax revenues are on average over 50 times larger than international aid (Figure 3).



(a) Low income countries (billions of US$)



(b) Middle income countries (billions of US$)

Figure 3: Tax revenues compared to other financial flows in low and middle-income countries.

Source: World Bank (2011).

It is also worth noting that in both groups of countries tax revenues are on average significantly larger than foreign direct investment (FDI) flows or remittances paid by emigrants.

As states grow economically, aid tends to fall and tax revenues tend to grow. In this process, the state's investment in fiscal capacity and economic development can act as complements (Besley and Persson 2009). It is therefore critical to ensure that the distribution of aid itself does not undermine the building of the state's capacity to collect and manage tax revenues, for example by bypassing the state (e.g. Kaldor 1963; Djankov, Montalvo, and Reynal-Querol 2008; Mascagni 2016; Bizhan 2017; Page and Pande 2018). While bypassing the state in the disbursement of international aid may sometimes be easier for foreign donors in the short run, it has the potential to significantly undermine the building of state capacity.

4.3 Building Tax Capacity: Information Is King

One of the key challenges in tax administration is that, to impose any tax, the state needs information about the taxable transactions taking place in the economy. This is particularly difficult in less developed economies, where many firms are not registered, and even among registered firms a substantial share of transactions remains informal. Governments in less developed countries therefore tend to have much less information about taxable transactions (e.g. Gordon and Li 2009b; Kleven, Kreiner, and Saez 2016b).

4.3.1 Historical perspective

This information extraction problem is one of the main reasons why today's rich countries also used to have tax systems that focused on those economic activities that were easiest to observe. Much of taxation used to be collected in the form of tariffs or tolls (e.g. Hinrichs 1966; Cagé and Gadenne 2018). One notable example are the Danish "Sound Dues". Taking advantage of the fact that trade through the Sound Strait was both easy to monitor and hard to substitute away from, these tolls, collected from ships that passed through the Strait, made up about 2/3 of Danish state income in 16^{th}-17^{th} centuries.

Figure 4: Pending caption.

Note: Historic image of the Sound Strait, from "Liber Quartus: Urbium Praecipuarum Totius Mundi" (Braun and Hogenberg 1617).

While today's rich countries have vastly broadened their tax base, in developing countries the tax structures often still reflect this limited access to information (Gordon and Li 2009b). Compared to OECD countries, low and middle-income countries tend to have a higher share of taxes collected in the form of tariffs on imports or exports, although the difference has fallen over time. This reflects mostly the persistent decline of tariff revenues that has taken place in developing countries (Cagé and Gadenne 2018). They also tend to collect more taxes from firms, rather than from individuals, since collecting information from a smaller number of firms tends to be less challenging than monitoring the much larger number of individuals in an economy (e.g. Kopczuk and Slemrod 2006b; Slemrod 2008). Figure 5 illustrates these tendencies for a number of OECD vs non-OECD countries.

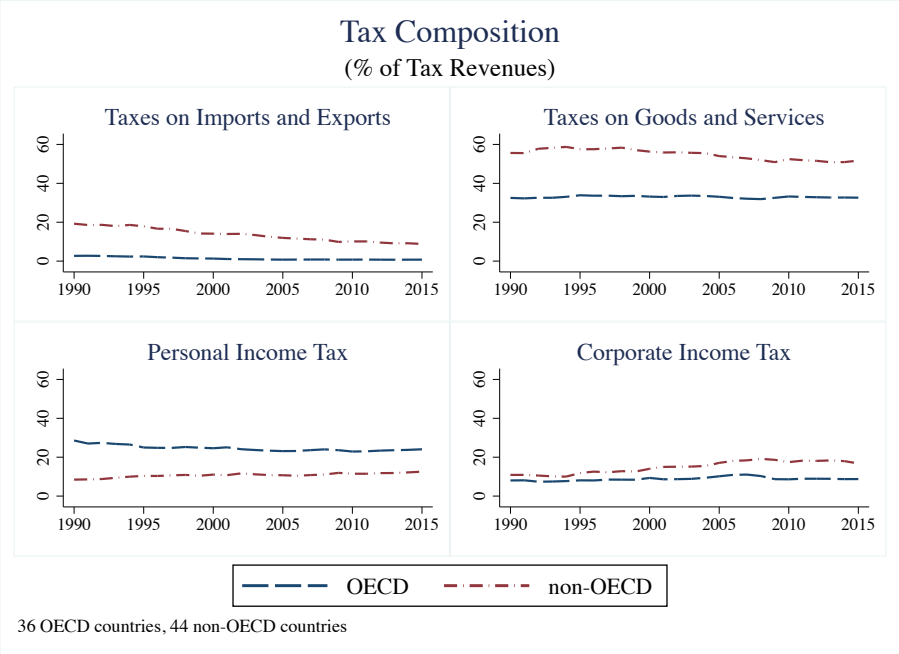


Figure 5: Composition of Tax Revenues in OECD vs. Non-OECD Countries.

Note: These figures represent the unweighted averages of tax revenues of OECD and non-OECD countries as they appear in the OECD Global Revenue Statistics Database. Source: O.E.C.D. 2018.

Many recent collaborations of researchers with tax authorities have therefore focused on evaluating mechanisms aimed at increasing the information to which the tax authority has access. One key source of information in this context is "third-party reporting" (e.g. Kopczuk and Slemrod 2006b; Gordon and Li 2009b; Kleven, Kreiner, and Saez 2016b). Such reporting happens when an agent in the economy has an incentive to report information to the government that includes evidence of a tax obligation by another agent. This then creates a so-called paper trail of information that the government can use for tax enforcement.

A well-known example of such third-party reporting happens in the case of wages. Employers file their wage forms to the government in order to deduct the wages from their profit tax, which then leaves a paper trail about the employees' incomes. As countries grow their sources of third-party reported information, their tax collection capacity tends to grow (Jensen 2019). For today's low and middle-income countries, this possibility has a lot of potential, but also some lim-

itations. The onset of modern computational power and digitalization allows for cross-checking very large quantities of information, which makes the existence of third-party information potentially much more powerful. On the other hand, as we will discuss below, building an effective web of third-party information and using it for tax enforcement has its own challenges.

4.3.2 Studying the Role of Information for VAT Enforcement in Chile

In a long-term collaboration with the Chilean tax authority, we studied the effectiveness of third-party information in the case of the Value Added Tax (VAT) through two large-scale randomized field experiments (Pomeranz 2015a). At the time the pilots of these interventions were conducted, taxation was still thought by many to be an area where randomized field experiments were not applicable. Pioneering work by the Minnesota tax authority (Coleman 1996) had implemented a randomized letter message experiment to study income tax compliance using normative appeals (Blumenthal, Christian, and Slemrod 2001) and deterrent messages (Slemrod, Blumenthal, and Christian 2001b). In collaboration with the Chilean tax authority (SII), we tried to take this method one step further and use it to evaluate the role of third-party information.

