Three Essays on Taxes, Public Policy and the Distribution of Income

by

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Dedicated to my grandparents Charles and Elizabeth Wegener
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ABSTRACT

This dissertation contains three essays that leverage novel administrative datasets to examine the relationship between public policies and the distribution of income.

Chapter 1 analyzes the role of the firm in mediating responses to changes in personal income tax rates. I create a new linked owner-firm-employee dataset to study how a recent increase in the top marginal tax rate faced by pass-through business owners affected the compensation of employees in the firms they own. I find that employees in firms whose owners experienced a larger tax increase reported lower relative earnings following the tax reform. Approximately 18 cents per dollar of new business tax liability was passed through to employee earnings. The primary burden was borne by employees who remained with the firm following the tax change, and not a result of changes to workforce composition. I show that the ability to pass tax burdens onto employees depends on underlying features of the labor market, underscoring the interaction between tax policies and labor market institutions. The results provide some of the first direct evidence of pass-through from changes in the top marginal personal income tax to workers in lower tax brackets, implying that the incidence of the personal income tax is not fully borne by those directly subject to the tax. I examine the implications of this result for the equity and efficiency of personal income taxation.

Chapter 2 uses unique administrative microdata, linking individual income reports with reports on foreign asset holdings, to estimate taxpayer responses to recent initiatives by the U.S. government to curb the use of offshore accounts to evade taxes. We find that enforcement caused approximately 50,000 individuals to disclose offshore accounts with a combined value of around $100 billion. Most disclosures happened outside voluntary disclosure programs, by individuals who never admitted prior noncompliance. Newly disclosed accounts were concentrated in countries often characterized as tax havens. Enforcement-driven disclosures increased annual reported capital income by $2-$4 billion, corresponding to $0.6-$1.2 billion in additional tax revenue. The findings show that enforcement initiatives can affect tax compliance even among not directly targeted groups of taxpayers.

Chapter 3 explores the recent trend in the U.S. workforce towards independent contractors (ICs) and away from employees. The essay establishes new criteria to identify
ICs using administrative data from tax filings and finds that the share of the workforce with some IC income grew by 1.4 percentage points, or 20%, from 2001 to 2015. The largest share of ICs is in the top quartile of the income distribution and uses IC earnings as supplemental labor income. Yet, the fastest growing type of IC uses contractor earnings as the primary household income source, over half of which are in the bottom quartile of the income distribution. These trends are particularly pronounced among female ICs, who have contributed over 60% of the total growth in IC labor over the period. Additionally, we find that the share of firms using IC labor increased by 20 percent, that the largest relative increase has been among small firms, and that the growth is spread across industries. These trends imply that the long-run growth in IC labor cannot solely be attributed to side jobs, or to the rise of a few online platform firms, but may represent a more structural shift in the labor market, particularly for women.
CHAPTER I

Sharing the Burden: Responses of Business Owners to Changes in the Top Marginal Personal Income Tax Rate

Abstract

This paper analyzes the role of the firm in mediating responses to changes in top marginal tax rates using a new linked owner-firm-employee dataset created from the universe of deidentified administrative tax records. The majority of business income in the United States is held by pass-through businesses whose income is taxed at the personal income tax rates of firm owners, as opposed to being taxed at the corporate level. I study how changes in the top marginal tax rate faced by business owners affect the compensation of employees who are not directly subject to the rate changes. I use panel difference-in-differences methods to estimate the sign and magnitude of these within-firm spillovers by comparing the earnings of employees in similar firms but whose owners were differentially exposed to a recent increase in the top marginal income tax rate. I find that employees in firms whose owners were more exposed to a tax increase experienced lower relative earnings growth following the tax reform. Approximately 18 cents per dollar of new tax liability was passed through to employee earnings. The response was a result of lower earnings growth among employees attached to their firms, not compositional changes in employment, and the responses were larger in states with slack labor markets. These results provide some of the first direct evidence of pass-through from changes in the top marginal personal income tax rate to workers in lower tax brackets, implying that the incidence of the personal income tax is not fully borne by those directly subject to the tax. I show that this implies that the elasticity of taxable income of those facing the top marginal rate is not a sufficient statistic for welfare analysis.
1.1 Introduction

The extent to which the personal income tax code affects the operations, hiring, and compensation practices of firms has been debated in the United States for decades, remaining a central issue in the discourse over the relationship between tax policy and income inequality. Despite the significance of this issue, the existence and magnitude of spillovers from the personal income tax code to firm operations have been difficult to estimate. This paper uses new linked owner-firm-employee tax microdata to present evidence on the role of the firm in mediating responses to changes in top marginal personal income tax rates. Particularly, I focus on pass-through entities, firms for which the business income is taxed at the personal income tax rates of the firm owners. I address the question: Do changes in the top marginal tax rate affect the compensation of lower-bracket workers who are not directly subject to the rate changes? To do so, I estimate the sign and magnitude of within-firm spillovers from changes in the top marginal tax rate faced by firm owners to the compensation of employees. I then examine the welfare implications of these spillovers.

The two major types of pass-through businesses, S-corporations and partnerships, account for almost 80% of the non-sole-proprietorship businesses in the United States and over 55% of the total business income. Additionally, pass-through owners are disproportionately represented at the top of the income distribution. Of those in the top 1% of the income distribution, 57% have some pass-through business income, reaching 78% for those in the top 0.1% of the income distribution Smith et al. (2019). Given the size of the pass-through business sector and the amount of pass-through income concentrated at the top of the income distribution, it is important to understand how owners of pass-through businesses respond to taxation when analyzing top marginal personal income tax rates. In particular, changes in the top marginal tax rate can elicit responses which will reflect a combination of behavioral responses to personal income taxation and to business or capital income taxation. In this paper I address one facet of this issue by investigating the direct effect of taxation of pass-through business owners on the earnings of employees of the firms that they own.

I analyze a recent increase in the top marginal tax rate in the United States, the American Taxpayer Relief Act of 2012 (ATRA), to estimate responses of pass-through business owners to taxation. ATRA increased top marginal personal income tax rates while leaving the tax rate schedule and tax base essentially unchanged at lower income levels. The
simplicity of this reform makes it particularly useful for estimating spillover effects from changes in the top marginal tax rate to the earnings of lower-bracket employees.

To conduct the empirical analysis, I develop a new linked owner-firm-employee dataset created from deidentified administrative tax records. I focus on S-Corporations, which are a corporate form of pass-through businesses that are required to have at most 100 owners, all of which must be non-institutional U.S. persons. The dataset links firms to their owners and firm owners to their individual tax data. The ability to observe the total income - both the business income and total household income - of the owners enables me to estimate within-firm responses to changes in the personal income tax rates of business owners. Additionally, the tax data allow me to link each firm to their employees. Using this link I am able to estimate the relationship between the (change in) tax position of the owners and the (change in) compensation of the employees in the firm. I use the firm’s income tax return information to control for non-tax differences between firms.

Different models of business income taxation provide different, and often competing, predictions about the incidence of the tax on the earnings of employees in the taxed firms. Classic models of corporate tax incidence, such as those in Harberger (1962) and Kotlikoff and Summers (1987), focus on long-run capital adjustment and generally predict no direct within-firm transmission of owner tax liabilities to employee earnings. In contrast, labor market models where employee wages differ from their marginal product can predict within-firm spillovers. To develop the intuition behind how the taxation of business owners can affect the earnings of employees in their firms, I present generalized versions of a class of labor market models characterized by rent-sharing between owners and employees. These models help establish a foundation for my empirical strategy, which leverages variation across firms in exposure to a tax change to identify within-firm spillovers. Additionally, I use the models to highlight features of the labor market that can mediate the relationship between business taxation and employee earnings, which I investigate in the empirical analysis. Ultimately the sign and magnitude of the potential spillovers are empirical questions, and are the central focus of this paper.

To estimate the effect of an increase in taxation of firm owners on the earnings of employees, I develop a new identification strategy which compares the earnings of similar workers in similar firms but whose owners are taxed differently as a result of the reform. The defining feature of pass-through entities is that the business income is taxed at the personal income tax rates of firm owners. Therefore, two firms with the same level of taxable business income may face different marginal and average tax rates depending on the total household income of the firm owners. I exploit this feature of pass-through business taxation to identify the effect of changes in taxation of firm owners on the compensation
of employees. Employees in firms whose owners were subject to the tax increase were “exposed” to the rate change through their firms, but saw no direct changes to the tax treatment of their personal income. If none of the burden of the tax increase is shifted to employees, the earnings of employees should be unaffected by changes to the income tax treatment of the firm owners. If there are within-firm spillovers, employees in more exposed firms will see differential earnings patterns relative to workers in non-exposed firms following the tax change. I show how this identifying variation mitigates many of the standard concerns that arise when using difference-and-difference methods to estimate behavioral responses to tax reforms.

Using a panel difference-in-difference (DD) design, I provide direct evidence of within-firm spillovers. I find that when firm owners are more exposed to the tax increase, their employees exhibit lower relative earnings growth following the tax change. The result is robust to various measures of exposure and various sets of firm-level characteristic and income controls. I find an elasticity of earnings with respect to the marginal tax rate on firm owners of $-0.10$ after three years. The interpretation of this result depends on whether the observed earnings responses are attributable to changes in the workforce composition or whether they reflect changes in the compensation paid to the same, or similarly skilled, employees. I find no differential extensive margin employment response amongst firms more exposed to the tax change. Neither do I find evidence of changes in the skill composition of the workforce in response to the tax reform and instead find that the majority of the earnings response is attributable to lower relative earnings growth among firm “stayers,” or those who were employed at the time of the tax change and remained with the firm following the tax change. This suggests that the observed spillovers represent lower wages paid to the same employees and can be interpreted as pass-through$^1$ of owners’ tax liability to the employee earnings.

These results provide some of the first direct empirical evidence of the incidence of changes in the top marginal personal income tax rates on the earnings of lower-bracket workers not directly subject to the rate changes. I estimate the direct effect of an exogenous $1$ increase in the business tax liability on the firm’s wage bill and find that approximately 15-18 cents per dollar of new tax liability are passed through to employee earnings. Additionally, I find no evidence of a change in production or productivity for more exposed firms. The pass-through estimate implies that owners pass a share of the increased tax

$^1$Note, this use of “pass-through” is distinct from the descriptor of the business type used previously. Here I use pass-through as a standard economic term to describe how changes in a firm-level income variable affect the wages of employees in the firm. In contrast, a pass-through entity/firm/business describes a legal structure for a business that pays no taxes, but instead the owners pay the business’s taxes through their personal tax return.
burden through to employees, but also that the majority of the burden may be borne by the business owners themselves, at least in the medium run.

Heterogeneity analysis shows that the earnings response was not constant across employees in exposed firms. The responses were concentrated among those in the lower half of their firms’ earnings distribution, implying that the burden may be disproportionately borne by lower skilled employees. Additionally, firms in states with more slack labor markets exhibited larger spillovers in response to the tax change. Together, these results suggest that labor market frictions may affect the ability of owners to pass the burden of business income taxation onto employees, and more generally that the incidence of business income taxation may be mediated by underlying features of the labor market.

In the final section I discuss the implications of the empirical results for welfare analysis. Most standard Mirrleesian models of optimal personal income taxation assume that the entire incidence of the personal income tax is borne by households facing the given tax rate. Concretely, it is assumed that a change in the top marginal tax rate only affects the income and behavior of individuals that face the top marginal tax rate. The evidence presented in this paper suggests that this is not the case; the results show a clear behavioral response to the business income taxation embedded in the personal income tax system, leading to within-firm and cross-bracket spillovers. I present a simple model of welfare analysis and highlight the two fundamental implications of this result. First, in the presence of cross-bracket spillovers, the ETI of those facing the top rate is not a sufficient statistic for the welfare analysis of a change in the top rate. We must also know the extent of the spillover, or how the pre-tax distribution of surplus between owners and employees changes in response to the a tax change. Second, when the pre-tax surplus shifts from employees to owners, the taxable income response of top-bracket households will understate the welfare loss associated with a change in their tax rate.

The remainder of the paper is organized as follows. Section 1.2 discusses the institutional background, including the ATRA and the administrative tax data. Section 1.3 presents labor market models that can predict within-firm spillovers from business income taxation to employee earnings. Section 1.4 discusses the identifying variation and the empirical strategy for estimating within-firm responses to the tax reform. Section 1.5 presents the results documenting the differential earnings responses of employees in more exposed firms and contains analysis of heterogeneous responses by firm and worker characteristics. Section 1.6 provides direct estimates of pass-through from owner taxation to employee earnings. Section 1.7 examines the welfare implications of the empirical results and Section 1.8 concludes.
1.1.1 Related Literature

This paper is related to three broad strands of literature in public and labor economics. The first is the literature estimating behavioral responses to changes in personal income taxation and the estimation of the elasticity of taxable income (ETI). Second, it speaks to a longstanding literature on the incidence of business taxation and a more recent literature on how firms mediate responses to individual-level tax incentives. Third, it is related to the literature on estimating the amount of rent-sharing in the labor market and, more generally, wage setting behavior in imperfect labor markets.

Since Feldstein (1995), using difference-in-difference (DD) methods with panel data has been the standard for using tax reforms to estimate the ETI. Subsequent work, including that of Gerald Auten and Robert Carroll (1999) and Jon Gruber and Emmanuel Saez (2002) expanded on this, using instrumental variable (IV) methods to correct for some of the endogeneity in responses. Two recent papers focus on estimating the ETI of top income earners using the same tax reform as used in this paper. Saez (2016) uses changes in top income shares, as derived from publicly available (SOI) statistics, to estimate responses to changes in the top marginal tax rate and finds a large short-run response, likely driven by income retiming, and a relatively small medium-run response. Kawano, Weber and Whitten (2016) use administrative microdata and develop an inverse probability weighted (IPW) DD estimator; they estimate very small medium-run elasticities of those subject to the top rate hikes. I use a similar DD estimation approach to address a very different question, by using the taxation of owners to isolate within-firm variation in the exposure of lower-bracket workers not directly subject to the rate change. By comparing the earnings responses of lower-bracket workers in different firms, but in the same part of the income distribution, I avoid some of the mean reversion issues that plague other DD estimates of responses to top rate changes.

Recent theoretical and empirical work investigates the implications of labor market imperfections which result in rents for optimal taxation. Piketty, Saez and Stantcheva (2014) adapt the standard Mirrleesian optimal tax model to include three types of responses to progressive income taxation: a “true” labor supply response, an evasion or avoidance response and a wage bargaining response. They provide suggestive evidence of a rent-sharing elasticity and use their estimates to show how the rent-sharing response can affect optimal top rates. Papers by Lockwood, Nathanson and Weyl (2017) and Rothschild and Scheuer (2016) also explore how the presence of rents in the labor market affects the patterns of optimal marginal tax rates. I expand on this work by using linked owner-firm-employee microdata to directly estimate spillover responses to changes in top marginal
tax rates. By controlling for firm-level characteristics and changes in firm productivity I am able to estimate the direct effect of the taxation of business owners on employee earnings. I present a new elasticity of within-firm spillovers and discuss the implications of this elasticity for the use of the ETI in optimal tax formulations.

Second, this paper speaks to the literature on the incidence of business income taxation. Most studies on the long-run incidence of corporate taxation have focused on the capital investment response. In his classic work, Harberger (1962) showed that in a closed economy taxation of the corporate sector would be borne by owners of capital in the corporate and non-corporate sector and that the incidence depends, in part, on the elasticities of substitution between capital and labor. Subsequent work by Bradford (1978) and Laurence J Kotlikoff and Lawrence H Summers (1987) introduced corporate taxation to models of open economies. These models show that capital taxation in the home country will be borne fully by labor in the home country if capital is perfectly mobile across countries but labor is not. In general equilibrium models of open economies where capital is not perfectly mobile, some of the burden will be shared between owners and labor.

A more recent body of work has focused on the role of the domestic labor market in determining the incidence of corporate taxation. Papers by Alison Felix and James R Hines Jr. (2009), using variation across states in the U.S., and Arulampalam, Devereux and Maffini (2012), using variation across firms for a set of European countries, use wage bargaining models to estimate the incidence of corporate taxation and provide empirical evidence of the direct effect of taxation of corporate income on employee earnings. Fuest, Peichl and Siegloch (2018) show how a variety of models where firms have wage setting power would imply direct effects of corporate taxation on wages and estimate the effect of corporate tax changes on earnings in firms across districts in Germany. Each of these papers find that employees bear some of the burden of corporate taxation. A related body of literature analyzes how firms mediate responses to tax policy. Best (2014) finds, in the low tax-capacity setting of Pakistan, differential underreporting behavior by workers in firms with differing degrees of third party reporting. Youssef Benzarti and Dorian Carloni (2019) estimate pass-through of changes in VAT rates onto workers and the relative incidence between owners and workers. Saez, Schoefer and Seim (2017) use firm-level variation to investigate how differential employment taxation of workers at different ages in Sweden affects wages and employment of workers. They find that wages in firms most exposed to the reform respond in a way consistent with rent-sharing, such that tax windfalls are shared with workers, including workers not directly subject to the tax change. Similar to these papers, I find that workers share some of the burden of taxation on business income and that the earnings responses are consistent with wage setting behavior, but
unlike previous work I estimate the response to changes in the personal income tax rate of business owners.

A large recent literature finds evidence of rent-sharing in the labor market, and that wage setting behavior of firms can respond to firm-specific shocks. A recent review of this literature by Card et al. (2018) shows that estimated rent sharing elasticities range from 0.05 to 0.15 depending on the identification strategy and measure of firm productivity used. Additionally, the literature that has emerged on the role of the firm in income inequality (see Abowd, Kramarz and Margolis (1999), Card, Heining and Kline (2013) and Song et al. (2018)) has found variation in earnings of similarly skilled workers across firms, consistent with firm-level variation rent-sharing. Kline et al. (2018) estimate rent-sharing elasticities with respect to an exogenous increase in operating revenue associated with a firm receiving a successful patent award and find a significant earnings response consistent with wage setting behavior. Each of these papers find firm-level variation in earnings among similar workers depending on either fixed firm characteristics or exogenous productivity shocks. I expand on this literature by investigating the relationship between these mechanisms and a policy shock by estimating how the taxation of business owners can affect wage setting behavior and how responses to taxation may vary depending on underlying labor market conditions.

1.2 Institutional Background and Data

1.2.1 2013 Tax Reform: Increased Taxation at the Top

In 2013 the U.S. saw a tax increase for high-income Americans. The tax cuts for top income earners established by the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA), commonly referred to as “the Bush tax cuts,” were repealed on January 2, 2013. Upon President Obama’s reelection in November 2012 there was a general consensus that there would be some form of repeal of the Bush tax cuts on top earners, but the exactly how the rates would change or at what income thresholds was not known until the passing of the American Taxpayer Relief Act of 2012 (ATRA) on January 2.

The main feature of the ATRA was to add a new top tax bracket which increased the marginal tax rate from 35% to 39.6% on ordinary income and from 15% to 20% on dividends and realized long-term capital gains. The new top bracket started at $400,000 for single filers, $425,000 for heads of household and $450,000 for married joint filers. These income thresholds corresponded roughly to the top 1% of the household income distribution at the time. A second feature of the ATRA was a provision which reduced itemized
deductions by 3% of AGI up to a cap of 80% of AGI for those with AGI above $250,000 for single filers, $275,000 for heads of household and above $300,000 for married joint filers. Saez (2016) documents the change in aggregate tax rates for various groups of top earners resulting from the individual components of the 2013 reforms and estimates that the combination of reforms effectively raised the top marginal tax rate on very high income Americans, those near the top 1% of the income distribution, by approximately 9.5 percentage points for capital income and 6.5 percentage points for labor income.² Importantly for the identification strategy used in this paper, those in lower tax brackets saw essentially no change in the taxation of their personal income, while those earning above approximately $400,000 saw substantial increases in their marginal tax rates on ordinary and investment income.

1.2.2 Taxation of Pass-Through Businesses

Businesses in the United States can be taxed in two different ways. The income of C-corporations is taxed under the corporate income tax. For C-corporations, business income is taxed first at the entity level, then dividends are taxed at the individual level upon distribution, and any capital gains from the sale of shares are also taxed at the individual level at rates generally lower than ordinary individual income. Businesses can also elect to organize as “pass-through” businesses such as S-corporations, partnerships, LLC’s and sole proprietorships. Pass-through businesses are not subject to the corporate tax system, but instead business profits or losses are “passed through” to the personal tax returns of the business owners and then taxed subject to the personal income tax system. Therefore, for pass-through business owners changes in the personal income tax rate are effectively changes in the tax rate on the business income of their firms.