The VAT is paid by firms on the value-added portion of their sales, i.e. on sales minus input costs. It had long been thought to have a "self-enforcing" property by providing downstream client firms with an incentive to ask suppliers for a receipt, which they can use to deduct the input costs from the VAT. This creates an auditable paper trail along the production chain. Due in part to the claimed self-enforcing property of VAT, the number of countries that adopted a VAT has increased from 50 in 1990 to over 165 today (O.E.C.D. 2016). Yet rigorous evidence on the effectiveness of such a paper trail was scarce.

A big challenge was how to evaluate a policy, such as the VAT, which was already in place. It was not possibly to exogenously vary who was subject to the VAT, nor was there a natural experiment of a policy change. We employed an "in-

direct use of randomization" (Khwaja and Mian 2011), designing interventions that interacted with existing policies and allowed for testing of the underlying mechanisms.

Over a year-long phase of exploratory work and pilot testing with the research department of the tax authority, we developed two interventions. In the first, we studied how the VAT chain affects tax compliance nationwide. We exploited the fact that the "self-enforcement" of the VAT breaks down at the end of the production chain, since the final consumer does not have an incentive to ask for a receipt (see Figure 6).

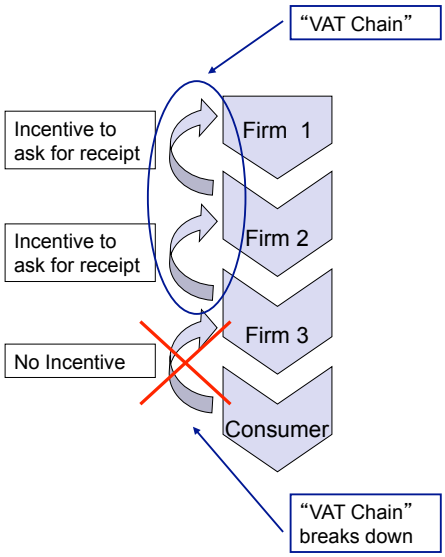


Figure 6: The VAT Chain Creates a Paper Trail.

Note: This figure illustrates the differing incentives that firms face when making sales to other firms versus to final consumers.

The tax authority sent letters to over 100,000 randomly selected firms, informing them that they had been randomly selected for special scrutiny and might be audited. We analyzed whether the paper trail can act as a substitute for the audit probability by measuring whether increased tax enforcement had less impact where the paper trail was present. This was indeed the case: while there was a sharp increase in the reported sales to final consumers, firms did not noticeably change reported sales to other firms or input costs (see Figure 7).

All else equal, an audit can detect more infractions on transactions covered by a paper trail. The fact that firms nevertheless had a stronger response on transactions that do not generate a paper trail suggests that they had been evading more on these transaction prior to receipt of the letter.

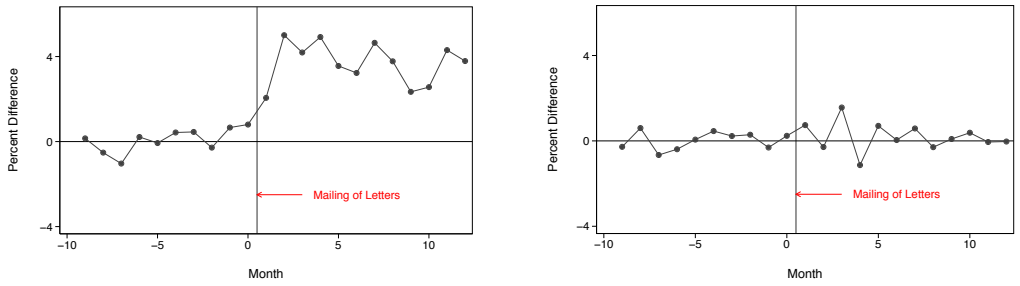


Figure 7: Impacts Sales to Final Consumers vs. Sales to other Firms.

Note: Percent difference between deterrence letter and control group in the probability of declaring more than in the same month of the previous year. From Pomeranz (2015a, Appendix).

These results suggest that the VAT paper trail in inter-firm transactions had a pre-emptive deterrence effect. However, it still leaves open the possibility that firms had responded differently in these two types of transactions for other reasons, e.g. if they had understood the letter to focus more on final sales, or because it may be harder for them to change behaviors involving another firm.

We therefore designed a second intervention to observe the self-enforcement mechanism in action. In this experiment, we tested whether increasing enforcement on one firm leads to spillovers up the VAT chain. To do this, the tax authority selected 5,600 small firms suspected of tax evasion to be audited. Half of them were randomly selected to receive a pre-announcement of an upcoming audit, while the other half did not receive any advance notice.

In line with the prediction of the "self-enforcing" mechanism in the VAT, the audit announcement not only increased tax payments of the firms receiving the audit pre-announcement, but also of their suppliers. This suggests that firms expecting audits began demanding receipts from their suppliers as proof of their input costs. The demand for receipts created a paper trail documenting the sales of suppliers, forcing them to increase their VAT payments to avoid punishment

for tax evasion. The fact that this spillover effect was not found among downstream client firms helps rule out that the effect was merely the result of word-of-mouth.

These findings suggest that verifiable paper trails can be a powerful tool for tax enforcement. Taxes such as the VAT may provide an advantage over other forms of taxation, such as a retail sales tax, because of the stronger paper trail. However, the results also show that information must be combined with deterrence to achieve effective tax enforcement. The mere existence of the paper trail created by a VAT system does not incentivize firms to accurately declare tax liabilities if the risk of being audited is low. The firms in the second experiment had low compliance prior to announcing audits; heightening deterrence by pre-announcing audits was necessary to trigger the effectiveness of the VAT paper trail and increase tax payments by supplier firms.

4.4 Limits to Enforcement based on Third-Party Information in Ecuador

The finding from Chile that it was the combination of information with effective enforcement capacity that led to tax compliance proved to be critical in a follow-up study that we undertook in collaboration with the tax authority in Ecuador (SRI) (Carrillo, Pomeranz, and Singhal 2017b). Ecuador had recently acquired the capability to electronically cross-check third-party information at a large scale. This allowed us to study the impact of the introduction of large-scale tax enforcement based on information cross-checks, and the challenges involved in such a policy reform.

Using VAT data, as well as other sources such as credit card sales, the Ecuadorian tax authority developed estimates of a firm's revenues based on third-party information. Almost 8,000 firms were notified about large discrepancies detected between the sales they had reported and third-party estimates. The tax authority

hoped that this would lead to a large increase in tax collection. However, the impact was below expectation, along two dimensions.

First, a large share of firms did not respond to the message. They anticipated -correctly- that the government did not have the capacity to formally audit and process the legal enforcement on such a large number of firms in a short period of time. When overall compliance is low, firms can rationally assume that government cannot prosecute everyone.

Second, among the firms that did respond and increased their reported revenues, there was a large compensating reaction: they also increased their reported costs by a similar amount, leading to only small increases in tax payments (see Figure 8). When third-party reporting is available on one margin of the tax declaration but not on others (in this example costs), the effectiveness of third-party reporting for tax enforcement can be severely limited. This concern can be an argument in favor of forms of taxation that provide third-party information covering the full tax base, as in the case of the turnover tax, as suggested by Best et al. (2015b).[2]

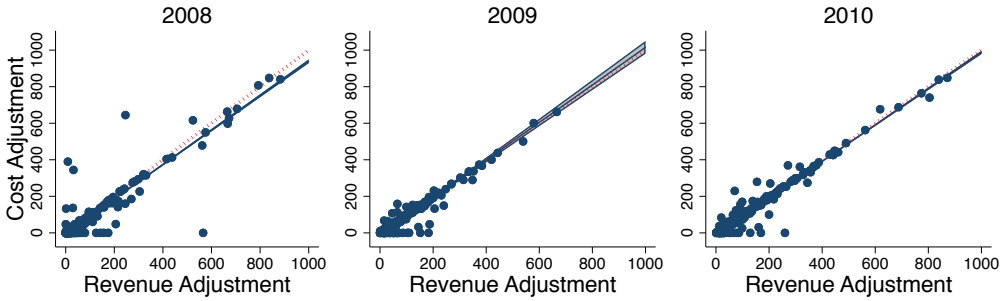


Figure 8: Firms Increased not only Reported Revenues, but also Reported Costs.

Note: Amounts of revenue adjustment and cost adjustment in the firms' tax filings in response to the notifications in thousands of USD. From Carrillo, Pomeranz, and Singhal (2017b).

[2]The reason this is difficult to achieve in the context of the VAT is that in settings of partial information, third-party reporting provides a lower bound. If firms report sales below the third-party reported amount, this is indication of under-reporting. However, a lower bound is not effective in case of costs, since misreporting on costs consists of over-, rather than under-reporting.

What does this imply for the role of third-party reporting as a tool to develop tax enforcement capacity? On the one hand, these results show that paper trails are not a panacea and not something that can be turned on and become effective immediately like a light switch. On the other hand, third-party information can still play a very important role in a number of ways.

First, when some transactions and firms are compliant with third-party reporting, authorities can focus their scarce auditing resources on the rest of the economy. Second, the deterrence power of paper trails can be built and strengthened over time. When firms report more costs, they have more incentives to ask for receipts, thereby increasing the coverage of the paper trail. The more firms comply and the more transactions are covered by paper trails, the more credible it is that authorities will clamp down on the rest.

To build this deterrence power, it may be in the interest of tax authorities to only send a small number of notices of discrepancies in the beginning, such that they have the capacity to follow up with enforcement on all taxpayers who do not respond to the notice or respond in a highly suspicious way (such as increasing costs by the exact same amount as revenues, as in the Ecuadorian experience). Over time, an increasingly larger share of taxpayers will respond to such notices, and therefore an increasingly large number of notices could be sent with a constant capacity for follow-up on non-compliers.

4.4.1 Growing Literature on the Role of Third-Party Information

A growing number of studies with tax authorities have contributed to our understanding of the importance and limitations of third-party reporting in different contexts. Kleven et al. (2011a) undertook a large randomized field experiment with the Danish tax agency, which varied both the real and perceived probability of being audited on the personal income tax and measured evasion in randomized audits. Third party reporting seems to have a very strong effect in deterring

evasion, and most evasion was concentrated on the small portion of income that was only self-reported.

Jensen (2019) takes a historical approach to this issue, analyzing third-party reporting on wages in a historical perspective. When work in the US shifted increasingly from self-employment to wage labor, this increased information about individuals' income for the government and led to a substantial expansion of state-level income taxes.

The monitoring effect cannot only flow from firms to employees, but also the other way around. In Mexico, employees started to receive written information about their employers' reports of their wages to the social security agency, which ultimately determine the employees' pension benefits. Kumler, Verhoogen, and Frías (2015) show that underreporting of wages fell considerably for workers with stronger incentives to monitor employers' reported wages.

Research by Naritomi (2018) investigates the weak spot in the VAT, namely sales to final consumers. Working with the government of Sao Paulo, Naritomi evaluated the impact of incentives for consumers to ask for registered receipts. Consumers were rewarded with tax rebates and lottery tickets if they asked for their ID numbers to be reported along with the receipt. These new information trails increased retail firms' reported revenues by over 20

The differential ease to evade VAT in transactions with final consumers as opposed to sales between firms was further documented by Mittal and Mahajan (2017a). In their study in the Indian state of Delhi, the authors show that after the government acquired the ability to cross-check buyer and seller records, VAT payments by wholesalers increased substantially more than those by retailers, who are more likely to sell to final consumers.

Much of the recent increase in use of third-party reporting is related to the growing digitalization of tax data (a topic extensively discussed in the book by Gupta et al. 2017).[3] A number of papers investigate this directly. Ali et al. (2015) find that when the Ethiopian Revenue and Customs Authority (ERCA) required

[3]Digitalization and online technology have also found to lead to improvements in another area of public finance: government procurement. See e.g. Bandiera, Prat, and Valleti (2009), Lewis-Faupel et al. (2016), and Gerardino, Litschig, and Pomeranz (2017).

firms to use electronic sales registry machines, firms VAT payments increased significantly. Okunogbe and Pouliquen (2018) implemented a randomized field experiment with the government of Tajikistan, promoting the use of electronic tax filing. While it did not affect average tax payments and bribes, electronic filing seemed to increase horizontal fairness. Firms classified by the tax authority as "high evasion risk" increased their tax payments, possibly because the scope for collusion with tax collectors in person was reduced. In contrast, "low evasion risk"-firms reduced their tax payments, possibly because tax collectors had previously extorted unjustified payments from them.

Brockmeyer and Hernandez (2018) study the power of third-party reporting compared with withholding of sales taxes in Costa Rica. While introducing third-party reporting significantly increased sales tax payments, direct withholding by credit card companies led to a substantially larger increase. Again, information on its own is of limited use in the face of constrained enforcement capacity, so even though withholding does not provide any additional information, it can play an important role by changing the default payment.