S-corporations, which are the focus of the empirical analysis, comprise over 60% of non-sole-proprietorship pass-through businesses and account for approximately 50% of pass-through income and 70% of employment in pass-throughs. They, like all corporations, have limited liability, but also have specific restrictions on their ownership structure; they can have at most 100 owners, all owners must be people, not institutions or businesses, and all owners must be U.S. taxpayers. Additionally, there can only be a single class of equity such that all income or losses are distributed pro rata to the owners according to their ownership share for each tax year. Each year the firm owes taxes on its net income.

²In the same year, the Affordable Care Act (ACA) surtax came into effect. The surtax applied to the labor and investment income of high income households. Non-passive profits, such as ordinary business income from S-corporations, are considered neither investment nor labor income, so were exempt from the ACA surtax. For a complete discussion of the tax changes faced by high income households in 2013 see Saez (2016).
income independent of any distributions of dividends. These rules make S-Corporations particularly well-suited for this study because they allow the linkage of all of the owners to their firms. The total taxable income and taxable business income of each owner can be observed and, therefore, so can the tax treatment of the business income of each firm.

S-corporation owners can be either active or passive, where active owners are shareholder-employees and passive owners do not perform substantive labor for the firm. Guidance on the IRS website states, “S corporations must pay reasonable compensation to a shareholder-employee in return for services that the employee provides to the corporation before non-wage distributions may be made to the shareholder-employee.” Active owners have some discretion over how much “reasonable compensation” they pay themselves and how much they take as profits. Owners must pay employment taxes on the amounts they pay themselves in wage and salary earnings, but not on the amounts they realize as profits, creating an incentive to minimize the former in favor of the latter. Because of this, my baseline calculation of owners’ business tax liability includes the liability on the sum of the owners’ net profits and their wage and salary income received from the firm they own.

1.2.3 Administrative Data

I create a linked owner-firm-employee dataset using deidentified administrative tax records at the IRS. The resulting dataset contains a balanced panel of S-corporations from 2006 to 2015 and includes variables from firm-level income tax returns as well as the income tax returns and information reports of firm owners and employees. I draw a 20% random sample of masked Employer Identification Numbers (EINs) from all S-corporations that file an income tax return (Form 1120S) in year 2012. To create a balanced panel, I keep firms that existed continuously from 2006 to 2015, where “existed” is defined as filing Form 1120S and reporting some non-zero income in each year. Second, I restrict the sample to firms with at least five employees in each year, where an employee is defined as anyone receiving a W-2 from a firm in a given year. The first restriction applies to approximately 41% of the original sample, and the second restriction applies to approximately 80% of the original sample. While the latter restriction eliminates the large majority of firms, it only eliminates a small percentage of S-corporation employees. The final sample includes approximately 86,000 firms and 4 million employees per year.

For each sampled firm, I use data reported on the annual firm income returns, Form 1120S. The income return line items are used directly as controls or outcome measures, and also used to create productivity measures for the firm. The production measures I use are: i) net sales: operating revenue minus returns, ii) profits: operating revenues minus costs, excluding passive income, where costs are the sum of inputs including costs of goods
sold, employee and owner wage compensation, rent, interest, and capital asset tax depre-
ciation; and iii) value-added: operating revenues minus costs, not including officer and
employee compensation. I convert these production definitions to per employee produc-
tivity measures by dividing each measure by the number of employees in the firm in that
year. Other firm-level variables collected from the income tax reports include the 6-digit
NAICS code\(^3\) and the state the firm is registered in.

Next, the firm income tax returns are linked to every employee who received a W-2
from one of the sample firms at any point in the sample period. This creates a sample of
all workers who receive a W-2 from a sampled firm in every year. For these employees,
wage and salary income from the W-2 information report is added to the dataset, as is
annual income and demographic information. Information on the age and sex of the tax-
payer come from social security records which are used to validate taxpayer identification
numbers. Income variables and information on filing status (single or married), number of
dependents, and the state in which the individual lives come from individual income tax
returns, Form 1040, and information reports (Form W-2). The variables from Form 1040
include Adjusted Gross Income (AGI) and taxable income. Reported taxable income and
filing status are used to determine which tax bracket the household falls into and therefore
who is subject to the tax rate changes.

S-corporations are required to file a separate Form 1120S Schedule K-1 on behalf of
each active and passive owner. The Schedule K-1 reports the individual share of firm
income received by each owner in each year. To identify S-corporation owners, I match
each sampled firm with all filed Schedule K-1 reports. After identifying each owner, I
link the same income information as that obtained for employees. Active owners (owner-
employees) are defined as those that receive a W-2 from the firm that they own. Owners
which receive no W-2 from their firms are passive owners. For active owners, I define “total
income” derived from their firm as the sum of their wage and salary income and their
business income reported on Schedule K-1. Active owners are required to pay themselves
“reasonable wages,” but have room to decide how much to compensate themselves in
wages and how much to take in business income, so the sum of these income sources is
a good metric for the total income derived from owning the firm. Together, the analysis
sample comprises a linked firm-owner-employee panel which includes individual income
variables for all individual owners and employees of each sampled firm in each year from
2006 to 2015, as well as firm-level income, productivity and characteristic variables.

Table 1.1 shows the characteristics of the firms in the sample. Comparing the charac-

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\(^3\)For the purposes of the empirical analysis, I convert the reported 6-digit NAICS code into the corre-
sponding 2-digit NAICS code. This is done to ensure that the cell sizes are not too small.
teristics of this sample to those presented in Smith et al. (2019), we see that this sample appears very representative of the universe of S-Corporations in the U.S.. I use a balanced panel because controlling for pre-trends using firm fixed effects is an important component of the identification strategy. Using a balanced panel could introduce selection bias if firms in the treatment or control group are more likely to exit the sample following the tax change. In Appendix Table A.1 I show that there is no evidence of differential attrition from the sample if I allow “treatment” and “control” firms, those with and without top-bracket owners, to exit the sample following the tax reform in 2012, so using a balanced panel is not likely to introduce selection bias.4

1.3 Models of Spillovers: Taxation of Firm Owners and Wage-Setting

There are a number of models one could use to analyze how a change in the personal income tax rate faced by business owners would affect the earnings of workers, many of which would lead to different, and sometimes contradictory, predictions. First, take the standard Mirrleesian model of personal income taxation. In this model, the individual facing a given income tax rate bears the entire burden of the income tax; there are no spillovers from the taxation of top-bracket households, the incidence of the tax falls entirely on them. In this paper I focus on the potential for the taxation of business income through the personal income tax to lead to spillovers, implying an incidence of the personal income tax on workers in lower tax brackets.

Classic models of capital income tax incidence (ex. Harberger (1962), Laurence J Kotlikoff and Lawrence H Summers (1987)) analyze the taxation of a defined sector, generally assuming perfect competition in product and labor markets, and use general equilibrium models to analyze changes in the long-run market equilibria. The incidence is determined by long-run capital accumulation incentives, substitutability of capital and labor and relative capital and labor mobility across jurisdictions, sectors or industries. Depending on the combination of these features, the models can predict that capital bears the full burden of the tax, that labor bears the full burden, or anything in between. This set of models does not predict within-firm responses to tax rates faced by specific business owners.

There is another set of models of business taxation which predict that the taxation of specific business owners can affect the earnings of employees in their firms. Piketty, Saez and Stantcheva (2014) develop a model where a change in the top marginal tax rate can affect the earnings of employees in lower tax brackets by changing the marginal

4In analyses not presented here, I repeat the main analyses using an unbalanced sample, allowing firms to exit after 2012, and the results are effectively unchanged.
incentives of business owners, managers or executives to engage in costly bargaining over rents. The higher marginal tax rate reduces the incentive to engage in costly bargaining activities, thus leaving more rents on the table to be shared with employees. Therefore, this model predicts that an increase in the top marginal tax rate would lead to higher employee earnings.

A set of labor market models characterized by rent-sharing predict that the taxation of business owners can directly affect the earnings of employees, such that increases in the top marginal tax rate would lead to lower employee earnings. These models include those with non-perfect competition in the labor market (ex. search and bargaining, union bargaining, or monopsony models) as well as models with perfect competition but other information asymmetries or costs (ex. incentive pay, efficiency wages, specific human capital models). Fuest, Peichl and Siegloch (2018) discuss a number of these models, showing how business taxes can affect the earnings of employees in the taxed firm. Though these models differ in their underlying assumptions, each involves rent-sharing such that employees are earning above their reservation wages, thereby leaving room for the taxation of the firm to affect the earnings of employees at that firm.

This discussion highlights that the various models offer competing predictions about whether we would expect any short or medium run effects of business taxation on employee earnings, if so, in what direction, and by what channel – within-firm or market-wide. Therefore, it is an empirical question as to whether, and how, changes in the top marginal personal income tax rate will affect lower-bracket employee earnings. The purpose of this paper is not to select the “correct” model and identify the parameters in that model, but rather to present key empirical facts on the channels by which the taxation of pass-through business owners, through the personal income tax code, affect the earnings of workers.

In this section I analyze the relationship between offered earnings and the taxation of business income for two commonly used models of rent-sharing, models with bargaining and wage posting models. I show how they can predict within-firm earnings responses to changes in the firm owners’ tax rate. Whether the models predict negative, null or positive earnings responses to a change in business income taxation depends on the model and on the parameters which represent the underlying features of the tax system and labor market. I use the models to develop intuition about the features of the tax system and labor market which can mediate the relationship between business taxation and employee earnings, and to provide a foundation for my empirical strategy which uses variation across firms in exposure to a tax change to identify within-firm earnings responses to owners’ income taxation.
1.3.1 The Firm Owner’s Problem

I begin by presenting a version of the firm problem that includes taxation of business income. In order to focus narrowly on the relationship between earnings and taxation, I use a simple model where firms have a general firm-specific production function which may include a firm-specific product price. The firm maximizes after-tax profits $\pi_j$,

$$\pi_j = Q_j(L^e(s), K) - \sum_s w_j(s)L^e(s) - \alpha \rho K - T(Q_j(L^e(s), K) - \sum_s w_j(s)L^e(s) - (1-\alpha)\rho K),$$  \hspace{1cm} (1.1)

where $Q_j(\cdot)$ is the firm $j$ specific production function with the arguments $L^e(s)$ representing the vector of labor inputs for each skill level $s$ and $K$ representing capital. The firm-specific wage paid to employees of skill level $s$ is $w_j(s)$, $\rho$ is the opportunity cost of capital invested by the owner(s), and $\alpha$ is a parameter governing how capital income returns are subject to the business tax rate. If capital returns are fully deductible from the tax base, $\alpha = 0$, but if they are less than fully deductible (e.g. capital is funded by equity of the business owners) and the outside option capital investment of the owners does not face the same tax rate as the business income (e.g. dividend or capital gain returns), then $\alpha > 0$. Net profits are taxed according to a general non-linear income tax function $T(\cdot)$, which I will treat as a graduated progressive income tax as is the case with the U.S. personal income tax.\(^5\)

When returns on equity invested by the owners is not fully deductible from the tax base, $\alpha > 0$, this set-up differs from a framework where all labor and capital costs are deductible from the tax base, i.e. full expensing. With full expensing and a labor market with no rent-sharing, taxation of business income should have no affect on the earnings of employees in a static model. Employees earn their competitive wage, equal to their marginal product, and firm owners choose labor to maximize profits taking the wages as given. In this context of a cash flow tax, the firm’s optimal labor choice is independent of the tax rate, so the wage rate and earnings are independent of the tax on profits in partial equilibrium.\(^6\)

In the following subsections I discuss deviations from this standard case, \(^5\)Many pass-through business owners also supply labor to their firms and pay themselves wages. I omit this in Eq. (1.1) for ease of notation. Assuming that owners’ wages are deductible from the firm’s tax base, this omission has no impact on the analysis that follows. Even when less than fully deductible, the resulting formulas change only slightly and it does not affect any of the qualitative implications. The amount that an owner decides to pay herself as “reasonable compensation,” deductible from the tax base, could be another margin of response to a change the owner’s tax rate. I do not model this potential income shifting response in the subsequent subsections, but it is not ruled-out in the empirical analysis. \(^6\)In the long-run higher taxes on business income can disincentivize capital investment and accumulation thus decreasing the marginal returns to labor and therefore the wage rate. In the horizon that I study it is unlikely that these general equilibrium factors are important. I am not able to directly observe firm
where there is some surplus shared between owners and workers.

1.3.2 Two Classes of Models with Rent-Sharing

1.3.2.1 Models with Bargaining

I begin by discussing a model where owners and a worker bargain over the surplus produced by a specific firm-worker match. Standard models of frictional labor markets like the search and matching models of Pissarides (2000) and Robert E Hall and Paul R Milgrom (2008) display this feature, as do collective bargaining models. In this class of models, the firm and employee agree to a match, either in the hiring or retention phase. Then wages are set such that the employee receives a fixed share of the after-tax match surplus generated by their employment at the firm. The distribution of surplus between owners and the employee is determined by a parameter representing the relative bargaining power of the worker. Wages are set according to

\[ w_j^* = \arg\max_w \left[ \theta \ln(w_j - b) + (1 - \theta) \ln P_j \right], \tag{1.2} \]

where \( P_j \) is the share of firm profits \( \pi_j \) in Eq. (1.1) attributable the hiring or retention of the employee. Formally, \( P_j = q_j - w_j - \alpha \rho k - T(q_j - w_j - (1 - \alpha) \rho k) \) where \( q_j \) is the marginal revenue product of hiring employee \( j \), and \( k \) is the capital investment necessary to equip employee \( j \), or the average capital per worker of worker \( j \)’s skill type \( K(s)/L^e(s) \), and \( T(\cdot) \) is the average tax liability associated with the profits generated by workers of that skill type. The exogenous bargaining parameter is \( \theta \), representing the bargaining power of the worker, and \( b \) is the worker’s reservation wage.\(^7\) As \( \theta \to 1 \) workers have more bargaining power. The firm owners set employee wages according to Eq. (1.2). Taking the first-order condition of the maximand with respect to wages provides,

\[ \frac{\theta}{w_j - b} = \frac{(1 - \theta)(1 - \tau)}{(q_j - w_j - (1 - \alpha) \rho k)(1 - t) - \alpha \rho k}, \]

where \( t \) is the average tax rate and \( \tau \) is the marginal tax rate, or \( T'(\cdot) \). Solving for the equilibrium wage gives:

\[ w^* = \frac{(1 - \theta)(1 - \tau)b + \theta((1 - t)(q_j - (1 - \alpha) \rho k) - \alpha \rho k)}{(1 - \theta)(1 - \tau) + \theta(1 - t)} \tag{1.3} \]

investment in my data, but in Section 1.5.4 I investigate responses of firm income and deduction line-items and find no significant responses.

\(^7\)The term inside the brackets of Eq. (1.2) is the log transformation of the maximand in a standard Nash bargaining problem, \((w - b)^\theta (P)^{1-\theta}\).
The numerator is a weighted combination of the reservation wage, \( b \), and the after-tax product of the employee’s labor \((1 - t)(q_j - (1 - \alpha)\rho k) - \alpha\rho k\), weighted by the relative bargaining power of the firm and workers. The denominator is a bargaining power weighted function of the net-of-marginal and average tax rates. Eq. (1.3) shows that, in general, the equilibrium wage is a function of both the average and marginal tax rates.

In certain special cases, this equation is straight forward to evaluate. As \( \theta \) approaches 0, the workers have no bargaining power and the equilibrium wages is simply the reservation wage \( b \), and therefore not a function of the tax faced by owners. As \( \beta \) approaches 1, the workers have all of the bargaining power and the equilibrium wage approaches \( w = q_j - (1 - \alpha)\rho k - \alpha\rho k/(1 - t) \), such that workers earn their after tax product of labor, which is a function of the average tax rate but not the marginal tax rate, and is decreasing in the average tax rate as long as \( \alpha > 0 \). In the case of a linear tax, the marginal tax rate equals the average tax rate and the equilibrium wage is:

\[
 w^* = (1 - \theta)b + \theta \left( q - (1 - \alpha)\rho k - \frac{\alpha\rho k}{(1 - t)} \right). \tag{1.4}
\]

In this case, wages are decreasing in the tax rate as long as \( \alpha > 0 \).

In the general case with a non-linear tax rate and where \( 0 < \theta < 1 \), the size and direction of the earnings response to an increase in the top marginal tax rate will depend on the parameters of the model. Taking the derivative of \( w^* \) given in Eq. (1.3) with respect to the marginal tax rate provides,\(^8\)

\[
 \frac{\partial w^*}{\partial \tau} = \frac{(1 - \theta)(w^* - b) - \theta(q_j - w^*)}{\tau(1 - t) + (1 - \theta)(1 - \tau)}, \tag{1.5}
\]

where \( w^*(\theta, b, t, \tau, \alpha, \rho k) \) is the equilibrium wage given the parameters of the model. The sign of the earnings response to an increase in the marginal tax rate is determined by the sign of the numerator and can be positive or negative depending on the parameters in the model. Specifically, the sign depends on the bargaining weight \( \theta \), the change in the average tax rate associated with the change in the marginal tax rate, \( \partial t / \partial \tau \), and where the equilibrium wage is relative to the worker’s reservation wage and marginal revenue product, conditional on \( \theta \).

It is instructive to examine the role of the term \( \partial t / \partial \tau \) to discuss the opposing incentives associated with the marginal and average tax rates. An increase in the marginal tax rate, holding the average tax rate fixed, leads to an increase in the offered wage, which can be seen by setting \( \partial t / \partial \tau = 0 \). All else equal, a higher marginal tax rate reduces the benefit to

\(^8\)The details of this derivation are provided in Appendix A.1.3.
owners from a marginal reduction in the offered wage. On the other hand, the fact that an increase in the marginal tax rate generally coincides with an increase in the average tax rate creates an offsetting affect because, all else equal, a higher average tax rate leads to a decrease in the offered wage. An increase in the average tax rate implies a smaller after-tax surplus to be shared between owners and workers (or the smaller “pie”), and as long as workers share any of the surplus ($\theta > 0$), the workers bear some of the burden. When there is a differential between the average and marginal tax rates, as in a gradated tax system where $\tau < t$, there is tension between the competing incentives. As the the differential shrinks and the average tax rate approaches the marginal tax rate, the affect of the average tax rate is more likely to dominate and the earning responses is more likely to be negative; a larger differential leads to the marginal incentive dominating and a higher likelihood of a positive earnings response.\(^9\) When the marginal tax rate equals the average tax rate, $\partial t/\partial \tau = 1$, the earnings effect will be negative as long as $\alpha > 0$, as seen in Eq. (1.4). Additionally, all else equal, when there is a higher $\theta$, representing more employee bargaining power, an increase in the marginal tax rate is more likely to be associated with a reduction of earnings, an affect which is increasing in the associated change in the average tax rate. As more surplus is shared with the workers, they also bear a larger burden of the smaller “pie.”

In general, this model shows that changes in the tax rate faced by business owners can directly affect the earnings of employees in the taxed firm. Whether there are positive, negative or null earnings responses depends on features of the tax system and labor market. In particular, with a linear tax, the model predicts an increase in the marginal tax rate is associated with a decrease in employee earnings as long as returns to capital are not fully deductible. If capital returns are fully deductible, or face the same tax rate if invested elsewhere, then employee wages are not a function of the business tax. In a graduated tax system, the differential between the marginal and average tax rates offsets the magnitude of the negative earnings response associated with the linear tax case, and as the rates diverge the earnings affect can switch signs such that a higher marginal tax rate is associated with an increase in employee earnings. This has implications for my empirical strategy because it suggests that the change in the size of the tax liability, governed by the average tax rate, not only the change in the marginal tax rate can affect the earnings

\(^9\)The incentive associated with the marginal tax rate is similar to that discussed in Piketty, Saez and Stantcheva (2014). In their model executives or managers can choose to change the pre-tax distribution of surplus at a cost. They show that a higher marginal tax rate decreases the incentive to engage in costly bargaining, resulting in higher employee earnings. Here I assume that $\theta$ is fixed, but the incentive associated with an increase in the marginal tax rate is in the same direction. But, with the bargaining model, the total amount of after-tax surplus, as governed by the average tax rate, creates a countervailing effect.
response. When estimating the pass-through of the tax increase to employee earnings in Section 1.6, I estimate the earnings response using cross-firm variation in the increase in business tax liability.