Overall, this fast-growing area of research suggests that while third-party information and digitalization can play an important role for tax enforcement and create powerful new tools for tax authorities, information on its own does not provide a panacea. However, enforcement capacity and information trails can be complements to each other. Strengthening other aspects of tax capacity therefore remains important, and we will discuss recent research on some of these other aspects in Section 4.5.

4.5 Strengthening Tax Capacity beyond the Information Extraction Challenge

4.5.1 Early randomized tax experiments

The first ever randomized field experiments with a tax authority that we are aware of date back to 1967 and took place in the United States. Schwartz and

Orleans (1967) cooperated with the American IRS to study what motivates tax compliance. They divided a sample of 374 taxpayers into two treatment and two control groups. The treatments consisted of interviews conducted by the research team, with one version emphasizing sanctions as a reason to comply and the other emphasizing the moral duty to pay taxes. One control group was interviewed with no emphasized topics (placebo), while the other control group was not interviewed at all (untreated). The only significant increase in reported income relative to the placebo group occurred in the "moral duty" group.

This pioneering study was followed by a number of lab experiments, aimed at studying the impact of varying audit and penalty rates in a more granular way (e.g. Friedland, Maital, and Rutenberg 1978; Spicer and Thomas 1982; Becker, Büchner, and Sleeking 1987; Alm, Jackson, and McKee 1992). In line with the classical Allingham and Sandmo (1972) model of tax evasion, these experiments generally found that higher audit and penalty rates reduced non-compliance.

In 1985, the IRS started implementing a series of randomized audits, through the Taxpayer Compliance Measurement Program (IRS 1996; IRS 2006). The goal of these extensive auditing programs was to estimate the tax gap, i.e. the amount of tax that was not paid voluntarily and punctually, and the type of taxpayer who had particularly large gaps.

4.5.2 Policies to Promote Tax Compliance

Communication strategies by the tax authority

As discussed above in Section 4.3, the Minnesota tax authority undertook what is to our knowledge the first letter message experiment with a tax authority (Coleman 1996; Slemrod, Blumenthal, and Christian 2001b; Blumenthal, Christian, and Slemrod 2001). These letter message experiments sparked a large series of follow-up studies to analyze the impact of different communication strategies on tax compliance.[4] Hallsworth (2014), Mascagni (2017), and Slemrod (2018)

[4]See e.g.: Torgler 2004; Torgler 2013; Wenzel and Taylor 2004; Wenzel 2005; Wenzel 2006; Hasseldine et al. 2007; Iyer, Reckers, and Sanders 2010; Kleven et al. 2011a; Ariel 2012; Carpio and Lucia 2014; Fellner, Sausgruber, and Traxler 2013; Ortega and Sanguinetti 2013; Harju, Kosonen,

provide comprehensive overviews of this literature. The most common letter experiments involve deterrence messages - which stress the risk of detection or the severity of penalties - and appeals to tax morale – which emphasize aspects such as the widespread social norm of voluntary tax compliance or the beneficial use of tax revenue. (For a great review of the literature on tax morale, see Luttmer and Singhal 2014).

In general, deterrence messages tend to have significant impacts on tax payments (even though there are notable exceptions, such as Mascagni 2017), while the results on impacts of appeals to tax morale are more mixed. It would be interesting to further explore the underlying mechanisms. Do the effects differ because deterrence is more important for compliance than tax morale factors such as social norms, or because the letters are not equally effective in shifting beliefs? It seems plausible, for example, that letters from the tax authority are more likely to shift perceptions of audit risks than perceptions of social norms.

A number of randomized interventions with tax authorities investigated not only the content of the message, but also the method of delivery. Ortega and Scartascini (2015) and Doerrenberg and Schmitz (2017) find that in Colombia and Slovenia, respectively, messages delivered in person had stronger impacts on tax payments than identical messages delivered via other channels. Emails were found to be more effective than physical letters both by Ortega and Scartascini (2015) in Colombia and by Mascagni (2017) in Rwanda.

Improving audit targeting strategies

Randomized deterrence messages can also be used as a tool to improve targeting of audits, as described in Pomeranz, Marshall, and Castellon (2014). Since audits are very costly, many tax authorities conduct careful analysis and use risk models

and Ropponen 2014; Bhargava and Manoli 2015; Castro and Scartascini 2015; Kosonen and Ropponen 2015; Ortega and Scartascini 2015; Chirico et al. 2016; Chirico et al. 2018; Dwenger et al. 2016; Guyton et al. 2016; Kettle et al. 2016; Kettle et al. 2017; Mascagni 2016; Bérgolo et al. 2017; Bott et al. 2017; Doerrenberg and Schmitz 2017; Hallsworth et al. 2017; Harju, Kosonen, and Slemrod 2017; Mascagni 2017; Shimeles, Gurara, and Woldeyes 2017; Biddle, Fels, and Sinning 2018; Brockmeyer and Hernandez 2018; Gemmell and Ratto 2018; House, Robitaille, and Mazar 2018; Meiselman 2018.

to select which taxpayers should be audited (see e.g. Khwaja and Mian 2011; Gupta and Nagadevara 2007; Hsu et al. 2015). One challenge with many such models is that the risk factors used are often endogenous, for example, when they are based on results from past audits. This can lead to self-fulfilling cycles: the types of taxpayers that are ex-ante deemed more likely to evade are monitored more intensely, therefore more often found to be incompliant, and then flagged by the model for additional audits.

Randomized deterrence letters can help to overcome this problem: taxpayers who strongly increase their tax payments in response are likely to have previously engaged in evasion. Tax authorities can combine letter experiment results with prediction models to see, which observable characteristics predict a strong response to deterrence.

Note: truthful communication on the part of the tax authority is very important. As discussed in the context of Carrillo, Pomeranz, and Singhal (2017b) above, the credibility and deterrence power of the tax authority is an important but fragile good. Empty threats should therefore be avoided.

Impacts of audits

A growing number of studies investigate not just the impact of a threat of audit, the general deterrence, but the effect of actually being audited, the specific deterrence. So far, these studies have mostly focused on high-income countries. In Denmark, Kleven et al. (2011a) study both the effect of a higher audit probability and the effect of being audited on personal income tax payments. As discussed above, their key finding is that this increase in tax payments following an audit was entirely driven by self-reported rather than third-party reported income. DeBacker et al. (2018b) and DeBacker et al. (2018a) and Advani, Elming, and Shaw (2017) also found lasting effects of audits on reported personal income in the US and the UK, respectively. Analogously, Guyton et al. (2018) find that when randomly-selected EITC claimants were requested to provide additional documentation to confirm their eligibility, they were less likely to claim EITC benefits in subsequent years. In contrast, DeBacker et al. (2015) found that US

corporations temporarily increased their tax aggressiveness following an audit, presumably acting on the belief that audits rarely happen to recently audited firms.