### 1.3.2.2 Wage Posting Models

In wage posting models, a form of monopsony model, employees have heterogeneous preferences over working at firms which offer different workplace environments. This heterogeneity leads to wage dispersion across firms even among workers of similar skills. While, in the previous set of models surplus was generated from search frictions or collective bargaining power, in wage posting models workplace differentiation and preference heterogeneity of workers imply an upward sloping labor supply curve which creates market power for the employer.

In this model, the quantity of labor is determined by the wage set by the firm. I assume that the firms do not observe the individual workers’ reservation wages, but know the distribution of preferences for the continuum of workers. Therefore, firms cannot perfectly price discriminate by offering each worker their firm-specific reservation wage. Instead each firm hires workers of a given skill by posting a wage that is public knowledge and hiring anyone of a that skill level willing to accept that wage. The last worker hired is indifferent to taking the job, but the inframarginal workers hired will obtain some surplus from the match which they gain from the hidden information about their true reservation wage. Let the elasticity of labor supply with respect to the wage be $\eta$, such that $L = w^\eta$. Substituting this into Eq. (1.1), and taking the first order condition with respect to the wage produces

$$w^* = \frac{\eta}{1+\eta} \left[q_j - (1 - \alpha)\rho k - \frac{\alpha \rho k}{1 - \tau}\right]. \quad (1.6)$$

Eq. (1.6) shows that the equilibrium offered wage is a function of the elasticity of labor supply to the firm, the worker’s marginal revenue product, the opportunity cost of capital and the marginal tax rate. Unlike the bargaining model described in the previous subsection, the equilibrium wage given in Eq. (1.6) is only a function of the marginal tax rate, $\tau$, and not the average tax rate.$^{10}$ In the wage posting model, the firm’s decision is whether or not to increase the wage in order to grow the firm, where in the bargaining model the distribution of surplus is determined ex post for a given size and employment level. In the wage posting model, a higher marginal tax rate is associated with lower offered wages as long as $\alpha > 0$; if $\alpha = 0$ then the equilibrium wage is not a function of the business tax.

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10The derivation of the wage equation can be found in Appendix A.1.3
The intuition is that a higher marginal tax rate reduces the marginal benefit to growing the firm by raising wages.

1.3.3 Discussion

This section shows that two commonly-used models of rent-sharing can predict within-firm spillovers from business income taxation to employee earnings. In both models, the presence of the earnings response depends on there being some sharing of surplus between owners and employees. In the bargaining model, the offered wage can be a function of both the average and marginal tax rate. When facing a graduated tax system, the incentives imposed by an increase in the average and marginal tax rates are offsetting, and depending on the differential between the two, the relative bargaining power of firms and workers and the deductibility of capital returns, the affect of an increase in the marginal tax rate on employee earnings can be either positive or negative. The wage posting model predicts that the offered wage is a function only of the marginal tax rate and is decreasing in the marginal tax rate, as long as capital returns are not fully deductible. As discussed in the introduction of this section, there are also many other models that with competing predictions as to the relationship between business income taxation and employee earnings. In general, it is an empirical question whether there are within-firm earnings responses to increases in firm owners' marginal tax rate, and what the sign of such responses would be.

The wage equations associated with the models analyzed in this section imply the possibility of a direct relationship between the tax rate faced by owners of a given firm and the earnings of the employees at the firm. This motivates an empirical approach that uses cross-firm variation in firm owners’ exposure to an increase in the top marginal personal income tax rate to estimate the effect on earnings of employees in taxed firms. Studies designed to estimate the magnitude of rent-sharing commonly use cross-firm exposure to shocks to estimate pass-through (see Card et al. (2018) for a review). I will use regression specifications similar to the standard rent-sharing regression approach, but will estimate the effect of an exogenous tax change as opposed to the effect of a productivity shock. As described in the next section, using an exogenous tax change as opposed to a productivity shock helps mitigate many of the standard endogeneity concerns that otherwise arise.

1.4 Empirical Strategy: Estimation of Within-Firm Spillovers

In this section I describe how I use the rules of pass-through business taxation to identify within-firm spillovers in response to ATRA and discuss how the proposed identification
strategy alleviates a number of the typical issues associated with identifying behavioral responses to taxation using tax reforms.

1.4.1 Identifying Variation

The ideal strategy for identifying within-firm spillovers, changes in employee compensation resulting from changes in the tax rate faced by firm owners, would be to take two groups of otherwise identical firms, randomly assign a higher marginal tax rate to one group of owners compared to the other and then simply compare the subsequent wages offered by the firms in the two groups. We could then attribute any observed changes in worker compensation to the causal effect of the tax change. Unsurprisingly, governments are not keen on randomly assigning tax rates, so we must find quasi-experiments that approach this ideal. An established literature estimating behavioral responses to marginal tax rates has developed methods for approximating this experiment using tax reforms as quasi experiments. One particular challenge to this approach is finding an appropriate control group. Rate changes often occur all at once for the entire economy, leaving us to compare the responses of taxpayers who face differential changes in their tax rates, where generally the rates changes differentially across different points of the income distribution. The main challenge this poses is that the rate change depends directly on the tax unit’s income level, and households or firms with different income levels are not likely to be “otherwise identical.”

As described in Section 1.2, pass-through business income is not taxed separately at a given tax rate, but is taxed as part of the total taxable income of the business owners and therefore taxed according to the personal income tax rates faced by the firm owners. This means that there can be two firms with identical business income, but the income is taxed at different rates because the tax rate is based on the total household income of the business owner, not the business income itself. As an illustrative example, suppose Firm A and Firm B both have net business income of $150,000 and, for simplicity, that each firm has only one owner that pays herself an annual salary of $100,000. Suppose the owner of Firm A receives all of her taxable income from her firm, so her total taxable income is $250,000 and her marginal tax rate is 35%. The owner of Firm B is married and her spouse makes $500,000 a year. Because of the joint taxation of income, her total household taxable income is $750,000 and she also faces a marginal tax rate of 35%. Following ATRA, Firm B’s owner becomes subject to the new higher top marginal tax rate of 39.6%, while Firm A’s tax rate does not change. Additionally, the average tax rate on Firm B’s income is higher than that for Firm A. If, instead, the owner of Firm B’s spouse has an income of $5 million a year, then the average tax rate on Firm B’s income would
be much higher, approaching 39.6%. This is just one example of the source of identifying variation; not all variation will come from spousal earnings. More generally, the variation comes from all of the taxable non-business income of the firm owners.

Figure 1.1 represents the identifying variation in the data and somewhat mirrors the experiment described in the previous paragraph. The figure shows how tax rates and liability change for firms with (approximately) $250K in business income as a function of the owner's non-business income. On the y-axis is the change in marginal tax rate or tax liability on business income associated with the change in the top marginal tax rate under ATRA, and on the x-axis is the non-business taxable income of the firm owner. For simplicity, I only use the subset of firms with single owners, for which there is a very clear mapping between the the owners’ taxable income and tax rate faced. For these households, total taxable income is the sum of non-business income (on the y-axis) and taxable business income, set to $250K. The blue line in Panel A shows that households with $250K in business income and less than $200K in non-business income face no change in their marginal tax rate on business income, while households earning more than $200K in non-business income face an increase in their marginal tax rate even though their businesses were earning the exact same amount of taxable income. The red line in Panel B represents the same exercise, but plots on the y-axis the change in total tax liability owed on business income. Households with over $200K in non-business income see an increase in their taxes owed following the reform. This figure illustrates the continuous variation in new tax liability on business income even for firms with the same level of taxable business income as a result of the amount of business income subject to the new higher rate. For households with over $450K in non-business income, all of the business income is subject to the new top rate so the change in liability is exactly $11,500 \((250K \times 0.046)\). In Panel C, each blue circle represents an average of 10 firms in the data. We see that there is substantial variation in non-business income across firms with approximately $250K business income, between $225K and $275K. There are many firms whose owners have less than $200K in non-business income but also many with more than $450K, and substantial variation in between. When we consider that this variation exists at all levels of business income, and that for firms with multiple owners the variation depends on the non-business income of all owners, this implies substantial variation in tax changes across similar firms. The rules of pass-through taxation allow non-business income to act as a shifter for exposure to the top rate change. In the next subsection I discuss how this identifying variation is leveraged for estimation of within-firm spillovers.
1.4.2 Estimation

I use difference-in-differences (DD) methods for estimating within-firm spillovers in response to the variation in the tax change faced by business owners. I begin by discussing potential threats to unbiased estimation in this setting, and show how many of the standard concerns that arise when using tax reforms to estimate the behavioral responses are mitigated by using the identifying variation described in the previous subsection.

There are three standard issues that could bias the estimation of the behavioral response to the tax change. First, changes in marginal tax rates generally affect those at different parts of the income distribution differently. If there are differential counterfactual trends in income growth among people at different parts of the income distribution absent the reform, this will bias the DD estimator of the response.\(^{11}\) This issue in not likely to pose a threat in my setting because the outcome variable of interest is the earnings of lower-bracket employees in the firm. I am comparing the earnings of individuals over the same range of the income distribution, all below the top marginal tax rate, but who are working in firms whose owner are taxed differently. Second, often changes in tax rates are accompanied by changes in the tax base which can confound direct comparisons of reported income pre and post reform. This is not a major concern here because employees below the top marginal rate did not experience any direct change in the tax treatment of their income as a result of the reform, neither a change in rates or base.\(^{12}\)

The third challenge to estimation using tax reforms is that marginal tax rates are endogenous to individual decisions that affect reported income. This creates two issues, the first of which is that with a graduated tax schedule there will be a correlation between changes in tax rates faced and reported income even absent any tax reform or any behavioral responses. To address this issue, as has been standard practice in the ETI literature, I will use the predicted change in the owners’ tax rate to isolate exogenous variation. The predicted change in the tax rate is the change in the tax rate that an individual would face absent any behavioral response to the tax change. It is calculated by comparing the tax rate faced prior to the reform to the tax rate that the individual would face after the reform had their real taxable income remained exactly the same as the pre-reform level. Formally, the predicted change in the (log) tax rate can be calculated as \(\ln(\tau_t(y_{t-1}^{\text{own}})/\tau_{t-1}(y_{t-1}^{\text{own}}))\), where the post reform tax rate \(\tau_t\) is the tax rate that would apply if the owner maintained their

\(^{11}\)This is essentially a violation of the “parallel trends” assumption required for unbiased DD estimators.

\(^{12}\)Additionally, because I am comparing the earnings of employees in the same part of the income distribution, changes to the base or other taxes for this group would affect employees in both exposed and unexposed firms similarly. If this were the case, any differences between the treatment and control earnings post reform would be attributable to the tax change, though this would affect the interpretation of the estimated parameters.
pre-reform income level \( y_{jt-1}^{own} \). The predicted rate is a function only of pre-reform income so this removes any endogeneity from changes in reported income.

A second form of endogeneity is mean reversion, the tendency for those with high (low) taxable income to report lower (higher) taxable income in the following year absent any change in tax incentives. Therefore, when tax changes affect those at different parts of the income distribution, the observed change in reported earnings following the reform will be a combination of the behavioral response to the reform and the natural mean reversion in taxable income.

Formally, mean reversion comes from the transitory component of income. Consider a general process that determines employee earnings,

\[
\Delta \ln(w_{jt}) = \epsilon \Delta \ln(1 - \tau^p) + \Delta \ln(\mu_{jt}) + \Delta \ln(\nu_{jt}),
\]

where \( w_{jt} \) is the earnings of employees in firm \( j \), \((1 - \tau^p)\) is the predicted net-of-tax rate on owner income as described above, \( \epsilon \) is the elasticity of employee earnings with respect to the predicted change in the net-of-tax rate, \( \mu_{jt} \) is the permanent component of employee earnings at firm \( j \) in year \( t \), and \( \nu_{jt} \) is the transitory component of employee earnings. Without further controls, \( \Delta \ln(\mu_{jt}) + \Delta \ln(\nu_{jt}) \) would comprise the error term in a regression of the change in log earnings on the predicted change in log tax rate.

The change in predicted tax rate is an exogenous regressor which can be used for unbiased estimation of earnings response if it is uncorrelated with the error term, or if \( \mathbb{E}[\Delta \ln(1 - \tau^p)'(\Delta \ln(\mu_{jt}) + \Delta \ln(\nu_{jt}))] = 0 \). Recall \( \Delta \ln(1 - \tau^p) \) is only a function of the mechanical tax change and the baseline reported income of the owner, \( y_{jt-1}^{own} \). As described previously, owners’ taxable income is composed of both business income and non-business income. Let \( y_{jt-1}^{own} = Z_{jt-1} + \Omega_{jt-1} \) where \( Z_{jt-1} \) is the owner’s reported business income in the pre-reform year and the \( \Omega_{jt-1} \) is the owners non-business, or “other,” income. The necessary condition for exogeneity of the tax variable is thus, \( \mathbb{E}[(Z_{jt-1} + \Omega_{jt-1})'(\Delta \ln(\mu_{jt}) + \Delta \ln(\nu_{jt}))] = 0 \). The error term must be uncorrelated with the baseline business and non-business income of the owner.

It would not be surprising if the baseline level of business income at a firm were correlated with the earnings path of employees at that firm, so I will begin with a discussion of this form of endogeneity. Let the owner’s business income have both a permanent and transitory component such that \( Z_{jt-1} = z_{jt-1} + \gamma_{jt-1} \), where \( z_{jt-1} \) is the permanent component of business income and \( \gamma_{jt-1} \) is a mean-zero transitory component with \( \gamma_{jt} \sim i.i.d.(0, \sigma^2_{\gamma}) \) for all \( t \). There is no endogeneity associated with owners business income only if there is no endogeneity in the permanent or transitory components.
First, let us consider the potential endogeneity associated with the permanent component of business income. There will be endogeneity if \( \text{cov}[z_{jt-1}, \Delta \ln(\mu_{jt})] \neq 0 \). If firms with higher permanent income pay more on average than firms with lower income, which we might expect if, for example, higher earning firms employ more productive workers, then \( \text{cov}[z_{jt-1}, \ln(\mu_{jt-1})] > 0 \). This alone would not violate exogeneity. If the levels of earnings covary with business income, but the log growth rates of earnings are the same in across the distribution of business income, then there is no endogeneity stemming from the permanent component of business income, \( \text{cov}[z_{jt-1}, \Delta \ln(\mu_{jt})] = 0 \). If, on the other hand, earnings grow at different rates across firms with differing levels of business income, then there will be endogeneity in the permanent income component such that and \( \text{cov}[z_{jt-1}, \Delta \ln(\mu_{jt})] > 0 \). In this case, it is necessary to include controls for baseline business income to ensure we are comparing earnings growth rates across firms with similar levels of business income. Controlling appropriately for baseline income would eliminate the endogeneity, \( \mathbb{E}[z'_{jt-1} \Delta \ln(\mu_{jt})|Z_{jt-1}] = 0 \).

The transitory component of business income would generate mean reversion if firms with a high (low) idiosyncratic shock to business income, perhaps from a transitory shock to demand, pay employees more (less) in response to the shock. In a perfectly competitive model of the labor market, there should be no correlation as wages are fixed equal to the marginal productivity of labor, but in models where firms have wage-setting power demand shocks can lead to systematic changes in workforce compensation. In the most logical potential case where positive transitory shocks are associated with higher earnings, \( \text{cov}[\gamma_{jt-1}, \ln(\nu_{jt-1})] > 0 \), and due to mean reversion, \( \text{cov}[\gamma_{jt-1}, \Delta \ln(\nu_{jt-1})] < 0 \). Again, appropriately controlling for baseline business income removes the endogeneity.

Studies designed to estimate the ETI have long used baseline income controls to help isolate exogenous variation in the tax rate. Estimation of the ETI using DD methods requires controls for smooth functions of baseline income and identification of the tax change comes from the non-linear relationship between income and the tax change. Because of this, estimating the response to an single tax reform where the rate change depends on the position in the income distribution becomes very difficult. As Saez, Slemrod and Giertz (2012) explain, “adding too many base-year income controls destroys identification by absorbing much of the independent variation in tax rates.” Fortunately, in my setting I am able to control very flexibly for baseline business income without destroying identification precisely because pass-through business income is not taxed separately but as part

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\(^{13}\)In this case, with homogeneous growth in log earnings across firms with different levels of business income, including year fixed effects in the model adequately eliminates any potential endogeneity from the permanent income component of earnings growth.

\(^{14}\)See for example Gerald Auten and Robert Carroll (1999) and Jon Gruber and Emmanuel Saez (2002).
of the owner’s total household income. Therefore, even for firms with identical business income, there can be substantial variation in the tax rate change because of variation in the owner’s non-business income, as was shown in Figure 1.1. For unbiased estimation, I am not required to use smooth functions of baseline income because identification does not come from the non-linearity of the income tax schedule, but from non-business income acting as a shifter.\textsuperscript{15} I am able to compare owners in the same part of the business income distribution who face different rate changes, which removes endogeneity of the predicted rate change variable with respect to business income.\textsuperscript{16}

The ability to use flexible controls in baseline business income will depend on the validity of the use of owners’ non-business income as an exogenous shifter of the tax rate. Let owners’ non-business income be $\Omega_{jt} = \omega_{jt} + e_{jt}$, where $\omega_{jt}$ is the permanent component and $e_{jt}$ is the mean-zero transitory component. Conditional on baseline business income, exogeneity of the tax rate variable requires that $E[(\Omega'_{jt-1}(\Delta\ln(\mu_{jt}) + \Delta\ln(v_{jt}))|Z_{jt-1}] = 0$. This is the same as the exclusion restriction for the validity of non-business income acting as an instrumental variable. Exogeneity of the permanent component requires that, conditional on business income, the level of the owner’s non-business income is uncorrelated with the earnings growth of employees in the firm, $E[\omega'_{t-1}\Delta\ln(\mu_{jt})|Z_{jt}] = 0$. As with the discussion of business income, this does not require that owners’ non-business income is uncorrelated with the level of employee earnings, only that there are not differential earnings growth rates for employees in firms with similar business income, but where the owners have different levels of non-business income. This assumption cannot be directly tested, but no standard model of profit maximization or wage determination would predict such a correlation. Additionally, we can assess the validity of this assumption by examining whether the conditional trends in earnings are parallel in the pre-reform period.

Exogeneity of the transitory component requires $E[e'_{t-1}\Delta\ln(v_{jt})|Z_{jt}] = 0$, or that there is no mean reversion in employee earnings associated with idiosyncratic shocks to owners’ non-business income. In other words, we must assume that owners do not compensate employees for known mean-zero shocks to their non-business income, which seems like a very reasonable assumption. I am not able to control for baseline non-business income to purge this sort of potential mean reversion because controlling for both business and non-business income would indeed destroy the identifying variation. Therefore, I regard this as the primary untestable identifying assumption of the proposed estimation strategy.

\textsuperscript{15}For example, in theory I could include a fixed effect for every dollar of baseline business income ($1$, $2$, . . . , $1\text{mil}$, . . .) and still retain identifying variation, as within each dollar amount of business income we would expect there to be variation in the tax rates faced by the owner attributable to variation in non-business income. In standard ETI studies, this would eliminate all identifying variation.

\textsuperscript{16}See Weber (2014) for a thorough discussion of using predicted rate changes as an exogenous variable.
To summarize, a sufficient condition for the exogeneity of the predicted tax rate variable is that, conditional on business income, employee earnings are uncorrelated with the non-business income of firm owners. This is not, however, necessary. The identifying assumptions required for valid estimation of the earnings response to the change in owners’ tax rates are i) there are no differential changes in earnings growth at the time of the tax reform between firms with similar business income but whose owners have different levels of non-business income, and ii) that there is no mean reversion in earnings associated with idiosyncratic shocks to owners’ non-business income. Under these conditions, the predicted tax change captures exogenous variation in business income taxation. As described in the following section, I will ultimately include an even richer set of firm-level baseline controls to help ensure the exogeneity of the predicted tax rate variable.

1.5 Results: Within-Firm Earnings Responses

In this section, I provide evidence of within-firm spillovers in response to the tax change faced by firm owners. I investigate the channels by which the spillovers occur, particularly whether changes in compensation result from changes in the composition of the workforce in more exposed firms or changes in the earnings of the same, or similarly skilled, employees. I show that the majority of the response is among “stayers” and that there is little change in the composition of the workforce. Subsequent heterogeneity analysis assists in further characterizing the behavioral responses to the tax rate change. The section concludes with a discussion of what the spillover responses imply for our understanding of the firm-level mechanism at work, before turning to the estimation of the dollar-for-dollar pass-through of the owner business tax burden to employee earnings in Section 1.6.

1.5.1 Description of Exposed and Unexposed Firms and Workers

Table 1.1 shows summary statistics separately for the full sample of firms and for firms with top-bracket owners. About 23% of firms in the sample have at least one top-bracket owner. Unsurprisingly, firms with top-bracket owners are larger in terms of employees and production than the average firm. Perhaps surprisingly, the mismatch in production is attenuated when looking at productivity. In terms of value-added per worker and profitability, measured as \(\frac{\text{profits}}{\text{revenues}}\), firms with top-bracket owners are more productive, but to a lesser degree. Additionally, the average earnings of employees in firms with top-bracket owners are larger than those for the average firm, but there is substantial overlap in the distributions. Despite the size and earnings differentials, the distribution of the labor
share, measured as \((\text{wage bill/value-added})\) or \((\text{wage bill/revenues})\), is very similar across groups. Appendix Tables A.2 and A.3 show that there is substantial overlap between firms with and without top-bracket owners within industry and state, respectively. Together, these features suggest that on average firms with top-bracket owners are much larger in scale, but that they are similar in terms of productivity relative to the average firm.

Panel B of Table 1 investigates how effective firm-level controls are at balancing the mean characteristics of firms with and without top-bracket owners. This panel shows the conditional mean differences between firm characteristics for firms with top-bracket owners and firms with no top-bracket owners, after controlling for baseline characteristics of the firm. The controls are the same as those used in the main regression specifications in the following analyses, and include indicators for deciles of net business income, deciles of value-added per worker, 2-digit industry, firm-size categories and state. We see that these controls go a long way balancing mean characteristics between firms with and without top-bracket owners. Conditional average earnings are less than $1,000 different and the difference in average firm size is only three employees, therefore the average wage bills between these sets of firms are also similar. The average difference in production, measured in value-added, is still significant though much reduced, and the difference in productivity is almost null.

The baseline differences between firms with and without top-bracket owners highlight the importance of using firm-level controls when estimating earnings responses to help ensure estimates are not confounded by non-tax shocks to large versus small firms at the time of the tax change. Panel B shows that the baseline controls do a very good job at mitigating the average differences between firms with and without top-bracket owners. This reinforces the validity of the empirical strategy presented in Section 1.4 and identifying variation displayed in Figure 1.1, which uses controls for baseline firm characteristics to isolate the variation in exposure to the rate change. Still, top-bracket firms are larger and their employees have slightly higher average earnings, so it will remain important to assess the validity of the DD estimation strategy by evaluating the pre-reform trends for these sets of firm.

1.5.2 Within-Firm Spillovers

1.5.2.1 Flexible Difference-in-Differences

In this section I use firm-level variation in firm owners’ exposure to the tax rate changes to identify within-firm spillovers to the earnings of employees. Employee earnings are defined as the annual W-2 wage and salary income received from the issuing firm in that
year. I create firm-level treatment variables, $exposure_j$, which is a measure of how exposed the firm is to changes in the top marginal tax rates through the firm owners. Employees in firms with no top-bracket owners are not exposed to the tax changes while workers in firms with top-bracket owners are exposed to the tax changes.

I begin by using a flexible difference-in-difference (DD) method comparing the average earnings in exposed (treatment) and unexposed (control) firms relative to a pre-reform year. This specification will help to assess the validity of the comparison of workers in more and less exposed firms for identifying spillover effects by allowing us to observe whether trends in reported earnings in these sets of firms move in parallel prior to the reform. The regression specification is:

$$
\ln(y_{jt}) = \alpha + \sum_{s \neq 2012} (\beta_s exposure_j + \Omega_s f(z_{2012}) + \Gamma_s X_{2012}) \times year_{s=t} + \delta_t + \psi_j + \nu_{jt} (1.7)
$$

where the outcome is log average earnings of full-time employees\(^{17}\) in firm $j$ and $\beta$ is the DD estimator of the differential in average earnings between more and less exposed firms relative to base-year 2012. I use a fixed definition of treatment based on having top-bracket owners in the pre-reform period.\(^{18}\) I include a firm fixed effect, $\psi_j$, to isolate within-firm variation, which purges any potential systematic time-invariant differences between firms with and without top-bracket owners. As discussed in Section 1.4, I control flexibly for the firm’s baseline business income, $f(z_{2012})$. My baseline specification includes non-parametric indicators for deciles of the 2012 distribution of business income, but I show robustness to various other functional forms. I also include a vector of firm-level baseline characteristics, $X_{2012}$, which are flexibly interacted with year in order to allow for differential time paths for firms with different pre-reform characteristics. Firm-level characteristics include industry fixed effects (2-digit NAICS), indicators for the state in which the firm is registered and deciles of value-added per worker. These ensure that we are best approximating the experimental ideal, comparing very similar firms with differential changes in the tax rate faced. Finally, I include year fixed effects, $\delta_t$, which capture the conditional time-path of average earnings for the control firms. The regressions are weighted by the baseline number of employees to simulate an individual-level regression with a firm-level treatment.

Figure 1.2 shows results from the estimation of specification (1.7). For the baseline
\(^{17}\)“Full-time” is defined as receiving annual wages of at least the equivalent of one quarter (13 weeks) at the federal minimum wage.
\(^{18}\)“Top-bracket” is defined according to the new top-bracket post reform, even in pre-reform years. For example, in 2010 an owner is considered to be in the top-bracket if they have (real) taxable income such that they would be in the new top-bracket established in 2013.
estimates, the \( exposure_j \) variable is an indicator equal to one for firms with top-bracket owner(s) in each year from 2010-2012 and zero for firms with no top-bracket owners in those years. This definition ensures that I am comparing firms which where most likely to be persistently affected by the tax reform relative to those which were least likely to be affected. By defining treatment purely in the pre-reform years, the results from these specifications can be considered intent-to-treat (ITT) estimates of the response to the tax reform.\(^{19}\)

Panels A shows the adjusted time path of average employee earnings in exposed and unexposed firms relative to 2012. The time path for control firms is represented by the coefficients on the year fixed effects, \( \hat{\delta}_t \), and the time path for the treatment group is the sum of the coefficients \( \hat{\beta}_t \) and the coefficient on the year fixed effect, \( \hat{\delta}_t \), for each year \( t \). The figure displays a clear pattern. The conditional time-path of employee earnings are nearly identical in the pre-reform years and then diverge starting in 2013, following the tax reform. Starting in 2013, the workers in treatment firms see lower relative earnings growth which continues through 2015. Panel B shows the same results, but plots the year specific DD coefficients and includes the 95% confidence intervals. The trends are flat prior to 2013, then diverge starting in 2013 and the difference in relative earnings is significant at the 5% level in 2014 and 2015. These figures show that employees in more exposed firms did not experience nominal decreases in their earnings, but instead experienced lower relative earnings growth following the tax reform. Going forward I will often present only the DD estimates, but it is important to recall that negative coefficients do not represent nominal decreases in earnings, but lower earnings relative to the counterfactual represented by the control firms.

1.5.2.2 First Difference Estimates and Robustness

In order to establish a single point estimate to summarize responses, I use a first-difference specification based on the framework established in Eq. (1.7). The specification is of the form:

\[
\Delta ln(y_{jt}) = \alpha + \sum_t \beta_{t-1}exposure_{jt-1} + \gamma_t f(z_{jt-1}) + \Gamma_t X_{jt-1} + \delta_{t-1} + e_{jt}, \tag{1.8}
\]

where \( y_{jt} \) is the average earnings of full-time employees at firm \( j \) in year \( t \); \( exposure_{jt-1} \) is a measure of how exposed the firm is to the tax change in base year \( t - 1 \); \( f(z_{jt-1}) \)

\(^{19}\)As discussed in Kawano, Weber and Whitten (2016), the ITT gives a lower bound for the treatment on the treated (TOT) parameter when owners may switch tax brackets across years. The ITT represents the TOT if all cross-bracket switching is a result of unanticipated behavioral responses to the rate change.
represents a flexible function of base period business income; \( X_{jt-1} \) are baseline firm-level characteristics; and \( \delta_t \) are base-year fixed effects. The first-difference specification means that all estimates are based on within-firm differences, thereby controlling for any fixed firm-level characteristics. The baseline specification uses three-year differences, as is standard in the ETI literature to estimate medium-run responses to tax changes. Using \( \text{exposure}_{jt-1} \) defined in the base-year means \( \beta_{t-1} \) gives the ITT estimator of the treatment effect.

First, I test the robustness of the within-firm spillover results to the inclusion of various baseline controls. Table 1.2 reports the results of this exercise. Each column represents a specification using different combinations of baseline firm characteristics. The third row reports the DD estimator of the effect of exposure to the tax change on average employee earnings, \( \hat{\beta}_{2012-2015} \). Since I have a long panel, I am able to use multiple pairs of years including those in the pre-period, which imply a placebo test for the parallel trends assumption, similar to that in a flexible event-study style DD specification. These effective placebo tests are reported in the first two rows, testing whether being a firm with a top-bracket owner, defined by the new top bracket established in 2013, implied a differential change in earnings between years 2006-2009 or 2009-2012, all years prior to the reform. We expect no differential change in log earnings between more or less exposed firms in the years prior to the tax change because prior to 2013 an owner having more or less than $450K in taxable income was an arbitrary distinction.

Table 1.2 shows that the specification is quite robust to the inclusion of baseline firm characteristics after controlling for deciles of baseline business income. Also, we see that the specification passes the placebo tests and there are no clear systematic differences in the earnings growth patterns of firms with and without top bracket owners prior to the tax change. Appendix Table A.4 shows robustness to the functional form of the controls for baseline income, and again we see that the earnings response is quite robust across specifications. The estimates are very stable whether I control for net income in 2012, 2011 or the average of the two years, and whether I use splines in base period net income instead of indicators for income decile.

Table 1.3 shows robustness across various definitions of the \( \text{exposure}_{jt-1} \) variable. The first column repeats the baseline \( \text{exposure}_{jt-1} \) definition and reports first difference estimates. The second column defines \( \text{exposure}_{jt-1} \) as an indicator equal to one if all owners are in the top bracket in the base year and zero if no owners are in the top bracket. The third column defines \( \text{exposure}_{jt-1} \) as the share of firm owners that are in the top bracket in the base year. The fourth column provides a very clean experiment using the subsample of firms with only one owner and defining \( \text{exposure}_{jt-1} \) as an indicator for whether that
owner is in the top bracket or not. We see that the earnings response is very consistent across definitions of $exposure_{jt-1}$, and that in all specifications there is no evidence of differential pre-trends prior to the tax change.

The fifth column presents the DD estimate of the elasticity, the percent change in earnings in response to a one percent change in the marginal tax rate faced by the firm’s owners. I define the marginal tax for a firm as the weighted average of the marginal tax rate faced by the owners, weighted by the 2012 ownership shares. The estimated elasticity is $-0.10$.

I interpret the results presented in Figure 1.2 and Tables 1.2 and 1.3 as providing consistent evidence that there was an effect of the reform on the average earnings of workers in firms more exposed to the tax change. The results suggest that, following the reform, workers in more exposed firms saw, on average, about 1% lower earnings growth than they would have were there no tax change. An additional statistic of interest is the dollar-for-dollar pass-through of the new tax liability on business income to employee earnings. Before interpreting this statistic, we must know whether the response is a result of changing composition of the firms’ workforces or whether it represents lower relative earnings growth among the same, or similarly skilled, employees. The latter would represent a pass-through and can be interpreted as the direct incidence of the tax change on earnings. I explore these channels in the following subsections before estimating the dollar-for-dollar pass-through in Section 1.6.

1.5.3 **Mechanisms: Composition or Compensation?**

I investigate whether the average earnings responses found in the previous subsections are attributable to changes in the workforce composition or whether they represent changes in the compensation paid to the same, or similarly skilled, employees. This is the central question for whether the observed within-firm earnings responses represent a pass-through of the tax burden to employee earnings or whether they represent a firm-level production response. As an extreme case, imagine that a firm reduces wages in response to the tax hike and all employees who received wage reductions leave the firm and immediately find new jobs at their old wage. The firm replaces those workers with lower skilled employees for whom the new lower wage matches their marginal product. In this case, none of the burden is passed on to employees, the firm simply uses less productive labor inputs. A related potential margin of response could be to convert workers who were W-2 employees to independent contractors, either by changing their actual job in the firm or by misclassification - paying the worker as a contractor for performing the same job as before. These responses would also show-up on the extensive margin. In order to dis-
entangle this mechanism from true pass-through, I investigate the joint employment and earnings responses to the tax change.

I begin by examining whether there is evidence of an extensive margin employment response to the tax change faced by firm owners. I test whether there is a differential change in net employment between more or less exposed firms, and whether there are differential employment or separation rates among more or less exposed firms. I define “incumbent” employees as those employees who worked for the firm in the base year $t-1$ prior to the reform, and I define firm “stayers” as incumbent employees who remain with the firm through post reform year $t$. New hires are defined as anyone who received a W-2 from the firm for the first time in some year between the base year and year $t$, exclusive of the base year.\footnote{I define receiving a W-2 from the firm for the first time as never having received a W-2 from the same firm in the prior years in the sample period. It is possible that the employee had worked for the firm in years prior to the sample period.}

Any change in total employment over the period is a combination of accumulated new hires and accumulated separations. A small or zero observed change in net employment could mask differential extensive margin responses if the number of separations and new hires effectively cancel each other out. To be concrete, the percent change in net employment can be decomposed as follows:

$$\frac{\Delta E_t}{E_{t-1}} = \frac{e_{t}^{\text{new}}}{E_{t-1}} + \frac{\Delta e_{t}^{\text{incumb}}}{E_{t-1}} = \frac{\text{new hires}}{E_{t-1}} - \frac{\text{separations}}{E_{t-1}},$$

(1.9)

where $E_t$ represents total full-time employment in year $t$, $e_{t}^{\text{new}}$ represents the number of employees in year $t$ that were not present at the firm in year $t-1$, and $\Delta e_{t}^{\text{incumb}}$ represents the difference between the number of incumbent employees present at the firm in year $t-1$ and those who remain at the firm in year $t$. The decomposition shows that the percent change in total employment can be separated into the share of new hires relative to baseline employment and the separation rate of incumbent employees.

The first columns of Table 1.4 present results from this decomposition using the first difference specification represented by Eq. (1.8). Column 1 shows the DD estimator of the effect of the tax change for the outcome log change in the number of full-time employees. There is a precise zero estimate for change in net employment. Columns 2 and 3 test whether the absence of a net employment differential masks any differential turnover on the extensive margin. Column 2 shows estimates for differential hiring rates and shows that there was no differential between treatment and control firms. Column 3 presents estimates for the retention rate and also shows no significant differential.

Taken together, the employment results suggest that the observed average earnings
response is not attributable to differentials in the number of employees at more or less exposed firms, but this does not fully answer the question about differential hiring/firing/separation patterns in response to the tax change. Even if the change in the number of employees are moving in parallel, it could be that the type of employees is changing. For example, the average earnings response could be a result of skill-downgrading such that new hires in more exposed firms are relatively low earning and separators are relatively high earning. To test this, I extend this analysis to estimate whether the observed change in the total wage bill is attributable to differential earnings paths for incumbent employees who remained with the firm or differential hiring or separation patterns. The change in the total wage bill can be decomposed as follows:

$$\frac{\Delta W_t}{W_{t-1}} = \frac{\Delta w_{t}^{\text{stay}}}{W_{t-1}} + \frac{w_{t}^{\text{new}}}{W_{t-1}} - \frac{w_{t-1}^{\text{sep}}}{W_{t-1}},$$

(1.10)

where $W_t$ represents the wage bill in year $t$; $w_{t}^{\text{stay}}$ represents the total earnings of “stay-ers,” those who remained at the firm between year $t - 1$ and year $t$; $w_{t}^{\text{new}}$ represents the total earnings of new hires in year $t$; and $w_{t}^{\text{sep}}$ is the total earnings of incumbents in year $t - 1$ which separated prior to year $t$. The percent change in the total wage bill can be decomposed into the relative change in the earnings of stayers and the differential share of earnings to new hires minus differential earnings of those separators.

Columns 4-6 of Table 1.4 present results from this exercise. Column 4 displays estimates for the log change in the total wage bill. The DD estimate is very similar to that for the change in the average wage bill, which is a direct result of the absence of an extensive margin response as documented in column 1. Column 5 shows the change in the share of total earnings going to stayers. Over 90 percent of the estimated response in the total wage bill is associated with the change in earnings going to stayers. Column 6 shows the share of the earnings response associated with differential turnover, represented by the sum of the last two terms on the right-hand-side of Eq. (1.10). A small and statistically insignificant portion of the response is associated with differential earnings among those leaving and entering the more exposed firms.

The results of this decomposition show that the majority of the observed average earnings response is associated with differential changes in earnings received by stayers in more exposed firms, with a small portion potentially attributable to skill downgrading. To highlight this point, I estimate the flexible DD specification from Eq. (1.7) comparing the average earnings of stayers in more or less exposed firms. Figure 1.3 Panel A shows

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21These results also imply that changing the classification of workers from employees to independent contractors was not a significant response to the tax change faced by the business owners.
the average earnings response for all stayers. The trends in earnings are very similar prior
to the tax reform followed by a sudden and sustained decrease in relative earnings growth
following the tax change. Recall that the DD coefficients following the tax change repre-
sent a decrease in earnings relative to unexposed firms, not nominal decreases in earnings
received by stayers. The second panel repeats the exercise for the subset of stayers with at
least three years of tenure in the base year, 2012, which I call “attached stayers.” We see
the same pattern for the group of attached stayers as for all stayers.

This evidence suggests that the earnings response in the exposed firms is primarily an
intensive margin response - incumbent employees in firms whose owners experienced a
tax hike experience slower relative earnings growth than do employees in similar firms
but whose owners saw no change in their tax rate. That the response is concentrated
among stayers shows that the observed spillovers likely represent lower wages paid to the
same employees and can be interpreted as pass-through of tax liability to the earnings
of employees in firms that experienced a tax hike. This allows me to use the observed
spillover response to estimate a dollar-for-dollar pass-through, which I do in Section 1.6.
First, in the following subsections I investigate heterogeneity of the within-firm spillovers
by employee and firm characteristics.

1.5.4 Firm Production Responses

Here I test whether there is evidence of real firm-level production or productivity
changes in response to the tax change. This helps to understand whether the observed
earnings responses are associated with real productivity changes or pass-through to earn-
ings of a similarly productive workforce.

Figure 1.4 presents ITT estimates from Eq. (1.8), where the outcome variables are
derived from line items from the firm’s income tax return. In general, we see no signif-
ificant change in production or productivity between firms whose owners were and were
not exposed to the rate increase; there is no significant difference in gross revenue, total
income, value-added or value-added per worker. There is also no significant change in the
total deductions of more exposed firms, though there is a negative point estimate which
may be related to the lower relative total wage bill among more exposed firms. The lack
of evidence of a significant change in production or productivity further suggests that the
observed earnings response is the result of a direct effect of the taxation of owners. Al-
though I am not able to directly observe prices, the lack of evidence for a change in gross
sales or income suggests that the firms may have had little ability to pass on the new tax
burden to consumers through higher prices.
1.5.5 Heterogeneity Analysis

1.5.5.1 Within-Firm Income Distribution

Next I investigate whether the observed earnings response is uniform across portions of this within-firm income distribution. This informs how the tax change affects the within-firm distribution of income and within-firm income inequality. In the data used for this project I do not observe occupation, but investigating differential responses across the within-firm income distribution may be used as a proxy for whether the burden is borne by lower relative to higher skill employees.