Penalties

Direct evidence on the effect of different penalties remains scarce. Experimental variation is usually not feasible for legal reasons. A notable exception is Aparicio, Carrillo, and Emran (2011), who use a differences-in-differences analysis to estimate the impact of a reform in Ecuador. An increase in the management's personal liability for tax crimes, including the possibility of prison, was associated with a significant increase in corporate tax payments.

Spillover effects of tax enforcement

As discussed above in Pomeranz (2015a), enforcement measures can go beyond the direct effects and lead to spillover effects to other taxpayers. In the VAT, this happens among trading partners along the supply chain. Rincke and Traxler (2011) study geographical spillovers of home audits for the Austrian broadcast tax. Inspectors visited households who did not pay the tax, to verify if they did not operate a TV and impose a fine if they did. Subsequently, other households in the same municipality also increased their tax payments. Relatedly, Drago, Mengel, and Traxler (2015) find that deterrence letters for the same broadcast tax also led to an increase in payments by neighboring households.

Boning et al. (2018) study spillover effects through tax preparers. Tax preparers play a very important role in the compliance behavior of many firms, and small firms often share an external preparer, rather than having a specialist in-house. Randomized in-person visits by a tax officers in the United States not only increased tax payments by the visited firm, but also had small impacts on other firms that share a tax preparer with the visited firm. Conversely, subsidiaries of visited firms somewhat reduced their tax payments, suggesting a possible reallocation of resources within the firm.

Strategic responses leading to bunching below enforcement thresholds

Two recent papers study the strategic response of taxpayers to enforcement actions. Almunia and Lopez-Rodriguez (2018) investigate the Large Taxpayers Unit in Spain, a program that subjects large firms to more and better audits. In response, firms kept their reported revenue under the program's threshold to avoid the additional monitoring. Carrillo, Emran, and Rivadeneira (2012) study the effect of discontinuous changes in the audit probability around withholding requirements. They find that there was substantial bunching of firms just above the withholding rate, suggesting firms tried to avoid the increased audit probability. In addition, firms who bunched near the threshold firms were more likely to misreport their sales and costs to the tax authority.

Positive incentives for tax compliance

Tax authorities sometimes use not only sticks but also carrots to promote compliance. Both in Argentina and in Montevideo, compliant taxpayers were entered in a lottery to win a reward. Researchers were able to study the impact of winning such a lottery (but not the overall effect of the existence of the lottery for compliers itself).

The nature of that reward seems to matter for the impact. In Argentina, a municipality rewarded 400 randomly selected compliant taxpayers with the construction of a sidewalk and public recognition in local media. Carrillo, Castro, and Scartascini (2017) found that both the lottery winners and their neighbors increased tax compliance in response. In contrast, when the government of Montevideo awarded a yearlong municipal tax holiday to randomly selected compliant taxpayers, this had the opposite effect. Dunning et al. (2017) found that it led to lower compliance by the winners following the holiday. This may be an indication that habit formation plays an important role for tax payment.

4.5.3 Taxpayer Responses to Tax Rates and Tax Regimes

For a long time, public finance research has devoted substantial efforts to estimating the behavioral responses to legal changes in taxation, such as the tax rate or other aspects of the tax regime. Responses can include both changes in tax evasion or avoidance and in real economic activity. Early empirical studies with tax authorities on the impact of the tax rate on evasion include those of the aforementioned Taxpayer Compliance Measurement Program (TCMP) of the American IRS. Using data from the TCMP, Clotfelter (1983) found that tax evasion was substantially higher for taxpayers with higher marginal tax rates, while findings by Feinstein (1991) were less conclusive. Consistent with Clotfelter's finding, the aforementioned study by Kleven et al. (2011a) found that audits in Denmark reduced the amount of bunching at kinks of the schedule of the tax rate, which implies that those with a higher marginal tax rate had been evading more taxes prior to the audit.

A vast literature analyzes the elasticity of the tax base with respect to the tax rate, generally by using publicly available tax return panels in the US, or data accessed through national statistics offices in Europe (see e.g. Saez, Slemrod, and Giertz 2012 for a review on the income tax). Recently, however, researchers have been able to cooperate with tax authorities in order to access novel administrative tax data to expand this literature. Chetty, Friedman, and Saez (2013) study the effect of the EITC on wage earnings. Devereux, Liu, and Loretz (2014) and Boonzaaier et al. (2019) study the taxable corporate income elasticity in the UK and in South Africa, respectively.

Londoño-Vélez and Ávila (2018) worked with Colombian tax data and sources from the "Panama Papers" to study the impact of taxation on taxable wealth. Using wealth tax reforms and discontinuities in the tax schedule, tax filers lowered their reported wealth to reduce their tax burden. Most of this response appears to have been due to evasion and avoidance behavior, rather than real changes in wealth. In particular, tax filers misreported items subject to less third party-reporting, and offshored assets to places like Panama.

Tourek (2019) investigates firm responses to a tax reform in Rwanda aimed at reducing tax liability. Rather than reducing tax payments, the reform instead lead to an increase in reported tax liability. Survey evidence reveals that many firms use past reported revenues as a benchmark and avoid filing reports that lead to a lower tax liability than in previous years, This is related to both their expectations about enforcement policies and uncertainty about their own true earnings. Such heuristic behavior is particularly prevalent among less educated and profitable entrepreneurs, leading to a regressive distribution of the effective tax burden.

The collaborations with tax authorities around the world has also engendered the study of taxes and tax regimes that are different from those in the US, which had been a focus of a large share of the preceding tax literature. One such phenomenon are notches in the tax schedule, where the tax amount increases discontinuously above certain thresholds. Such notches are particularly prevalent in developing countries. They create strong incentives to reduce (or underreport) earnings to remain below the notch. Kleven and Waseem (2013) show in the case of Pakistan that even when the underlying behavioral elasticities are modest, the incentives created by notches are so strong that the observed behavioral response can be very large.

Another characteristic of tax systems in developing countries, as discussed by Gordon and Li (2009b), is that they are often distortionary and lead to production inefficiencies. Best et al. (2015b) study the trade-off between production efficiency and revenue efficiency, i.e. efficiency for tax collection. In Pakistan, the production-inefficient turnover tax reduced tax evasion on corporate incomes by up to 70%, compared to a production-efficient profit tax.