First, I test whether there is an aggregate change in the earnings distribution in more exposed firms. To do so, for each year I split the within-firm distribution of employee earnings into quartiles and take the average earnings in each quartile. I then use the specification represented by Eq. (1.8) where the outcome is the average earnings within each quartile, estimated separately by quartile. The results of this exercise are presented in Panel A of Figure 1.5. The average earnings in the bottom three quartiles decrease in response to the tax change relative to the average earnings in these quartiles in the non exposed firms. Those in the top quartile of the earnings distribution saw essentially no relative change in their earnings. This implies that, on average, the response to the tax change resulted in an increase in within-firm earnings inequality in more exposed firms.

Next, I can focus on the stayers to investigate whether there was differential pass-through across employees in different parts of the pre-reform earnings distribution. I locate stayers according to their position in the 2012 within-firm earnings distribution, then estimate the response separately for the stayers according to their quartile in the pre-reform distribution. Panel B of Figure 1.5 shows the result of this test. The solid black bars represent the DD estimator by quartile for all stayers; the blue dashed lines show the estimates for attached stayers, with at least three years of tenure in 2012. The pattern is clear for all stayers and for attached stayers; the earnings responses are concentrated in the lower half of the within-firm income distribution. There are significant negative DD estimates for stayers in the bottom two quartiles of the earnings distribution and precise zeros for those in the top two quartiles.

1.5.5.2 Differential Effects by Labor Market Conditions

Next I investigate whether the earnings responses vary by the labor market conditions of the state in which the firm operates. The labor market models presented in Section 1.3 imply that labor market conditions could affect the estimated earnings response of workers in firms more exposed to the tax change. Primarily, in order for there to be any relationship
between the tax rates faced by the owners and the earnings of the workers there must be some form of labor market friction that creates a wedge between the earnings of the employee and their marginal product. In locations with tight labor markets and few frictions, there will be less of a wedge between the marginal product and the earnings received by the employee and therefore a smaller role for the taxation of owners to spillover to the employee earnings.

Figure 1.6 presents ITT estimates from Eq. (1.8) separately by labor market characteristics of the state in which the firm operates. I use two measures of labor market conditions in a state and rank states according to these measures. The first measure I use is the state unemployment rate in 2012, the year prior to the reform. Second, I use the “state shock” measure established in Yagan (2018) to measure how hard the labor market in a state was hit by the recession; this rank measure is created using the change in state unemployment rates between 2007 and 2009. Each state is ranked according to their position along each of these measures, and I run separate regressions for groups of states according to their quartile rank on each measure.

The first set of bars in Figure 1.6 presents results by rank of the 2012 unemployment rate. There is a clear pattern along this measure. The point estimates of the earnings responses are monotonically decreasing in quartiles of the state unemployment rate; the largest earnings responses are found in states with the highest unemployment rates in the year prior to the tax increases. The second set of bars present results for the Yagan (2018) recession shock measure. The earnings responses are fairly uniform for the first three quartiles of the distribution of the state shock, while the estimate for the lowest quartile, representing firms in states with the smallest shock to the unemployment rate during the recession, saw almost no earnings response.

Taken together, these results suggest that the magnitude of the earnings response depends on the labor market conditions around the time of the tax change, with larger spillovers in states with relatively slack labor markets. When unemployment rates are higher, it may be easier for employers to fill vacancies if incumbent employees leave and it may be more costly for incumbents to separate in response to lower earnings growth. These results suggest that labor market conditions are an important factor in the magnitude of spillovers from tax rate changes on business owners to the earnings of employees.\footnote{A paper by Kahneman, Knetsch and Thaler (1986) and the follow-up comment by Gorman and Kehr (1992) surveyed employees and executives about when it would be considered fair for business to respond to business conditions by adjusting prices or wages. They find that 78% of individuals and 98% of executives would consider it fair to reduce the rate of wage growth in response to a shock to business profits, particularly in times of high unemployment. Both individuals and executives generally considered it fair to reduce bonuses or wage growth in response to shocks to profits, but not fair to reduce nominal wages and less fair to lay-off workers.}
which in turn suggests that labor market institutions and macroeconomic conditions may mediate responses to taxation of business owners.

1.5.5.3 Other Heterogeneity

Figure 1.7 presents estimates from Eq. (1.8) separately by a range of firm and employee characteristics. The top set of estimates shows responses by firm size. The response is similar across firms with fewer than 100 employees, with the largest estimated responses among medium sized firms, those with 50 to 100 employees. There is no statistically significant response among large firms, those with over 100 employees, implying that the aggregate response is driven by small and medium sized firms.

To investigate whether the response is driven by small or medium sized firms in terms of total production or productivity, I next rank all firms by their average value-added in the years prior to the tax change, 2011 and 2012, and estimate the earnings response separately for terciles of this distribution. We see that the largest responses are among firms in the second and third terciles and that there is no significant response in among the smallest firms in terms of value-added. Next, I rank firms by their profitability defined as net profits over gross revenue and estimate the earnings responses by terciles of this distribution. There were relatively uniform responses across this distribution with slightly larger responses among more the more profitable firms. This shows that the response is larger in small and medium sized firms in terms of employees, but that the response is in fact larger among firms which are large in terms of economic activity. I also rank firms by the labor share of revenues, defined as the wage bill over gross revenues. The responses were relatively consistent across firms with different labor shares though slightly smaller among firms in the top tercile of labor share.

The next set of estimates investigate responses by the ownership structure. First I test for differential responses by whether the owner exposed to the tax change is an active owner (an owner employee) or a passive owner. The first estimate shows the earnings response for firms which have a top-bracket active owner relative to firms with no top-bracket owners. The estimate is significant and slightly larger than the aggregate response. The next estimate presents the earnings response for firms that have a passive owner who was exposed to the tax change, but where the active owner was not exposed to the tax change. Interestingly, there is no significant earnings response among these firms. Next I estimate heterogeneous responses by the number of owners. There is no evidence of differential responses between single owner and multiple owner firms on average. Among multiple owner firms, those with 2-5 owners respond similarly to single owner firms and there is no significant earnings response among firms with over 5 owners, however, because there
are few firms with more than 5 owners in the sample, the estimate is quite imprecise.

Finally, I conduct heterogeneity analysis by characteristics of the employees. I test whether there is evidence that the pass-through is different among men and women and find that there is no statistically significant difference in earnings responses across these groups though there is a slightly larger response among women. Next I test whether there is a differential response among women with or without dependent children. I find a slightly larger, but not statistically distinguishable, response among women with children relative to those without and the point estimate for women without children is almost identical to that of men.

1.5.6 Summary of Within-Firm Spillovers

The results presented in this section provide direct evidence of spillovers from the top marginal personal income tax rate faced by pass-through business owners to the earnings of employees. Average earnings of employees in firms exposed to the tax change grew more slowly than the earnings of employees in similar unexposed firms following the tax change. There were no apparent extensive margin employment responses to the tax change as nearly all of the earnings response was concentrated among stayers, employees who were with the firm at the time of the tax change and remained with the firm. Additionally, there is no evidence that the earnings response was a result of a decrease in average production or productivity among more exposed firms. Together, this suggests that the average earnings response is associated with the pass-through of the taxation of firm owners to the wages of employees, as in the generalized labor market models presented in Section 1.3. This also suggests that I am able to convert the spillover estimates to a dollar-for-dollar pass-through calculation, as I will do in the following section.

Heterogeneity analysis shows that the earnings response was not constant across employees in exposed firms. The responses were concentrated among those in the lower half of their firm’s income distribution, implying that the burden may be disproportionately borne by lower skill employees. Additionally, firms in states with more slack labor markets saw larger spillovers in response to the tax change while firms in states with tight labor markets exhibited very small and insignificant responses. This suggests the potential importance of labor market frictions for the ability of owners to pass-through business taxation to employee earnings. In markets with more frictions, or for employees who may find it more difficult to face the outside market, firms may have more wage setting power and therefore more scope for passing the burden of taxation to employee earnings.

Further, the heterogeneity analysis shows that the ownership structure of the firm may be important for mediating the incidence of income taxation. Employees in firms where the
active owners experienced the tax increase exhibited larger earnings responses than did employees in firms where only passive owners experienced the tax hike. This suggests that there may be differential incidence between the taxation of pass-through businesses, most of which have few owners and majority active owners, and that of C-corporations, which generally have very many owners and mostly passive owners. Additionally, taxes which differentially affect active and passive owner income may have different implications for the incidence of that tax.

1.6 Pass-Through of Owner Tax Liability to Employees

In this section I estimate the pass-through from the increased taxation of S-corporation owners to employee earnings, defined as the share of an exogenous $1 increase in business tax liability borne by the employees as lower earnings. Note that because I am estimating responses over a three year time period, it is unlikely that the pass-through estimates can be attributed to reductions in the capital stock driving down returns to labor. Given the evidence in Section 1.5 and the nature of the natural experiment, it is most likely that the estimates correspond with the direct pass-through of tax liability as predicted by the wage-setting labor market models presented in Section 1.3.

The estimates in this section are based on Eqs. (1.7) and (1.8), where the independent variable of interest, \( \text{exposure}_{jt-1} \), is a measure of the change in tax liability faced by the business owners due to the rate change. I use a tax calculator adapted from an IRS tool for calculating federal income tax rates and liabilities in order to create annual measures of the tax liability, marginal tax rate and average tax rate faced by firm owners. I calculate the average tax rate on taxable income as the total tax liability divided by total taxable income. To obtain a single marginal tax rate for each firm, I use a weighted average of the owners’ marginal tax rates, weighted by the ownership shares in 2012. To calculate the tax liability on business income I treat business income as the last dollars earned by the household of the firm owner. The business tax liability is defined as the total tax liability of the owner minus the tax liability that the owner would have owed had they earned no business income from their firm. To calculate the second number, I subtract the business income items from the owners total taxable income and apply the tax calculator to the remaining income.

In the primary analysis I define total business income as the sum of net business income and the wage and salary income a firm owner receives from their firm. Active owners of S-corporations receive business income from the firm, but also must pay themselves W-2 wage and salary income. There is a guidance that active owners must pay themselves
“reasonable wages” for the services performed for the firm, but they have some discretion in exactly how much they pay themselves and how much income they take in the form of profits. Given this, the business income concept which includes both the owner’s net business income and wage and salary income is appealing for two reasons. First, given the discretion that the owner has in shifting between business income and wages, total income received from the firm may be a more robust and consistent measure of owner income. Second, owners of partnerships or LLCs are not required to pay themselves W-2 wages, but receive all income as a share of business earnings according to the partnership agreement. Therefore, the total income concept is more analogous to that which we would observe with other types of pass-through businesses. While I use the combined measure for the baseline estimates, I test robustness to using only the liability on net ordinary business income as the independent variable of interest.

1.6.1 Pass Through of Business Taxation

I begin by presenting estimates for the effect of the percent change in the business income tax liability on the earnings of lower-bracket workers. I use a modification of the event-study specification represented by Equation (1.7) where the right-hand-side variable of interest, exposure, is defined as the predicted log change in tax liability of business income per worker. The mechanical change in log tax liability of business income is defined for each firm as $\ln(T_t(business\ income_{t-1})) - \ln(T_{t-1}(business\ income_{t-1}))$, where $T_t(\cdot)$ represents that tax liability per employee given the tax-system in year $t$, and $T_{t-1}(\cdot)$ is the tax liability per worker given the tax system in year $t-1$. In other words, the mechanical change in log tax liability is the percent change in after-tax business income associated with applying the new (higher) tax rates to the base period income. The coefficient on this variable will be the DD estimator for the effect of an exogenous one percent increase in business tax liability on the earnings of lower-bracket workers. I weight each regression by firm size (number of full-time employees) in 2012 so that the resulting estimates simulate individual-level regressions with a firm-level treatment. In the previous section we observed variation in earnings responses by firm size, so weighting by firm size alleviates any potential bias created by this heterogeneity.23

Figure 1.8 plots event-study coefficients this specification. Panel A uses the full sample of firms where the control firms are those with no top-bracket owners and experience no predicted change in their business tax liability. The flat pre-trends show that after controlling for baseline firm characteristics, firms with a higher predicted change in tax

\[23\] Empirically, weighting by firm size provides very similar results as controlling flexibly for baseline firm size.
liability have no differential earnings path prior to the tax reform. In 2013 there is a sudden and persistent relative decrease in earnings of employees in more exposed firms, with a point estimate of $-0.10$ in 2015.\(^{24}\) This point estimate can be interpreted as an elasticity: a 10% exogenous increase in the firm’s income tax liability is associated with a 1% decrease in employee earnings relative to the counterfactual earnings growth.

Panel B repeats the exercise, but for the subset of firms with at least one top-bracket owner. Each of these firms had at least one owner experience an increase in their marginal tax rate and each firm with positive business income experiences some mechanical increase in their tax liability. This isolates variation in the exogenous shock to tax liability among firms which were exposed to the tax change. Though this greatly reduces the sample of firms, much variation in tax liability remains. The pattern and point estimates are very similar for this subsample and remain statistically significant, though the standard errors are slightly larger due to the reduction in sample-size. The point estimate as of 2015 is $-0.09$. There are two main takeaways from this exercise. First, we learn that the observed pass-through response are not purely driven by a comparison between those with some top-bracket owners and those with no top-bracket owners. In other words, the pass-through is a function of the total change in tax liability, or the change in average tax rate on business income, and not purely a function of jump in the marginal tax rate the business faces. Second, this can be seen as a robustness test. If we were concerned that there were unobserved differences between firms with and without top-bracket owners that was changing changing after 2012 in a way that would bias the spillover results, then this should help alleviate any such concerns. All of these firms have at least one top-bracket owner, so this subsample includes very similar firms but with differential shocks to business tax liability.

Figure 1.8 provides estimates leveraging the full variation in tax liability as depicted in Panel B Figure 1.1 and validates the parallel trends assumption necessary for a causal estimate of the pass-through parameter, but it does not provide the the dollar-for-dollar pass-through estimate. To do so, I convert the estimated elasticity to a dollar metric to calculate the pass-through of an exogenous $1$ increase in business tax liability to employee earnings. This calculation is derived from the elasticity estimate evaluated at sample averages of business income tax liability and wages. The estimated elasticity can be represented as

$$\varepsilon = \frac{\partial w}{\partial T} \frac{T}{W},$$

which can be rearranged to formulate the effect of a $1$ change in tax liability on earnings

\(^{24}\)Recall that the negative coefficient does not represent a nominal earnings decrease, but lower earnings growth relative to the counterfactual firm which experienced a 1% smaller change in business tax liability.
as
\[
\frac{\partial w}{\partial T} = \varepsilon \frac{W}{T}.
\] (1.11)

I use this formulation, evaluated at the mean wage bill and business tax liability for the sample, to calculate the dollar-for-dollar pass-through estimates presented in Table 1.5.

Table 1.5 presents the elasticity and corresponding pass-through estimates separately for all employees and for stayers, and for specifications using various controls for baseline firm characteristics. The first three columns present results using all full-time employees. The first row presents the elasticity estimates from estimating Eq. (1.8). The second row presents the dollar-for-dollar pass-through estimates calculated by evaluating the elasticities at the ratio of sample average wage bill to tax liability according to Eq. (1.11). We see that the estimates are not very sensitive to the choice of firm-level controls, after controlling for deciles of net business income in 2012. Focusing on the preferred specification with full controls presented in column 3, I find an 18% pass-through. For each dollar of new business tax liability, 18 cents is “paid” by employees.

The second set of columns repeats the exercise for the average earnings of stayers only. This presents the most conservative estimate of pass-through, as it represents only the change in earnings for a fixed set of employees who remain with the firm. The elasticities are slightly larger, but the pass-through estimates are somewhat smaller than for the full sample because the wage bill of stayers is lower than the total wage bill. The estimates for stayers are also not sensitive to the set of baseline controls. The preferred specification in column (6) shows a 15% pass-through to the earnings of stayers.

To put these estimates in context, the third row provides the sample average of the mechanical change in business tax liability experienced by firms with top-bracket owners. Applying this pass-through estimate to this statistic provides a simple calculation of the average change in the wage bill resulting from the tax reform for firms that experienced the tax change. The estimated change in wage bill is $6,000-8,000.

1.6.2 Robustness to Alternate Income Concepts

As discussed above, the estimates presented so far define total business income as the sum of net business income and owner wage and salary income. I repeat the pass-through estimation using only the reported net business income, and present the estimates in Appendix Table A.5. The pass-through estimates are larger when using this income concept, but when evaluating the implied total change in the wage bill, shown in the fourth row, we see estimates in the same range as in the baseline concept. The definition of business income affects the dollar-for-dollar pass-through estimate, but does not much
affect the welfare relevant metric - the total change in wage bill resulting from the tax reform.

Next I test whether there is any evidence that the owners are passing the new tax liability on their non-business income onto the employees, or whether it appears that the pass-through is associated with the increased liability on the business income as would be suggested by models of the sort presented in Section 1.3. To do this, I test whether there is differential pass-through among firms whose owners experience a larger change in tax liability on their non-business income, controlling for the change in the tax liability on business income. This variation is displayed by the blue line in Panel D of Figure 1.1. I modify Eq. (1.8), as follows:

$$\Delta \ln(y_{jt}) = \alpha + \sum_t \beta_{t-1} \text{exposure}_{jt-1} + \sum_t \theta_{t-1} \text{nonbus}_{jt-1} + \gamma_t f(z_{jt-1}) + \Gamma_t X_{jt-1} + \delta_{t-1} + \epsilon_{jt}, \quad (1.12)$$

including an additional set of right-hand-side variables, nonbus_{jt-1}, which are defined as the mechanical change in log tax liability on the owners’ non-business income, while continuing to control for the change in log tax liability on business income as before, exposure_{jt-1}.

As represented in Panel D of Figure 1.1, an owner with less than $450K in non-business income may have a portion of their business income subject to the change in the top marginal rate. Once an owner has more than $450K in non-business income, all of their business income is subject to the top rate and their non-business income over $450K is subject to the top rate as well. Therefore, the coefficients \theta_{jt-1} are only identified for firms with at least one owner with over $450K in non-business income.

The results of this exercise are presented in Table 1.6, which displays the coefficients on the percent change in tax liability on business and non-business income, \beta_{2012–2015} and \theta_{2012–2015}, in the first and second rows respectively. The first two columns show results where business income is defined as the primary analysis as total K1 plus wage and salary income of the owners and the second pair of columns shows results where business income is defined only as the K1 income of the owners. Columns 1 and 3 show results when using the full sample of firms and columns 2 and 4 show results when restricting to firms with at least one top-bracket owner.

The results show no evidence of a differential earnings response associated with firms whose owners have larger changes in tax liability on their non-business income. The coefficient on the change in liability on business income remains stable and very similar to the estimates when not controlling for the change in liability on non-business income. The coefficients on the change in liability on non-business income are all statistically insignificant and the point estimates are small and positive, suggesting, if anything, that owners
with larger changes in their non-business income tax liability pass on less of the burden to employees. These results suggest that owners are passing the tax liability on business income through to employees, but not the tax liability on the non-business income, and correspond with a model of business income taxation such as those presented in Section 1.3.

1.6.3 Discussion of Pass-Through Results

Focusing on the preferred specifications presented in columns 3 and 6 of Table 1.5, I find a pass-through of business income taxation on employee earnings of 15-18%. This estimate is lower than recent estimates of the incidence of business taxation on earnings. Fuest, Peichl and Siegloch (2018) estimate that 43% of the burden of corporate taxes is born by workers and Arulampalam, Devereux and Maffini (2012) estimate a long-run incidence of 39%. Juan Carlos Suárez Serrato and Owen Zidar (2016) estimate a model of mobile capital and labor across states and estimate that employees bear 30-35% of the burden of state corporate taxes in the U.S. The estimate by Fuest, Peichl and Siegloch (2018) is based on German corporations which have much higher levels of collective bargaining than in the U.S. The bargaining model presented in Section 1.3 highlights that workers with more bargaining power may bear a larger burden of the tax change. Given the relative lack of unionization in the U.S., it may not be surprising that the incidence estimates would be smaller in the U.S. context. Arulampalam, Devereux and Maffini (2012) use cross-country regressions to estimate the incidence on earnings and use a sample of European countries, which also have higher levels of unionization than the U.S. on average. In contrast to the state-level tax variation used by Juan Carlos Suárez Serrato and Owen Zidar (2016), my estimates are within state. The smaller pass-through parameter that I find may be a result of higher labor mobility across firms in a given state than across states.