Consistent with these findings, and with Carrillo, Pomeranz, and Singhal (2017b), Bachas and Soto (2018) analyze the Costa Rican corporate income tax regime and find that cost deductions can represent a weak spot in corporate income tax enforcement. Notches in the tax schedule had a much stronger impact on reported costs than revenues, likely because it is harder for tax authorities to verify costs. They calculate that moving to a turnover tax might therefore be

beneficial. Additionally, elasticities of corporate income are considerably larger in Costa Rica than those found by Devereux, Liu, and Loretz (2014) for the UK. This likely reflects the weaker enforcement capacity of developing countries.

In countries with low tax capacity and large elasticities on the evasion margin, changes in the tax regime can have large impacts on tax collection. Waseem (2018b) analyzes a reform in Pakistan that raised taxes on partnerships relative to other legal forms. Results from a difference-in-differences estimation show many affected firms changed their legal form or moved into informality, and the shift was so large that the net effect of the higher tax rate on revenue was negative.

4.5.4 Take-up of Tax Benefits

While an overarching concern of tax authorities is incomplete payment of tax obligations, implementing the tax legislation can also include the opposite concern: incomplete take-up of tax benefits, aimed at redistributing income, promoting investment, or other policy goals (see Currie 2006 for a more general review on non-take-up of social benefits). Bhargava and Manoli (2015) conducted a randomized field experiment with the IRS in California in which reminders were sent to individuals who were likely to be eligible for the Earned Income Tax Credit (EITC). This led to a substantial increase in claims for EITC payments. Providing additional information aimed to reduce social stigma or emphasizing the low cost of claiming the EITC did not further affect take-up. However, Manoli and Turner (2016) and Guyton et al. (2016) show that the impact of reminders faded relatively quickly in the following years. Studying firms rather than households, Bustos and Pomeranz (2016) find very low take-up of investment tax credits in Chile. Less than 15% of potentially eligible firms requested the tax credit. This stems in part from firms which indicate no taxable profits or who file on eligible investments in their tax declaration. However, even among firms with both taxable profits and eligible investments, only about 50% of firms took the tax credit.

4.5.5 Incentives for Public Officials

While the research covered above focuses mostly on the behavior of taxpayers, a growing number of studies also focus on policy impacts of public officials such as tax collectors or politicians.

Three randomized field experiments stand out with regards to the study of incentives for tax collectors and their impacts on tax collection and on bribes: Khan, Khwaja, and Olken (2016) and Khan, Khwaja, and Olken (2019) in Pakistan and Amodio et al. (2018) in the Kyrgyz Republic. Khan, Khwaja, and Olken (2016) find that while performance incentives for tax collectors led to higher tax payments by some taxpayers, they also increased bribe payment by others. This is consistent with the hypothesis that performance pay increases tax collectors' bargaining power vis-à-vis taxpayers. Khan, Khwaja, and Olken (2019) instead look at the effect of non-financial incentives, namely performance-based postings. These turn out to be almost as effective as performance pay, increasing tax revenue growth by over 30%. For governments with little fiscal space, performance-based postings can therefore be an interesting alternative to financial incentives. Amodio et al. (2018) study the impact of feedback incentives, in which tax inspectors' rewards were based on anonymous feedback by taxpayers. Consistent with the hypothesis that this reduces bribe-paying, they find that affected firms had lower costs and passed this on with lower prices for their customers. In addition, the paper by Okunogbe and Pouliquen (2018) shows that digitalization has the potential to significantly affect interactions public officials with taxpayers, as it can reduce the scope for public official's discretion in determining the tax liability.

Another way in which taxation can affect public officials is in the way it may affect politicians' expenditure decisions. One mechanism through which this may come about is that citizens who pay taxes may feel more empowered to exert pressure on elected officials. As discussed in Section 4.2 above, Weigel (2019) tests this idea in the Democratic Republic of Congo and finds that tax enforcement can indeed increase citizen engagement. In line with this, Gadenne (2017)

studies the impacts of a program that increased the tax capacity of Brazilian municipalities on the quality of government expenditures. This program led to improvements in the quality of public expenditures (particularly strongly in areas with a local radio station), while comparable increases in the government budget due to federal transfers did not.

Finally, tax enforcement policies can also affect who is in charge of public policy through impacts on elections. Casaburi and Troiano (2016) analyze the impacts of a program to detect and formalize unregistered buildings in Italy, which significantly increased tax revenues and local government expenditures. As a result, local politicians from areas where the program was most intense experienced a substantial boost to their re-election chances.

Overall, as the short review in this section has shown, partnerships with tax authorities have sparked interesting new research avenues in many areas of the economics of taxation. Many key questions remain to be explored, and the growing number of collaborations between academics and policy experts in tax authorities promises to continue to provide new insights for both economic theory and practice. The following section provides some pointers for researchers and practitioners interested in building such partnerships.

4.6 The Increase and Nature of Collaborations with Tax Authorities

The number of collaborations between academic economists and tax administrations around the world has been increasing steadily over recent years. These partnerships take different forms and levels of intensity. They can involve data sharing to study questions of mutual interest, quasi-experimental evaluations of policy reforms, or the joint implementation of field experiments.

In this section, we draw on personal interviews as well as responses from an anonymous online survey with researchers engaged in this type of partnerships, to provide a descriptive view of what such research processes can look like and

some practical advice. The survey was conducted in August and September 2018 among around 70 researchers who had conducted studies in collaboration with tax authorities aimed for publication in academic economics journals.

Respondents reflect a wide range of experiences, with 34% having undertaken projects with tax authorities in low-income countries, 37% in middle-income countries and 57% in high-income (OECD) countries. In most cases, researchers worked very closely with the tax authorities over an extensive period of time. Over half had been collaborating with tax authorities for more than 4 years. In about half of the cases, the academic authors had spent more than 3 months at the tax authority. In only a small number of cases the collaboration focused exclusively on access to data. About half of the collaborations involved information sharing about the context beyond the data and feedback by the tax authority on the research findings. Over a third of the collaborations went beyond that and consisted of jointly developed research projects, with daily or weekly interactions.

Different collaborations with tax authorities often have similar phases, which can overlap or reoccur multiple times. This section summarizes some common experiences and advice from survey respondents on:

1. Establishing the relationship.
2. Exploratory qualitative analysis and potentially piloting of an intervention.
3. Data collection, confidentiality and academic independence.
4. Main data analysis.
5. Communication with the tax authority about the research results.

4.7 Establishing the Relationship

There are many different avenues to start a conversation with a potential government partner and build a strong foundation for a long-term research relationship. Essentially, this is a matching problem. Many tax authorities are interested in the

work of academics, and many researchers are looking for a policy partner. The challenge is to overcome asymmetric information about where these potential partners are. For researchers interested in getting involved in this type of work, the main advice is therefore to knock on many doors and reach out to many people.