The estimates I find for pass-through firms in the U.S. are somewhat smaller than those estimated in each of these studies. This could be a function of setting as described above or potentially because owners of pass-through businesses respond differently to income tax changes than do owners of C-corporations. The heterogeneity analysis presented in Figure 1.7 suggests that the ownership structure of the firm may mediate the response to business income taxation. Additionally, the variation across state with different prevailing unemployment rates presented in Section 1.5 suggests that the pass-through parameter may not be structural but instead may depend on the prevailing macro labor market conditions in addition to prevailing labor market institutions. Finally, the parameters estimated in each of these studies is somewhat different, Fuest, Peichl and Siegloch (2018) and Juan Carlos Suárez Serrato and Owen Zidar (2016) estimate responses to uniform changes in sub-
national tax rates, Arulampalam, Devereux and Maffini (2012) estimates responses to national tax changes, and I estimate responses to a differential tax rate changes within jurisdiction. Different estimates may be more appropriate for interpreting different tax policies.

Critically, the experiment conducted here focuses specifically on the types of firms that are taxed subject to the personal income tax system. I find that it is the taxation of the business income of pass-through business owners that affects the earnings of their employees. Therefore, the parameter estimated here is the most relevant for analyzing cross-bracket spillovers from changes in the top marginal personal income tax rate.

1.7 Implications for Welfare and Optimal Income Taxation

In the standard Mirrleesian optimal income tax model it is assumed that the marginal tax rate faced by individuals at a given income level has no effect on the income or behavior of those at different income levels. Concretely, it is assumed that a change in the top marginal tax rate only affects the income and behavior of individuals that face the top marginal tax rate, so that the entire incidence of the personal income tax is borne by households facing the given tax rate. The evidence presented here suggests that this is not always the case, particularly in a tax system with pass-through businesses. The results show a clear behavioral response to the business income taxation embedded in the personal income tax system leading to within-firm, cross-bracket spillovers. In this section I present a simple model of welfare analysis with cross-bracket spillovers as a response to changes in the top marginal tax rate. The model will highlight that in such a setting the ETI of those directly facing the rate change is not a sufficient statistic for welfare analysis; one must also know the transfer in surplus associated with the tax change - the parameter estimated in the empirical analysis above. When an increase in the top tax rate leads to a transfer of surplus away from employees toward owners, using the ETI of those facing the top rate as a sufficient statistic for the marginal welfare loss associated with the tax change will understate the true marginal welfare loss.

1.7.1 Marginal Welfare Analysis

I use a basic framework for welfare analysis and examine the implications of cross-bracket spillovers. For clarity and simplicity, I assume that there are only two types of agents in the economy, business owners that are at the top of the income distribution and face tax rate $\tau$ and employees who are lower in the income distribution and face tax rate
In order to highlight the implications for using ETI as a sufficient statistic for welfare analysis, I fully abstract away from distributional considerations by assuming that the social welfare weight on owner income and employee income is the same and that owners and employees have linear utility functions.

Firm owners’ and employees’ utility functions are represented by the following:

**Owners:**

\[ u^o(c, z(\pi, e)) = (1 - \tau)(\pi + e) - \psi(\pi, e), \]  

\[ (1.13) \]

**Employees:**

\[ u^e(c, z(\omega, -e)) = (1 - t)(\omega - e) - \phi(\omega, -e). \]  

\[ (1.14) \]

Agents receive positive utility from consumption, but negative utility from activities which generate pre-tax earnings \( z \). For owners, pre-tax earnings is the sum of \( \pi \), which represents the earnings function were they to receive none of the match surplus, or rents, from their employment relationships, and their share of the surplus arising from their employment relationships, \( e \). Similarly, \( \omega \) represents the employee’s earnings were they to receive all of the match surplus from their employment relationship. For example, \( \omega \) could represent employee earnings were their wage equal to their marginal product, \( \pi \) owner earnings were they to pay employees \( \omega \), and \( e \) the mark-down associated with earning less than their marginal product.\(^25\) Owners and employees choose \( \pi \) and \( \omega \), respectively, and experience utility costs, \( \psi \) and \( \phi \) associated with generating net-of-surplus earnings, which are increasing and convex in \( \pi \) and \( \omega \). Whether the agents choose the surplus share, \( e \), and experience the associated utility costs, or whether it is as an exogenous parameter in their optimization problems depends on the labor market model, and will have implications for the welfare analysis. I discuss three alternative cases below.

The government does not observe \( \pi \) or \( \omega \) directly, but only the total taxable income of owners and workers, \( \pi + e \) and \( \omega - e \) respectively. I assume the government collects taxes and returns the money to everyone lump-sum or, analogously, that the social marginal value of public funds equals one. The welfare in the economy can be represented by:

\[ W = (1 - \tau)(\pi + e) - \psi + (1 - t)(\omega - e) - \phi + \tau(\pi + e) + t(\omega - e) \]  

\[ (1.15) \]

To assess the excess burden generated by a small change in the top marginal tax rate, I differentiate Eq. (1.15) with respect to the top marginal tax rate, \( \tau \). A small increase in the tax rate produces a mechanical effect and a behavioral response, and also induces a pre-tax transfer of surplus, \( de/d\tau \). The impact of these responses for owners employees

\[^{25}\text{I present here the pre-tax earnings as an additive function of } \pi \text{ or } \omega \text{ and } e \text{ for clarity of presentation, but this is not necessary. In Appendix A.1.4 I use general earnings functions, and the intuition is the same.}\]
and government revenue are summarized below.

\[
\frac{\partial W}{\partial \tau} = \tau \frac{d\pi}{d\tau} + \tau \frac{de}{d\tau} - t \frac{de}{d\tau} + (1 - \tau) \frac{de}{d\tau} - \psi \frac{de}{d\tau} - (1 - t) \frac{de}{d\tau} - \phi \frac{de}{d\tau}
\]

(1.16)

The mechanical effect holds behavior constant. An increase in the tax rate leaves the owner with less after-tax income and generates an equal amount of revenue for the government, and so produces no net change in welfare. The tax change also induces a behavioral response among owners such that they reduce pre-tax earnings in response to the higher marginal tax rate, \(d\pi/d\tau < 0\). The behavioral response produces no first-order effect on the owner's welfare because the owner chooses \(\pi\) optimally as an implicit function of the tax rate \(\tau\). This is the standard application of the envelope theorem to the owner's utility optimization problem from Eq. (1.13). The behavioral response does have a first-order effect on revenue because the owner does not internalize the fiscal externality associated with the response. The net welfare effect of the behavioral response is thus the revenue loss associated with the fiscal externality, \(\tau (d\pi/d\tau) < 0\). In the standard Mirrleesian model, this revenue loss equals the deadweight burden from a tax increase.

Additionally, the tax change induces a transfer in pre-tax surplus away from employees and towards owners, \(de/d\tau > 0\), as consistent with the models in Section 1.3 and with the empirical findings. There is a fiscal externality associated with the transfer as long as the money is shifted across groups facing different tax rates. In this case, the fiscal externality increases revenues because the surplus is shifted from lower-bracket employees to top-bracket owners. The net welfare effect depends on whether the tax-induced transfer has a first-order effect on the welfare of the owners and employees. This in turn depends on whether the surplus, \(e\), is a choice variable or an exogenous parameter in the agents’ optimization problems, which will determine whether the envelope theorem applies to the welfare effects of the transfer. Whether \(e\) is a choice variable or an exogenous parameter for the owners and employees depends on the underlying labor market model.

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26I refer to this as an “earnings” response for simplicity. More generally it reflects all taxable income responses net of the transfer of surplus, which can include avoidance/evasion responses.

27Note that I assume here that the employees display no behavioral response to the change in the owners’ marginal tax rate, i.e. that \(d\omega/d\tau = 0\). This implies that employees do not change labor supply behavior and that their marginal productivity does not change in response to the owners’ tax rate; their taxable earnings only respond through the tax induced transfer of surplus. This will generally hold in the frameworks of the two models described in Section 1.3, where the change in surplus is small such that the offered earnings remains above their reservation wage for the firm. I make this assumption only to simplify the discussion. In Appendix A.1.4, I allow for \(d\omega/d\tau \neq 0\); the intuition is very similar, though the formulas become slightly more complicated.
The net change in welfare consists, first, of the total revenue externality associated with all tax-induced responses to the change in the top rate. This is a standard result of marginal welfare analysis, the unique feature being the need to account for the taxable earnings response of lower-bracket employees not directly subject to the change in the top rate. In addition, the net welfare effect includes any potential first-order welfare effects for the agents associated with the tax-induced transfer of surplus. I will discuss the three relevant cases for the latter component in turn.

**Case 1: Transfer determined by the market (\(de/d\tau\) has a first-order welfare effects for owners and employees)**

First I consider the case where the surplus share, \(e\), and therefore the response of the surplus to the tax rate, \(de/d\tau\), are determined by the market. In other words \(e\) is not part of the agents’ choice set; the agents choose their optimal behaviors (e.g. labor, leisure, capital and labor investment) and the market determines surplus shares, \(e(\tau)\), which is a function of the owner's tax rate. Agents choose \(\pi(\tau,e)\) and \(\omega(t,e)\) optimally as implicit functions of their tax rates and surplus shares, and \(\partial\psi/\partial e = \partial\phi/\partial e = 0\) because the distribution of surplus shares implies no marginal utility cost beyond the effect on consumption. This would be the case for the class of search and bargaining models presented in Section 1.3.2.1 where agents make economic decisions and \(e\) is determined by the Nash bargain, which is governed by an exogenous bargaining parameter.

When \(e\) is not chosen optimally by the agents, the envelope condition does not apply and changes in \(e\) have a first-order effect on agents’ welfare. Both the direct effect of the transfer and the revenue externality remain in the marginal welfare calculation. The net change in welfare from a small increase in the top marginal tax rate is:

\[
\frac{\partial W}{\partial \tau} = \tau \frac{d\pi}{d\tau}.
\]

In this case, the tax induced change in surplus is a pure transfer between owners and workers, and between individuals and the government, so the net welfare effect of the transfer is zero. All that remains in the marginal welfare calculation is the revenue effect associated with the change in underlying earnings behavior. With no distributional concerns, Case 1 can be seen as a special case of the result in Chetty (2009a) when transfers between agents have no net welfare or revenue effect.\(^\text{28}\)

Equation (1.17) shows that the owners’ ETI is not a sufficient statistic for welfare analysis in this context. The ETI reflects the response of total reported taxable income to the

\(^{28}\text{If we introduce distributional considerations, the marginal welfare analysis becomes more complex, and the direct effect of the transfer would appear directly in the marginal welfare calculation.}\)
tax rate, \( d(\pi + e)/d\tau \). Rewriting Eq. (1.17) in terms of taxable income we have,

\[
\frac{\partial W}{\partial \tau} = \tau \left( \frac{d(\pi + e)}{d\tau} - \frac{de}{d\tau} \right).
\]

There are two primary implications. First, the sufficient statistics for welfare analysis are the total taxable income response and the transfer response. Second, since I find that \( de/d\tau > 0 \), and we know generally that \( d(\pi + e)/d\tau < 0 \), implying that total taxable income response underestimates the marginal welfare cost. This is because the transfer from employees to owners mitigates the owners’ total change in taxable income, thereby understating the underlying welfare relevant response to the rate change, \( d\pi/d\tau \), which creates the deadweight loss. Numerous studies have been dedicated to capturing the taxable income response of those directly facing rate changes, and the empirical analysis in this paper is dedicated to the additional welfare relevant parameter by directly estimating the transfer associated with a change in the owner’s tax rate.

**Case 2: Transfer determined by owner and employee optimization** (\( de/d\tau \) has no first-order welfare effects for owners or employees)

Next, I consider the case where equilibrium \( e \) is the result of the optimization of both owners and employees. Owners and employees optimize utility by jointly choosing \((c, \pi, e)\) and \((c, \omega, e)\) respectively, and their choice of \( e \) has a utility cost such that \( \partial \psi/\partial e \neq 0 \) and \( \partial \phi/\partial e \neq 0 \). In this case, the direct effect of the transfer has no first-order welfare effect for either the owners or the employees as the envelope condition applies to both. The resulting net change in welfare is

\[
\frac{\partial W}{\partial \tau} = \tau \frac{d\pi}{d\tau} + (\tau - t) \frac{de}{d\tau}, \text{ or (1.18)}
\]

\[
= \tau \frac{d(\pi + e)}{d\tau} - t \frac{de}{d\tau}.
\]

Again, we see that the owners’ ETI is not a sufficient statistic for welfare and that the owners’ taxable income response understates the marginal loss in welfare when \( de/d\tau > 0 \). As represented by the second term of the first formulation in Eq. (1.18), the revenue externality is positive because income being transferred from a lower tax bracket to a higher tax bracket, which mitigates the welfare loss. If the transfer were across agents in the same tax bracket, there would be no revenue externality from the transfer and the marginal welfare loss would be associated with the change in the earnings generating behavior of the owners, identical to that represented by Eq. (1.17) in Case 1.

The marginal welfare loss is equal to the total marginal revenue effect from all taxed
induced behavioral responses from all sources. This welfare result has a very similar intu-
tuition as to that when considering avoidance behavior in which an agent shifts income
from one tax base to another, as discussed by Saez, Slemrod and Giertz (2012). Similar
to income shifting, the welfare calculation must account for income shifted to a different
base and the tax rate of the alternate base, but, in this case the alternate base is not a
different income source for the taxed individual but is the earned income of other taxed
individuals who face a different tax rate.

Case 3: Transfer determined by owner optimization \((de/d\tau\) has a first-order welfare
effect for employees only)

Finally, I consider the intermediate case where \(e\) is chosen directly by the owner, but not
by the employees. In this case the tax induced transfer will have no first-order effect on the
welfare of the owners by the envelope condition, but there will be a first-order effect on
the welfare of the employees. This would be the case in the wage posting model presented
in section 1.3.2.2 where owners directly choose the employees’ offered wages (inclusive of
the potential mark-down) optimally given the labor market fundamentals, and employees
take that as given and make labor supply decisions.\(^{29}\)

This implies the net marginal welfare effect,

\[
\frac{\partial W}{\partial \tau} = \tau \frac{d(\pi + e)}{d\tau} - \frac{de}{d\tau}.
\]  

Again, the total reported taxable income response is not a sufficient statistic for the marginal
welfare loss. The welfare loss implied by the total taxable income response of the owners,
weighted by the tax rate, understates the total welfare loss. The taxable income responses
of owners and employees to the change in the owners’ tax rate are sufficient statistics for
welfare analysis, as in the other two cases. The total revenue response of all agents un-
derstates marginal welfare loss. Instead, the employees’ taxable earnings response must
be weighted by one, instead of by the employees’ tax rate, because the transfer has a first-
order effect on employee welfare. Therefore, the marginal welfare loss is larger than in
the other two cases.

1.7.2 Discussion

The empirical analysis found cross-bracket spillovers from changes in the top marginal
personal income tax rate. The welfare analysis highlights the two fundamental implica-

\(^{29}\)In the wage posting model the marginal employee will be indifferent between working at firm \(j\) at
earnings \(\omega - e\) and will change behavior in response \(de/d\tau\). Thus, the marginal employee will experience no
first-order welfare loss, but all of the inframarginal employees will experience a first-order welfare loss.
tions of this finding. First, in the presence of cross-bracket spillovers, the owners’ ETI is not a sufficient statistic for welfare analysis. We must also know the extent of the spillover, or how the distribution of surplus changes in response to a tax change. Second, when the pre-tax surplus shifts from employees to owners, the taxable income response of top-bracket households will understate the welfare loss associated with a change in their tax rate.\textsuperscript{30}

While the welfare analysis above ignored distributional considerations, when evaluating optimal tax and transfer policy it becomes particularly important to account for the distributional consequences of cross-bracket spillovers. The specific design of the optimal tax and transfer system in the presence of cross-bracket spillovers will depend on the underlying mechanisms which mediate the spillovers. Solving for the optimal personal income tax structure for each potential labor market model is beyond the scope of this paper, but the main insights of the simple welfare analysis remain. Conceptually, when designing the optimal tax schedule the government can adjust the tax rate and/or transfers for the lower-bracket employees to help offset the welfare effect of the pre-tax transfer of surplus. In order to effectively adjust rates or transfers, the government would need a statistic beyond the ETI, the magnitude of the spillovers, the location of the affected employees in the income distribution and the underlying mechanisms. The empirical analysis provides the sign and magnitude of the spillover and shows that the within-firm earnings response is a mediating channel. Accounting for such spillovers can improve the efficiency and equity of the tax system.

This analysis underscores how labor market mechanisms can interact with the income tax system. The models in Section 1.3 show how features of the labor market such as the reservation wages / outside options of an employee in a firm, bargaining power, and monopsony power can affect the transfer of surplus in response to a tax change. The welfare analysis implies that these underlying features affect optimal income tax policy. In addition to taxes, the government designs policies which affect the interaction between workers and firms in the labor market, for example the minimum wage, health care policy, unemployment insurance, and regulations affecting monopoly and monopsony power. For example, if the government has tools which eliminate or reduce the rents, $e$, or the transfer of rents, $\frac{de}{d\tau}$, this would also make income taxation more efficient. The findings here

\textsuperscript{30}Though the mechanism is quite different, the underlying intuition behind these results are similar to a model where wages respond endogenously to tax rates in general equilibrium, such as in the model presented in Allen (1982). The taxes induce redistribution within the labor market, in addition to through the fiscal system, with additional welfare implications. The analysis also shares some of the same intuition as when product markets are not perfectly competitive, as in Kaplow (2019), in which case the optimal income tax schedule must be adjusted to account for the tax induced changes in product price mark-ups.
suggest that it may be optimal to jointly consider tax and labor market policy.

Finally, I find that the business income taxation embedded in the personal income tax system is associated with cross-bracket spillovers, and affects the equity and efficiency of the personal income tax system. This has implications for the optimal design of a business income tax system, and the choice of whether to tax business income separately or as part of the personal income tax. This issue is increasingly important as the majority of businesses in the U.S. are pass-through businesses and pass-through business income is earned disproportionately by those at the top of the income distribution, becoming a main contributor to income inequality.\footnote{31} As it becomes more difficult to distinguish between capital and labor income, it will become increasingly important to analyze the optimal form of taxation of business owners.

## 1.8 Conclusion

A central question in the debate over the relationship between top marginal tax rates and income inequality has been the degree to which changes in the top marginal tax rate affect workers in lower tax brackets. This paper uses a new administrative dataset which links S-corporation owners and workers to their firms and investigates within-firm spillovers resulting from a recent increase in the top marginal tax rate. The empirical strategy uses the insights from labor market models where surplus is shared between owners and employees. The linked administrative data allows me control for detailed characteristics of firms and isolate variation of the exposure of S-corporation owners to the tax change in order to alleviate issues of mean reversion and estimate unbiased treatment effects.

I find that S-corporation owners passed a share of the burden of their new personal income tax liability onto employees of their firms. Workers in firms more exposed to the tax change saw approximately 1% lower relative earnings growth following the rate hikes. This represents an elasticity of the earnings with respect to the owners’ marginal tax rate of $-0.10$. I show that the spillover to employee earnings is concentrated among stayers, employees who are with their firm prior to the tax change and remain with their firm after, and that there is little extensive margin employment response. The spillovers are primarily associated with the same employees receiving lower earnings following the tax reform, representing direct pass-through of the tax burden to the employees. I estimate that a $1 exogenous increase in business tax liability results in a 15-18 cent decrease in

\footnote{31}Almost 80% of non-sole-proprietorship businesses are taxed through personal income tax code and more than half of total business profits are taxed according to the personal income tax schedule. Smith et al. (2019) document that of those in the top 1% of the income distribution, 57% have some pass through business income, as do 78% of those in the top 0.1% of the income distribution.
the firm’s wage bill over the medium-run. This is some of the first direct evidence of the incidence of changes in top marginal personal income tax rates to workers not directly subject to the rate changes.

Heterogeneity analysis shows that the burden was borne by employees in the lower half of their firm's income distribution and that the pass-through to employees was larger in states with slack labor markets. These results imply that labor market frictions for different workers or workforces may play a role in the ability of business owners to pass tax burdens on to employees. The empirical results are consistent with a labor market model where pass-through firms have some wage setting ability. In general, the findings suggest that the pass-through parameter estimated from changes in business income taxation may not represent a universal structural parameter, but instead may be a function of macro-economic conditions and the underlying labor market institutions, which affect the ability of owners to directly pass tax burdens on to employees.

I conduct a simple welfare analysis and highlight two main implications of the results. First, in the presence of cross-bracket spillovers, the ETI of those facing the top marginal tax rate is not a sufficient statistic for welfare analysis. We must also know the extent of the spillover, or how the distribution of surplus changes in response to the a tax change. Second, when the pre-tax surplus shifts from employees to owners, the taxable income response of top-bracket households will understate the welfare loss associated with a change in their tax rate. This, in turn, has implications for optimal progressive income tax policy. The exact magnitude of the welfare loss associated with the spillovers and the resulting design of optimal tax schedule depend on the underlying labor market mechanisms which mediate the spillovers. The heterogeneity analysis also suggests that labor market characteristics affect the earnings response to business taxation. In addition to taxes, the government designs policies which affect the interaction between workers and firms in the labor market, for example the minimum wage, health care policy, unemployment insurance, and regulations affecting monopoly and monopsony power. The findings here suggest that it may be optimal to jointly consider tax and labor market policy and underscore that further research on interaction between these policies could be fruitful.

The results also have implications for the optimal design of a business income tax system and the choice of taxing business income separately or as part of the personal income tax system. The passage of the Tax Cuts and Jobs Act of 2018 sparked debate over the appropriate taxation of pass-through businesses and over the use differential tax systems for pass-throughs and traditional corporations. As capital, labor and personal income become increasingly intermingled, it also becomes increasingly important to analyze the optimal system for taxing this income.
1.9 Figures

Figure 1.1: Identifying Variation

Panel A: Single Owner Firms w/ $250K Business Income
Panel B: Single Owner Firms w/ $250K Business Income
Panel C: Single Owner Firms w/ $225-275K Business Income
Panel D: Single Owner Firms w/ $250K Business Income

Notes: The figures show the mechanical change in tax rates and liability for a single owner firm with $250K in business income, as a function of the owner's non-business income. Panel A shows the change in marginal tax rate as a function of non-business income. The tax rate jumps by 4.6pp as non-business income exceeds $200K (which is where taxable income exceeds $450K and the owner enters the new top bracket). Panel B shows the mechanical change in tax liability on business income as a function of non-business income. Panel C plots the binned averages of the change in tax liability (using 10 firm bins) for firms with approximately $250K in business income, showing the variation in non-business income for similar firms in the sample. The red line in Panel D replicates that in Panel B, and the blue line shows the mechanical change in the owner's total tax liability.
Notes: Figure 1.2 displays evolution of log average earnings for employees in “exposed” firms relative to control firms relative to the pre-reform year 2012, after absorbing pre-reform differences in firm characteristics, using specification (1.7). The exposure$_j$ treatment is defined as having at least one top-bracket owner in each year 2010-2012 and control is defined as having no top owners in the years 2010-2012. Panel A shows the conditional mean outcome of the treatment and control group relative to 2012. Panel B shows the coefficients and corresponding 95% confidence intervals from the DD specifications. Each specification includes firm fixed effects and controls for the pre-reform (2012) deciles in business income and value-added, categories for the number of employees and industry dummies (2-digit NAICS codes) all interacted with year dummies to allow for flexible time trends. The 95% confidence intervals are based on robust standard errors clustered at the firm level.
Notes: These figures show results from regression (1.7) for subsets of “stayers,” incumbent employees at the time of the tax change that remain with the firm through 2015. Panel A shows results for all stayers. Panel B shows results for stayers with at least three years of tenure as of base year 2012. Each specification compares firms with at least one top owner in 2012 relative to firms with no top owners in 2012 and controls for baseline net income and value-added deciles and 2-digit NAICS codes interacted with year. Standard errors are clustered at the firm level.
Figure 1.4 plots DD coefficients from Eq. (1.8) where the outcome variables are various elements from the firm’s income tax return. Each estimate represents the differential change in the outcome variable between 2012 and 2015 for firms with at least one top-bracket owner relative to firms with no top-bracket owners. Each specification controls for baseline net income deciles and 2-digit NAICS codes interacted with year. Standard errors are clustered at the firm level.
Figure 1.5: Earnings Response by Position in Within-Firm Earnings Distribution

Panel A: At least 1 top-bracket owner

Panel B: At least 1 top-bracket owner

Notes: Figure 1.5 presents DD estimates from Eq. (1.8) where $exposure_j$ is an indicator for having a top-bracket owner in 2012. For Panel A I split the within-firm distribution of employee earnings into quartiles and take the average earnings in each quartile for each firm in each year. The estimates represent the change in log average earnings for those in each quartile. Panel B focuses on “stayers,” incumbent employees at the time of the tax change that remain with the firm through 2015. I locate stayers according to their position in the 2012 within-firm earnings distribution, then estimate the response separately for the stayers according to their quartile in the pre-reform distribution. “Attached Stayers” defined as stayers with at least three years of tenure as of base year 2012. Each specification includes controls for baseline net income and value-added deciles and 2-digit NAICS codes interacted with year. Standard errors are clustered at the firm level.
Figure 1.6: Earnings Responses by Labor Market Conditions

Notes: Figure 1.6 plots DD estimates for differential changes in earnings of lower bracket workers in firms exposed to the tax change relative to those in firms not exposed to the tax change. The outcome variables for each coefficient in log change in earnings between 2012 and 2015. Each set of bars represents a state-level measure of labor market conditions. The first set shows estimates by quartile rank of the unemployment rate (UR) in 2012. Each bar represents DD estimates for firms in each of the four quartiles of the the distribution of the labor market measure. The second measure presents estimates by rank of the recession shock as developed in Yagan (2018). The first bar, “1 (high)”, represents the estimate for states with the worst labor market conditions according to each measure, i.e. highest UR and largest recession shock. Each specification controls for baseline net income and value-added deciles and 2-digit NAICS codes and state interacted with year. Standard errors are clustered at the firm level.
Figure 1.7 plots DD estimates from Eq. (1.8) comparing firms with at least one top-bracket owner to firms with no top-bracket owners; the outcome is the change in log average earnings between 2012 and 2015. Each point represents a coefficient from a separate regression where firms are distinguished by pre-reform characteristics. The first set of estimates divides firms by the number of employees; the second set by terciles of the value-added distribution; the third by profitability defined as (net profits/revenues); the fourth by labor share defined as (wage bill/revenues). Top owner “active” defines treatment as the firm having an active owner in the top-bracket and “passive” defines treatment as a firm where the only top-bracket owner is a passive owner. “N owners” divides firms by the number of owners. The outcomes in the “Demographics” estimates are the average earnings of the given group for each firm.
Figure 1.8: Pass-Through: Predicted Business Tax Liability on Employee Earnings

Panel A: Full Sample

Panel B: Firms with $\geq 1$ top-bracket owner

Notes: Figure 1.8 plots event-time coefficients estimated from specification (1.7) and displays evolution of log average earnings for workers more “exposed” to the tax change relative to the pre-reform year 2012. In this specification, $exposure_{ij}$ is defined as the predicted change in tax liability attributable to the tax reform based on reported business income in 2012. Panel A uses the full sample of firms, including the control firms with no top-bracket owners and experience no mechanical change in their business tax liability. Panel B includes only the subsample of firms with at least one top-bracket owner, isolating the continuous variation in the change in liability across firms with top-bracket owners. Each specification controls for baseline net income and value-added deciles and 2-digit NAICS codes and state interacted with year. Standard errors are clustered at the firm level.
1.10 Tables
## Table 1.1: Summary Statistics - Firm Characteristics

### Panel A: Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>With Top-bracket Owner(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>p10</td>
</tr>
<tr>
<td>Revenue</td>
<td>6,623,147</td>
<td>397,433</td>
</tr>
<tr>
<td>Profits</td>
<td>338,376</td>
<td>-29,044</td>
</tr>
<tr>
<td>Value-Added</td>
<td>2,158,226</td>
<td>232,855</td>
</tr>
<tr>
<td>Value-Added/Worker</td>
<td>62,636</td>
<td>12,428</td>
</tr>
<tr>
<td>EBITD</td>
<td>219,572</td>
<td>-68,011</td>
</tr>
<tr>
<td>Employees</td>
<td>50.12</td>
<td>7</td>
</tr>
<tr>
<td>Full-time Employees</td>
<td>34.59</td>
<td>6</td>
</tr>
<tr>
<td># Owners</td>
<td>2.08</td>
<td>1</td>
</tr>
<tr>
<td># Active Owners</td>
<td>1.52</td>
<td>1</td>
</tr>
<tr>
<td># Passive Owners</td>
<td>0.57</td>
<td>0</td>
</tr>
<tr>
<td># Top-bracket Owners</td>
<td>0.39</td>
<td>0</td>
</tr>
<tr>
<td>Top-bracket owner</td>
<td>0.23</td>
<td>0</td>
</tr>
<tr>
<td>Avg. Employee Earnings</td>
<td>24,125</td>
<td>6,900</td>
</tr>
<tr>
<td>Avg. Full-time Earnings</td>
<td>28,248</td>
<td>11,602</td>
</tr>
<tr>
<td>Wage Bill</td>
<td>930,561</td>
<td>77,545</td>
</tr>
<tr>
<td>Profits/Revenue</td>
<td>0.02</td>
<td>-0.03</td>
</tr>
<tr>
<td>Wage Bill/Value-added</td>
<td>0.37</td>
<td>0.16</td>
</tr>
<tr>
<td>Wage Bill/Revenue</td>
<td>0.22</td>
<td>0.07</td>
</tr>
</tbody>
</table>
Table 1.1: Summary Statistics - Firm Characteristics

Panel B: Difference in Conditional Means - Firms with top-bracket owners v. firms with no top-bracket owners

<table>
<thead>
<tr>
<th></th>
<th>Avg. Earnings full-time</th>
<th>Employees full-time</th>
<th>Value-added per worker</th>
<th>Value-added</th>
<th>Wage Bill full-time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference in means</td>
<td>742.42***</td>
<td>906.42***</td>
<td>3.13</td>
<td>3.59</td>
<td>228.64</td>
</tr>
<tr>
<td></td>
<td>(281.96)</td>
<td>(267.87)</td>
<td>(3.24)</td>
<td>(2.28)</td>
<td>(756.67)</td>
</tr>
<tr>
<td>N</td>
<td>82,240</td>
<td>82,240</td>
<td>82,240</td>
<td>82,240</td>
<td>82,240</td>
</tr>
</tbody>
</table>

Notes: This table shows summary statistics for the firms in the sample by whether they were exposed to the tax reform, i.e. whether they have at least one top-bracket owner or have no top-bracket owners. Statistics and exposure status are defined for year 2012, the last year prior to the tax reform. Panel A shows means, medians the 10th and 90th percentiles for each variable for the full sample and for firms with at least one top-bracket owner. Statistics at percentiles of the income distribution represent the average of ten taxpayers around that percentile to avoid disclosure of any individual income tax information. “Full-time” employees are those receiving at least the equivalent of one quarter of full-time wages at the federal minimum wage, or about $2,827.50 in 2012. Panel B shows the conditional difference in means for various firm characteristics across firms with and without a top-bracket owner. The difference in means is conditional on net income and value-added per worker deciles, firm-size categories, 2-digit NAICS industry codes, and state. Robust standard errors are in parentheses.
Table 1.2: Estimates of Employee Wage Effects - First-Difference Specifications

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_{2006-2009}$</td>
<td>0.00002</td>
<td>-0.00036</td>
<td>0.00041</td>
<td>-0.00022</td>
<td>0.00019</td>
<td>0.00034</td>
</tr>
<tr>
<td></td>
<td>(0.00229)</td>
<td>(0.00245)</td>
<td>(0.00250)</td>
<td>(0.00244)</td>
<td>(0.00247)</td>
<td>(0.00258)</td>
</tr>
<tr>
<td>$\beta_{2009-2012}$</td>
<td>-0.00313</td>
<td>-0.00333</td>
<td>-0.00311</td>
<td>-0.00297</td>
<td>-0.00300</td>
<td>-0.00324</td>
</tr>
<tr>
<td></td>
<td>(0.00235)</td>
<td>(0.00254)</td>
<td>(0.00249)</td>
<td>(0.00255)</td>
<td>(0.00255)</td>
<td>(0.00263)</td>
</tr>
<tr>
<td>$\beta_{2012-2015}$</td>
<td>-0.01181***</td>
<td>-0.01251***</td>
<td>-0.01262***</td>
<td>-0.01191***</td>
<td>-0.01232***</td>
<td>-0.01077***</td>
</tr>
<tr>
<td></td>
<td>(0.00216)</td>
<td>(0.00233)</td>
<td>(0.00241)</td>
<td>(0.00239)</td>
<td>(0.00253)</td>
<td>(0.00242)</td>
</tr>
</tbody>
</table>

Bus. Inc. Deciles X X X X X X
Value-added/worker X X X
Firm size X X X
Industry X X X
State X

Observations 244,035 244,035 244,035 244,035 244,035 244,035

Standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: Table 1.2 shows first-difference estimates for treatment effect of “exposure” to the tax reform on the average earnings of employees based on regression specification (1.8). The exposure measure is an indicator for having at least one top-bracket owner. The outcome in each column is change in log average earnings and each column includes different sets of firm-level base-year controls as labeled. Standard errors are clustered at the firm level.
Table 1.3: Earnings Responses, Various exposure Measures

<table>
<thead>
<tr>
<th>Exposure Measure:</th>
<th>Any Top Owners</th>
<th>All Top Owners</th>
<th>Share of Owners in Top Firms</th>
<th>Single Owner Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>( \beta_{2006-2009} )</td>
<td>0.00002</td>
<td>-0.00273</td>
<td>-0.00130</td>
<td>0.00523</td>
</tr>
<tr>
<td></td>
<td>(0.00229)</td>
<td>(0.00301)</td>
<td>(0.00283)</td>
<td>(0.00401)</td>
</tr>
<tr>
<td>( \beta_{2009-2012} )</td>
<td>-0.00313</td>
<td>-0.00410</td>
<td>-0.00560*</td>
<td>-0.00165</td>
</tr>
<tr>
<td></td>
<td>(0.00235)</td>
<td>(0.00332)</td>
<td>(0.00310)</td>
<td>(0.00434)</td>
</tr>
<tr>
<td>( \beta_{2012-2015} )</td>
<td>-0.01181***</td>
<td>-0.01437***</td>
<td>-0.01456***</td>
<td>-0.01286***</td>
</tr>
<tr>
<td></td>
<td>(0.00216)</td>
<td>(0.00304)</td>
<td>(0.00285)</td>
<td>(0.00401)</td>
</tr>
</tbody>
</table>

Observations 244,035 222,980 244,035 115,176

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

Notes: Table 1.3 shows first-difference estimates for treatment effect of “exposure” to the tax reform on the average earnings of lower-bracket workers, based on regression specification (1.8). The outcome in each column is change in log average employee earnings. The table contains intent-to-treat (ITT) estimates of the treatment effect for various firm-level definitions of “exposure.” The first column replicates the baseline specification defining treatment as having at least one top-bracket owner. In column 2 treatment is defined as having all owners in the top-bracket in the base year (t-1). In column 3 treatment is defined as a continuous variable representing the share of owners in the top-bracket in year t-1. The fourth column uses the subsample of firms with only one owner and defines treatment as the owner being in the top bracket in year t-1. Each specification controls for net income and value-added per worker deciles, firm-size categories, 2-digit NAICS industry codes, and state. Standard errors are clustered at the firm level.
### Table 1.4: Decomposition of Employment and Earnings Response - Incumbents v. New Hires

<table>
<thead>
<tr>
<th>Employment</th>
<th></th>
<th>Earnings</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Δfull-time employees (1)</td>
<td>New hire share (2)</td>
<td>Separation rate (3)</td>
<td>Δtotal wage-bill (4)</td>
<td>Δstayers earnings share (5)</td>
</tr>
<tr>
<td>β_{2012-2015}</td>
<td>0.00067</td>
<td>0.00238</td>
<td>-0.00170</td>
<td>-0.01243***</td>
</tr>
<tr>
<td>(0.00687)</td>
<td>(0.00653)</td>
<td>(0.00252)</td>
<td>(0.00473)</td>
<td>(0.00622)</td>
</tr>
<tr>
<td>Controls</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
</tr>
<tr>
<td>Observations</td>
<td>244,035</td>
<td>241,044</td>
<td>241,044</td>
<td>244,035</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

**Notes:** This table displays the decomposition of employment and earnings responses into the changes attributable to new hires and incumbent workers, including the earnings response of stayers, those who remain at the firm between the base year and year t. The decomposition follows from Eqs. (1.9) and (1.10). The outcome in column 1 is the change in log total full-time employment. The outcome in column 2 is the share new hires in year t relative to full-time employees in the base year, and the outcome for column 3 is the share of retained incumbents relative to baseline full-time employment. Column 4 shows the three year difference in log total wage bill for firms with a top bracket owner relative to firms with no top bracket owners for various base years. Column 5 shows the change in wage the earnings paid to stayers in the firm. The outcome in column 6 is the share of earnings of new hires in year t relative to the total wage bill in the base year. Each specification controls for net income and value-added per worker deciles, firm-size categories, 2-digit NAICS industry codes, and state. Standard errors are clustered at the firm level.
Table 1.5: Pass-Through of Business Tax Liability on Employee Earnings

<table>
<thead>
<tr>
<th></th>
<th>All Employees</th>
<th></th>
<th></th>
<th></th>
<th>Stayers</th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
<tr>
<td>$\beta_{2012-2015}$</td>
<td>-0.09037***</td>
<td>-0.10059***</td>
<td>-0.09827***</td>
<td>-0.13226***</td>
<td>-0.1256***</td>
<td>-0.1235***</td>
<td>-0.13226***</td>
<td>-0.1256***</td>
</tr>
<tr>
<td></td>
<td>(0.0258)</td>
<td>(0.0299)</td>
<td>(0.0229)</td>
<td>(0.0293)</td>
<td>(0.0322)</td>
<td>(0.0352)</td>
<td>(0.0293)</td>
<td>(0.0322)</td>
</tr>
<tr>
<td>Pass-Through ($)</td>
<td>-0.1690***</td>
<td>-0.1880***</td>
<td>-0.1837***</td>
<td>-0.1588***</td>
<td>-0.1508***</td>
<td>-0.1483***</td>
<td>-0.1588***</td>
<td>-0.1508***</td>
</tr>
<tr>
<td></td>
<td>(0.0482)</td>
<td>(0.0559)</td>
<td>(0.0435)</td>
<td>(0.0352)</td>
<td>(0.0387)</td>
<td>(0.0408)</td>
<td>(0.0352)</td>
<td>(0.0387)</td>
</tr>
<tr>
<td>Mean ΔLiability</td>
<td>42,080</td>
<td>42,080</td>
<td>42,080</td>
<td>42,080</td>
<td>42,080</td>
<td>42,080</td>
<td>42,080</td>
<td>42,080</td>
</tr>
<tr>
<td>Implied Δ Wage Bill</td>
<td>7,111</td>
<td>7,911</td>
<td>7,856</td>
<td>6,682</td>
<td>6,346</td>
<td>6,030</td>
<td>6,682</td>
<td>6,346</td>
</tr>
<tr>
<td>Bus. Inc. deciles</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Value-added deciles</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Industry</td>
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<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
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<td></td>
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<td>X</td>
</tr>
<tr>
<td>Observations</td>
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<td>81,780</td>
<td>81,780</td>
<td>81,780</td>
<td>81,780</td>
<td>81,780</td>
<td>81,780</td>
<td>81,780</td>
</tr>
</tbody>
</table>

Notes: This table displays estimates of the first-difference estimate of intent-to-treat (ITT) effect of log change in business income tax liability on average earnings. Business income is defined as the firm’s reported net business income plus owner wage and salary income. In columns (1)-(3) the outcome is the average earnings of all full-time employees. In columns (4)-(6) the outcome is the average earnings of firm “stayers,” incumbent employees at the time of the tax change that remain with the firm through 2015. The first row shows the elasticity estimated using Eq. (1.8). The second row contains estimates of the dollar-for-dollar pass-through attributable to the change in liability, which are estimated as $\beta_{2012-2015} \times (W/L)$, where $W/L$ is the ratio of the wage bill to tax liability calculated at the sample mean. Each regression is weighted by firm size and standard errors are clustered at the firm level. Standard errors for the pass-through estimate are calculated using the delta method.
### Table 1.6: Pass-Through of Non-Business Income Tax Liability

<table>
<thead>
<tr>
<th></th>
<th>K1 + Wage &amp; Salary Income</th>
<th>K1 Income only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Top-bracket only</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Business Income, $\beta_{2012-2015}$</td>
<td>-0.14023***</td>
<td>-0.11879***</td>
</tr>
<tr>
<td></td>
<td>(0.02577)</td>
<td>(0.03132)</td>
</tr>
<tr>
<td>Non-business Income, $\theta_{2012-2015}$</td>
<td>0.02934</td>
<td>0.02288</td>
</tr>
<tr>
<td></td>
<td>(0.02167)</td>
<td>(0.02828)</td>
</tr>
<tr>
<td>Controls</td>
<td>Full</td>
<td>Full</td>
</tr>
<tr>
<td>Observations</td>
<td>81,780</td>
<td>18,883</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

***p < 0.01, **p < 0.05, *p < 0.1

**Notes:** This table displays results from Eq. (1.12). The first row shows the coefficient on the mechanical change in log tax liability on business income between 2012 and 2015 and the second row shows the coefficient on the mechanical change in log tax liability on non-business income. The first two columns define business income as total owner K1 plus wage and salary income; the second set of columns defines business income as total owner K1 income. Columns 1 and 3 use the full sample of firms and columns 2 and 4 use the subsample of firms with at least one top-bracket owner. Each specification controls for net income and value-added per worker deciles, firm-size categories, 2-digit NAICS industry codes, and state. Standard errors are clustered at the firm level.
CHAPTER II

Taxing Hidden Wealth: The Consequences of U.S. Enforcement Initiatives on Evasive Foreign Accounts

From a work with Niels Johannesen, Patrick Langetieg, Daniel Reck and Joel Slemrod

Abstract

In 2008, the IRS initiated efforts to curb the use of offshore accounts to evade taxes. This paper uses administrative microdata to examine the impact of enforcement efforts on taxpayers reporting of offshore accounts and income. We find that enforcement caused approximately 50,000 individuals to disclose offshore accounts with a combined value of about $100 billion. Most disclosures happened outside offshore voluntary disclosure programs, by individuals who never admitted prior noncompliance. Disclosed accounts were concentrated in countries often characterized as tax havens. Enforcement-driven disclosures increased annual reported capital income by $2-$4 billion, corresponding to $0.6-$1.2 billion in additional tax revenue.