Among the survey respondents, 19% reached out to the tax authority directly in a cold call or email, while in 13% of cases the tax authority had reached out to the researcher. Conferences and events can be a useful platform to initiate a relationship: 20% of respondents started their relationship at such an event. In the remaining cases, the contact came about through a direct or indirect relationship: through an advisor or co-author or through a personal or professional contact.

One key ingredient for a successful partnership tends to lie in winning the strong interest in the research collaboration of at least one influential person in the tax authority. In cases where the collaboration involves more than data sharing, these internal partners can also play a crucial role in building support across sub-departments of these large public institutions. A couple of survey respondents pointed out that it was ideal to work both with a very senior person to have broad buy-in and with a mid-ranked person who is more involved in the day-to-day activities and who is less likely to be replaced in case of a change in political leadership. An additional practice that has developed in some locations is for a research-related institution to play a brokering role between researchers and public authorities. These institutions have the potential to become long-term partners of public authorities, thereby reducing transaction costs for the researchers and potential risks for the public body.

Asked about the main reasons why partners in the tax authority were interested in research collaborations, six common themes stood out:

1. Learning about more effective ways to increase revenue collection and reduce tax evasion.

2. Learning about new research methods.

3. Leveraging their own data and being able to implement research projects that individuals in the tax authority were interested in but did not have the time to pursue on their own.

4. Opportunity to get an independent opinion on relevant policy issues.

5. Providing stimulating experience for staff who are interested in research.

6. Prestige for officials to work with famous academic institutions.

To be able to build and maintain a successful relationship, it was key for researchers to put themselves in the shoes of their research partners within the tax authority and to really take the time to learn about their institutional partners' experiences, perspectives, and needs. It is rarely the case that an idea that occurs to an academic researcher from a distance ends up corresponding exactly to the interests, priorities and feasibilities of the tax authority. This may be one of the reasons why almost 40% of research ideas emerged from a joint process of searching for topics of mutual interest. Survey respondents gave the advice to "listen to what the tax authority would like to know and build that into your research agenda" and to "do your best to look out for their interests and not only yours." Helpful information about how to build a success research partnership with practitioners can also be found in Glennerster (2014) and Glennerster (2015).

Even after the establishment of the relationship, many researchers invest significant time and energy in nurturing and strengthening that collaboration. When asked about which was the most serious challenge to the implementation and survival of the research project, 23% of respondents named setting up of the relationship and a similar share named dealing with turnover within the tax authority and other challenges in the relationship. In contrast, only one respondent ranked data analysis as highest, and over half of respondents ranked data analysis as the least challenging aspect of the project.[5]

By far the most repeated points of advice in our survey related to the importance of the depth and the breadth of the relationship. "It's crucial to have a

[5]Getting access to the data and implementing field work ranked in between the other choices.

permanent relationship", "Don't underestimate the bureaucratic issues", "Make sure the relationship lasts until the end of the project, for clarification about the context of the data", "Form close relationships with the people at the tax authority and talk to them often", "Get to know individuals in the tax authority who are interested in research", etc.

Concrete advice included the following: "Be extremely patient and realize that you are not (and should not be) their top priority. "Make sure you listen carefully to their feedback as they understand the data and institutional details much better than you – at the same time, be careful with the anecdotes they tell you.", "Provide frequent feedback. Email every two months at a minimum about how things are going, and go to in-person meetings in addition."

4.7.1 Exploratory Qualitative Analysis and Potentially Piloting of an Intervention

In order to strengthen the quality of the economic analysis, it is often very fruitful to conduct qualitative exploratory work, to improve researchers' understanding of the context and help generating hypotheses and improving the interpretation of results. See for example Glennerster, Walsh, and Diaz-Martin (2018). Survey respondents frequently emphasized this point: "Try to embed yourself in the tax authority for a period". "Listen and observe what's going on in the country, in the tax office, on the news, etc." "Go and listen to people in the tax administration. Go with a few loose ideas of what you're interested in, but most of all with an open mind and intense curiosity."

In cases where the collaboration involves a randomized field experiment, conducting a pilot of the intervention before the large-scale study is an important step that can significantly enhance the quality and probability of success of the project. Piloting has important benefits both for academic and institutional purposes.

From an institutional perspective, a pilot intervention reduces the risk of unforeseen difficulties. Potential problems that emerge can be addressed at small

scale before causing more serious difficulties. A pilot also allows for stronger implementation, and in cases where the project is controversial within the tax authority, it can help reduce concerns about potential problems with the intervention.

From an academic perspective, the pilot plays an important role in a number of ways. First, it allows testing whether the intervention indeed works in the way it was conceived. More often than not, there are unexpected responses or difficulties that arise, and the intervention can then be adjusted correspondingly. An informative pilot often combines a small-scale intervention with additional qualitative exploratory conversations to gain a deeper understanding of the context. It also makes it more likely that the large-scale intervention will work as intended. Finally, the pilot can sometimes allow researchers to get baseline information that can be used for power calculations.

There are many excellent resources about both the econometric methods and the practical implementation of randomized field experiments. We will therefore not cover this topic in detail. The book by Glennerster and Takavarasha (2013) as well as the website of the Poverty Action Lab provide guidance on many technical and practical questions involved in running randomized evaluations. Some aspects can differ when running a randomized field experiment in collaboration with a government rather than a non-governmental institution, as discussed in Chabrier, Hall, and Struhl (2017).

4.7.2 Data Collection, Confidentiality and Academic Independence

There are typically two types of data that may be involved in research projects of this nature: administrative tax data and survey data. One big benefit of research conducted in partnership with a large institution such as a tax authority is that much of the analysis can be implemented by using existing administrative data. This can substantially reduce project costs, as no surveys or project-specific data collection may be required. On the other hand, a key challenge is that tax data is

highly confidential. Access for researchers is therefore always subject to varying degrees of restrictions, with the goal that researchers cannot identify individual tax payers in the data and that no data can leak to unauthorized persons. Almunia and Lopez-Rodriguez (2018) describe two case studies of how to organize access to tax data and emphasize the importance of high data security and equality of access across researchers.

Data access and confidentiality can represent a hurdle for research. Choosing among five different aspects of the research project, over 30% of respondents indicated that getting access to the tax data and dealing with data confidentiality was the most time-consuming part of the collaboration. In contrast, the actual analysis of the data was judged by most respondents as the least time-consuming aspect. Managing the relationship with the tax authority, implementing fieldwork and preparing the data for analysis ranged in between.[6]

In order to grant access, even to de-identified data, tax authorities typically ask researchers to sign a legal agreement. One important point to consider in these data access agreements is the assurance of academic independence. While the tax authority has the prerogative to define the scope of the work that can be done with their data, it is inadvisable to sign any agreements that provide the authorities a veto right about whether or not the results can be published, as this could seriously jeopardize academic independence and research transparency. As one survey respondent put it: "You are not an employee of the government, but an independent academic. So do collaborate and use the tax authority's expertise, but do not compromise on the right to publish what you find." It is therefore important to clearly define the scope of the work ex-ante, and agree that all results within that scope can be published, independent of the findings.

[6]In the case of fieldwork, the responses were bimodal, with 30% of respondents saying it was the most time intensive aspect – presumably many of those having implemented randomized field experiments – while 33% responded that this was the least time intensive – presumably many of those focusing exclusively on analysis of existing data.

4.7.3 Main Data Analysis

Working with administrative tax data provides its own benefits and challenges, as discussed extensively in Slemrod (2016) and Feeney et al. (2015). One key benefit of working closely with the tax authority is that researchers can gain many insights from the experts of tax administration who have a deep understanding of the data and the context. These experts can not only explain to the researchers how the different variables are constructed and defined, but also provide deeper insight for their interpretation. This allows the researchers to adopt the "mindest of a plumber" in their search for relevant academic insights Duflo (2017). Many of the survey respondents provided advice in this direction: "Talk to some of the frontline people who actually work with the data for administrative purposes, who are the main data creators and users", "You'll learn that some variables may mean different things than what you thought.", "Reserve a lot of time to understand the data structure".

Just as qualitative, exploratory conversations are helpful when designing the study, as discussed above, it is often very fruitful to return to such conversations after having implemented some of the quantitative analyses. The experts from the partner institution can often provide helpful feedback on preliminary research results. Their input on possible interpretation can lead to new hypotheses that can be tested in the data, or a deeper understanding of the context from which the quantitative results emerge.

4.7.4 Communication with the Tax Authority about the Research Results

After long periods of collaboration, with often significant costs on individuals within the tax authority in terms of time and effort, it is crucial that researchers take the time to share the results with the partners in the tax authority. This can include two important, separate aspects: the research findings, and the research methods.

With regards to the methods, academics often have knowledge of new methods that those analyzing data within the tax authority are eager to learn. This may involve sharing of files describing how the researchers analyzed the tax data and teaching of the methods employed in the process. This can involve a variety of approaches, including workshops, sharing codes, and providing specific feedback for ongoing internal research in the tax authority. Over 40% of survey respondents reported that the tax authority had adopted research methods used in their projects for their own internal analysis.

In terms of sharing research findings, researchers take a range of approaches with varying degrees of involvement. All survey respondents shared the findings with the tax authority, and many used multiple channels in parallel. At the most basic level, researchers can send the academic paper to the policy partners. 70% of respondents did so. However, this by itself may be of limited use, as the technical nature of such documents is often only accessible to a small group of experts within the tax authority. About half of respondents therefore wrote a policy report and over 80% gave an in-person presentation of the results. One of the most effective approaches consists of meeting in-depth with the partners in the tax authority and thinking together about ways in which the results may be useful and may have actionable implications for the government. What academics should avoid in all cases is making promises about how learnings will be shared and then never follow through in the end.

Sharing of results can sometimes lead government partners to implement policy changes, large or small. Some of these changes are based on the direct research results of the academic paper. 64% of respondents indicated that there had been some policy changes as a result of a specific finding in their academic study. These impacts ranged from adjustments to the format of notices sent to tax payers, to changes to the auditing strategies and internal management structure, to legal reforms of the tax schedule. Results from the joint academic studies were also used by tax officials in policy conversations and negotiations both with other government entities and with international donors. In other cases, there can be "side products" of learnings that emerge during the collaboration, for example

when academic collaborators notice some opportunities for improvement and make suggestions, which are not an explicit result of the academic study. Almost half of respondents reported such impacts. These ranged from helping in organizing the collection or management of data to improvements to internal logistics, to new ways of measuring employee performance and new approaches for auditing strategies.

4.8 Conclusion

State capacity and the ability to raise taxes in an effective, fair and efficient way are key foundations of the modern state. A growing number of research projects, implemented in partnerships between academics and practitioners from tax authorities, have helped to shed new light on these important issues. This trend has been fueled by a combination of increased availability of large-scale administrative data, a growing penchant of economists to combine quantitative data analysis with fieldwork-based research, and renewed interest of the economics literature for the role of institutions and the impact of specific administrative policies.

In a fruitful iterative cycle, this strand of the literature both tests existing theories and provides empirical puzzles that can generate new theoretical hypotheses. The wide range of geographical, economic and cultural contexts in which these research projects are undertaken, allows to build an increasingly rich picture of the mechanisms at play. Both theory and replications help gaining a deeper understanding about which effects are very context-specific, and which mechanisms seem to be robust across many settings (Bates and Glennerster 2017).

As this strand of the literature grows, many additional research topics remain to be explored, including in areas such as the impact of tax enforcement on real economic activity, the role of social norms, the distributional implications of tax policies and tax enforcement, the role of discrimination in tax administration or the interplay of politics and power with taxation.

Conclusion

This thesis has examined two key aspects of governance through empirical analyses of direct democracy and tax enforcement. Chapter 1 reveals that the thematic composition of the ballot can systematically influence voter participation. Agricultural referendums mobilize voters from rural and right-leaning relative to urban and left-leaning ones, in concurrent votes unrelated to agriculture. While the impact of agricultural referendums on the 2021 CO_2 bill was likely limited, policy themes that differentially mobilize urban voters are more likely to affect voting outcomes, given that they represent a larger share of the population.

On the taxation front, Chapters 2 and 3 demonstrate the challenges of international tax enforcement. Despite Chile's efforts to adopt OECD transfer pricing standards, the reform failed to reduce profit shifting by multinational corporations. Instead, it expanded the tax advisory industry, as experts developed more sophisticated planning strategies. This finding illustrates the dynamic nature of tax enforcement, where a race between authorities and taxpayers can benefit intermediaries at the expense of society.

Chapter 4 contextualizes these findings within the broader literature on tax capacity, highlighting the importance of information systems, third-party reporting, and effective enforcement mechanisms. It also emphasizes the value of research partnerships between academics and tax authorities and provides practical recommendations for successful collaborations.

These studies show that behavioral responses to policy interventions can lead to unintended consequences, whether changes in voter composition or expanded tax planning activities. Implementation details critically influence policy effectiveness, suggesting policymakers should pay close attention to design features and potential strategic responses. This research underscores the complementary relationship between information and enforcement capacity, showing that neither is sufficient alone to ensure compliance. In conclusion, this thesis contributes to our understanding of how institutional design affects political participation

and policy implementation, offering insights that can help improve democratic representation and tax capacity.

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