JEL Codes: H26 , H24
Keywords: Tax Compliance, Tax Evasion, Tax Haven, Tax Amnesty
2.1 Introduction

The use of secret offshore accounts to evade tax liabilities is a serious challenge for tax policy. One prominent study estimates that households around the world hold $6 trillion in offshore banking centers, amounting to about 8% of total household financial wealth (Zucman, 2013). Other research suggests that, at least in one set of countries, offshore wealth is highly concentrated at the top of the wealth distribution and almost never reported to the tax authorities (Alstadster, Johannesen and Zucman, 2019). The size and concentration of offshore wealth suggests that improved tax enforcement for offshore income and wealth could generate substantial revenue and perhaps also large social welfare gains, but it is not straightforward to achieve in a world of extremely mobile financial assets and foreign tax havens\(^1\) with institutionalized financial secrecy.

In response to this challenge, beginning in 2008 the U.S. government conducted a series of enforcement initiatives aimed at offshore accounts of its citizens. First, it compelled a number of tax havens to accept information exchange agreements under which the Internal Revenue Service (IRS) can request account information about U.S. taxpayers suspected of tax evasion. Second, it took ad hoc legal measures to force major Swiss banks, most famously the world’s biggest private bank, UBS, to turn over names and account details of many of their U.S. customers. Finally, complementing the measures aiming to facilitate detection of undeclared offshore income, it established a series of programs under which cooperating U.S. taxpayers who voluntarily disclose their previously unreported offshore accounts and the taxable income they generate are subject to reduced penalties and avoid criminal sanctions. Many countries have pursued very similar policies, combining cross-border exchange of banking information and incentives to self-declare foreign assets.

This paper uses comprehensive administrative data to estimate compliance responses to the bundle of U.S. enforcement efforts starting in 2008. From a policy perspective, it is important to know how effective the global wave of enforcement has been in fostering tax compliance and raising tax revenue, but the available evidence is scant and indirect.\(^2\)

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\(^1\)We use the term tax haven loosely to indicate jurisdictions with low effective tax rates and a sufficient commitment to financial secrecy so as to be attractive to foreigners desiring to shield income from home-country taxation. There is no single universally accepted list of such jurisdictions, and being so designated is often disputed by named countries. In Section 2.5, for descriptive analyses we make use of the countries meeting the 2000 OECD definition of uncooperative tax havens. In these analyses, we also show by-country information separately for all countries. This list does not have any official role in IRS enforcement efforts; the IRS does not have an officially accepted definition of a tax haven.

\(^2\)Langenmayr (2015) shows that U.S.-owned deposits in offshore jurisdictions increased in 2009 relative to a synthetic control group and interprets this as evidence that the OVD was associated with an increase in offshore tax evasion. Hanlon, Maydew and Thornock (2015) show that information exchange treaties between the U.S. and offshore tax havens lead to a decrease in portfolio investment from the cooperating tax havens into the U.S., consistent with a decrease in “round-tripping” by U.S. households, but do not discuss
We analyze data on reported foreign accounts from Reports of Foreign Bank and Financial Accounts (FBARs), which must be filed annually by U.S. taxpayers when the total value of their foreign accounts exceeds $10,000. We combine these data on reported foreign accounts with information on participation in Offshore Voluntary Disclosure (OVD) programs and income reported on tax returns. Combining these data sets permits us to study the effect of enforcement on account disclosures and income reporting not only for OVD participants, but also for any individuals who disclosed “quietly,” by beginning to report a foreign account and income in that account without entering OVD.

We begin by documenting a sharp increase in the number of self-reported foreign accounts that coincides with the enhanced enforcement efforts. In each of the years 2005 through 2008, approximately 40,000 U.S. residents filed an FBAR for the first time, disclosing that they owned foreign accounts. Many of these were presumably taxpayers who simply opened their first foreign account and duly filed an FBAR. In 2009, the number of first-time FBAR filers more than doubled to about 90,000 individuals. The steep increase is suggestive that a large number of taxpayers - a simple difference estimate would be around 50,000 individuals - disclosed previously unreported foreign accounts in response to the new enforcement policies. Only about 15,000 of the first-time FBAR filers in 2009 participated in the voluntary disclosure program, suggesting that much of the compliance response - a simple difference estimate would imply around 35,000 individuals - occurred in the form of “quiet disclosures” outside of the voluntary disclosure program. We estimate that the combined value of the accounts disclosed because of the enforcement efforts was just over $100 billion.

This reading of the trends in FBAR reporting is consistent with patterns in the underlying microdata. The increase in first-time FBAR filings was disproportionately large for account types that are a priori more likely to play a role in tax evasion, even for those who did not participate in an OVD program. First, the increase was much larger for accounts in countries often characterized as tax havens than in other foreign countries. For instance, the number of first-time FBAR filings related to accounts in the Cayman Islands grew from about 300 in 2008 to approximately 4,500 in 2009. Second, the increase was more pro-

whether this reflects an increase in tax compliance or shifting of evasive accounts to non-cooperating tax havens.

3The FBAR filers we study are single or joint individual owners of accounts disclosed on FBARs; we do not focus on businesses. We use the term individuals loosely throughout to refer to single or joint account owners.

4We use the term evasion to refer to non-compliance with income or asset reporting. The paper studies traces, or indicators, of evasion; we do not have audit data or information on whether individuals were charged with or convicted of tax evasion. Throughout the paper we use the terms non-compliance and evasion interchangeably.
ounced for large accounts (above $1 million), which are more likely to serve investment rather than transactional purposes, than for smaller accounts (below $100,000). Third, there was no comparable increase in new FBAR filings by taxpayers residing outside of the U.S., who have a clear non-tax motive for holding a foreign account. New accounts disclosed by those previously filing an FBAR were also disproportionately high-value and concentrated in tax havens.

Entering OVD required paying back taxes and substantial penalties, but eliminated the risk of more severe criminal penalties, while disclosing outside OVD allowed a taxpayer to avoid paying back taxes and penalties at the risk of harsher criminal penalties if evasion was later detected. We next try to understand the factors determining whether taxpayers disclosed inside or outside of the voluntary disclosure program. Under the assumption that the 2009 cohort of first-time FBAR filers would have resembled the 2008 cohort in the absence of expanded enforcement, we identify the characteristics of those induced to file by enforcement. Our findings support the notion that taxpayers decided to enter OVD when the risk of detection and prosecution for a quiet disclosure was sufficiently high, as those using the voluntary disclosure program were more likely to disclose a large account (with higher risk of criminal charges in case of detection), and to disclose an account in Switzerland (with a higher detection risk given the concurrent crackdown involving Swiss banks).

To measure the effect of the enforcement initiatives on tax compliance, we are ultimately interested in whether new disclosure of foreign accounts is associated with a resulting increase in reported taxable income. Here, we turn to the data from income tax returns. We employ an event study methodology that allows us to estimate the increase in taxable capital income occurring when a taxpayer discloses foreign accounts for the first time. To account for the underlying trend in reported income, we include a comparison group of individuals who filed an FBAR and reported the same number of accounts in every year during our sample period.

Not surprisingly, for individuals participating in the voluntary disclosure program—who have admitted to non-compliance—we estimate a sharp and substantial increase in reported taxable capital income after disclosure. More intriguingly, for first-time FBAR filers not participating in OVD—who have not admitted non-compliance—we also find a substantial increase in capital income in the first year of filing an FBAR, although with smaller relative effects than we observe for the OVD participants.

These results suggest that the unusually large group of first-time FBAR filers in 2009 includes a significant number of quiet disclosers, who started reporting foreign accounts and the capital income accruing to these accounts in response to the enforcement ini-
tiatives without admitting tax evasion, explicitly or implicitly. Three additional pieces of evidence support this interpretation. First, other types of income do not increase following disclosures. Second, the increase in capital income at the time of the first FBAR filing was not reflected in the third-party reports filed by domestic banks, suggesting that the income indeed was associated with foreign accounts. Third, we find that the probability of filing amended tax returns for previous tax years doubled after a first-time FBAR filing, although from a low baseline of around 3%. These facts bolster our claim that the effect on capital income reporting is being driven by quiet disclosures, and rule out alternative explanations.

Finally, we estimate the total effect of the policy on reported taxable capital income and tax revenue. Depending on what assumptions we make to address the issue of heterogeneous effects of disclosure on reported income, we find that these enforcement initiatives increased capital income reporting by $2 to $4 billion annually, corresponding to $0.6 billion to $1.2 billion in annual tax revenue. Most of the total effect comes from quiet disclosers rather than OVD participants, although the dollar amount per individual is larger for OVD participants.

To put these findings in perspective, it is instructive to compare our estimate of offshore wealth disclosed in 2009 because of the enforcement efforts, around $100 billion, to a recent estimate of total offshore wealth owned by U.S. households in roughly the same period of about $1,000 billion (Alstadster, Johannesen and Zucman, 2018). The growing literature on offshore tax evasion provides two potential explanations for why the enforcement efforts we study did not have a larger effect on tax compliance. One set of studies shows that targeted enforcement policies induce some owners of offshore accounts to adapt a new evasion strategy, for instance by moving assets to non-cooperative tax havens (Johannesen and Zucman, 2014; Johannesen, 2014) or by adding layers of secrecy in the form of anonymous shell corporations (Omartian, 2016). Additionally, a supply-side theory of offshore tax evasion predicts that increases in enforcement are more effective in inducing evaders with the smallest accounts to become compliant (Alstadster, Johannesen and Zucman, 2019).

Our findings also inform current debates about the Foreign Account Tax Compliance Act (FATCA), a highly ambitious policy seeking to enhance tax enforcement by inducing foreign financial institutions to report information to the IRS about all accounts held by U.S. taxpayers beginning in 2015. Many observers have expressed reservations about FATCA, claiming that it involves significant administrative costs for banks (e.g., Jolly and Knowlton, 2011) and pointing to the compliance costs faced by U.S. citizens when setting up and maintaining foreign accounts for fully legitimate purposes (e.g., Jacobs, 2012). In the
face of these concerns, the effectiveness of the enforcement initiatives preceding FATCA in deterring evasion is paramount. Our results suggest that the enforcement policies implemented prior to FATCA had a significant effect on aggregate tax compliance, but may have been limited by a lack of scope, and, thus that stronger policy instruments may be needed to ensure effective taxation of foreign accounts. Whether FATCA will significantly improve overall tax compliance, especially for very high-wealth individuals, will be an important task for future research, as data become available.

2.2 Background: U.S. Enforcement Policy Initiatives Since 2009

For decades, the use of offshore bank accounts for tax evasion was straightforward and involved a low risk of detection because the banking secrecy of foreign tax havens shielded tax evaders from investigations by the U.S. tax authorities. Starting in 2008, however, the U.S. government adopted a range of enforcement initiatives targeting owners of offshore accounts. The carrot-and-stick approach combined measures to increase the probability of detecting undeclared offshore accounts and a program providing incentives for tax evaders to voluntarily disclose their foreign assets. This paper seeks to understand the effects of this bundle of policies as a whole. Many other countries have since adopted a similar bundle of policies, including enhanced information exchanges and reduced penalties for disclosing offshore wealth. This section provides a summary of these enforcement initiatives.

2.2.1 As hoc legal steps against Swiss banks

When Bradley Birkenfeld, a former employee at the Swiss bank UBS, blew the whistle and revealed that the bank’s representatives were knowingly assisting U.S. individuals with tax fraud involving anonymous shell corporations and undeclared Swiss bank accounts, the U.S. government took the fight against offshore tax evasion to court. At the request of the Department of Justice, a federal judge in July 2008 authorized the tax authorities to requisition information from UBS about its U.S. customers without specifying the identities of these customers in advance, a so-called “John Doe summons.” A few months later, the FBI announced that UBS was under investigation for its role in tax evasion and several UBS executives, including the head of the wealth management division, Raoul Weil, were indicted.5

While the criminal case against UBS was settled in February 2009 with the bank agreeing to pay a fine of $780 million, the civil case about disclosure of customer lists had more

5Mr. Weil was eventually found not guilty.
far-reaching legal and political implications. The demand by the U.S. government that UBS provide details about its 52,000 U.S. customers was a direct assault on the Swiss banking secrecy rules, under which UBS was required to protect the privacy of its customers and its executives would face criminal charges in Switzerland if customer lists were shared with the U.S. government. The case was settled in March 2009, when the U.S. and Swiss governments agreed that UBS would reveal the identities of 4,450 customers to the U.S. tax authorities by intermediation of the Swiss Financial Services Authority. How exactly 4,450 names were selected from the 52,000 demanded by U.S. authorities was never disclosed, but these are widely believed to have been the most egregious, wealthy tax evaders.\(^6\)

Apart from the UBS account holders directly named in the settlement, the outcome of the UBS case may have induced compliance responses among offshore tax evaders more broadly by demonstrating that the banking secrecy of foreign tax havens was no longer impenetrable, and instead could be effectively challenged in courts. Later, the U.S. government took a similar approach against a number of foreign banks with major wealth management divisions, issuing John Doe summonses against a number of other foreign banks, including HSBC, Credit Suisse and Wegelin & Co., and establishing a program for several Swiss banks to provide information on U.S. taxpayers.

### 2.2.2 Information exchange

At the same time as the U.S. government took ad hoc legal steps against individual banks to obtain information about their customers, it also pursued a broader agenda to improve its access to tax-relevant information from foreign banks through bilateral information exchange agreements. In a first step, several countries believed to be tax havens were compelled to accept the conventional mode of cross-border cooperation in tax matters under which tax authorities can request bank information about specific taxpayers from other countries in tax evasion cases. Many important tax havens had long rejected this type of cooperation, often with reference to the banking secrecy rules in their domestic law. However, coordinated political pressure by the United States and other G20 countries, involving an explicit threat to impose economic sanctions on non-cooperative jurisdictions issued at the G20 summit held in April 2009, induced virtually every tax haven in the world to agree to the standard. The U.S. government signed bilateral agreements about information exchange on request with six tax havens, Switzerland, Luxembourg, Liechtenstein, Malta, Monaco and Panama, during the period 2008-2010.

The main limitation of these agreements is that tax authorities can only request bank

\(^6\)For example, the IRS commissioner said at the time that “we were never interested in pursuing 52,000 accounts,” and that the 4,450 names gave IRS “access to the accounts we wanted” (DOJ, 2009b).
information about specific taxpayers, and only in tax evasion cases where they possess sufficient evidence to assert the relevance of the information requested. In practice, the information exchange agreements are therefore rarely used and prominent tax experts have argued that the mode of cooperation is simply too weak to be an effective deterrent of offshore tax evasion (Sheppard, 2009).

In a second step, the U.S. Congress passed a new law inducing foreign banks to provide information about all accounts owned by U.S. taxpayers to the U.S. tax authorities. This move from occasional information exchange with foreign jurisdictions under bilateral treaties to systematic reporting by all foreign banks represents a dramatic change in the tax enforcement efforts with respect to offshore accounts. The new reporting regime is detailed in the Foreign Account Tax Compliance Act (FATCA), which was proposed in Congress in October 2009 and signed into law by President Obama in March 2010. While the first reporting of foreign account information under FATCA was due in 2015, several years after our period of analysis, the prospect of much more comprehensive third-party reporting of foreign income may have induced compliance responses as early as 2009 when such legislation was initially being considered by legislators.

2.2.3 Voluntary disclosure programs

Complementing the initiatives aiming to facilitate detection of undeclared offshore accounts, the IRS also implemented a series of “voluntary disclosure” programs with incentives for offshore tax evaders to voluntarily declare their foreign assets. The first initiative of this kind was the Offshore Voluntary Disclosure Program, under which participants benefitted from reduced civil penalties and escaped criminal prosecution. The program was initiated in March 2009, and expired in October 2009. To apply for participation in the program, taxpayers had to submit a letter to the IRS containing identifying information and details about their foreign accounts or entities. Once cleared to participate, the taxpayer was required to i) provide copies of previously filed original and amended returns, ii) submit updated complete and accurate returns for the previous six years, iii) provide information about previously undisclosed income, including information on financial accounts, institutions and facilitators, and iv) remit the necessary back taxes and penalties imposed by the OVD Program. Taxpayers already under investigation for tax evasion were ineligible for the program.

A key feature of the OVD program was the uniform penalty structure under which participants were liable for unpaid taxes and interest for the previous six years, an “accuracy-
related penalty” of 20% of the total unpaid taxes, and an “offshore penalty” of 20% of the value of the disclosed assets.\footnote{The OVD penalty structure was in lieu of the usual penalty structure for a willful failure to file FBAR, which was the greater of $100,000 or 50 percent of the balance in the account at the time of the violation, for each violation. To ensure that the OVD program in fact reduced the applicable penalty, the tax authorities would compare the OVD penalties to the total penalties applying absent the program, and the discloser would be liable for the lower amount. The civil penalty for non-willful failure to file an FBAR was up to $10,000 per violation.} As the heightened publicity of the reporting requirements for offshore accounts made many taxpayers aware of their FBAR filing requirement for the first time in 2009, the IRS clarified that individuals who had been paying all taxes due but had been unaware of their FBAR filing requirement should not participate in OVD and incur the offshore penalty, but rather they should simply file the delinquent FBARs (IRS, 2009).

Subsequent to the 2009 OVD Program, the U.S. offered several other voluntary disclosure programs with similar terms and conditions: the Offshore Voluntary Disclosure Initiative, in place between February and September 2011, and the 2012 Offshore Voluntary Disclosure Program, in place from January 2012 onward. Each subsequent program increased the overall offshore penalty, and simultaneously introduced lower penalties and an easier disclosure process for less substantial non-compliance. We refer to this set of programs by the acronym OVD.

The IRS reported that the first voluntary disclosure program, active from March to October 2009, drew around 15,000 disclosures of offshore accounts and resulted in the collection of $3.4 billion in back taxes and penalties (IRS, 2011). As of 2014, the IRS reported 45,000 disclosures occurred through the voluntary disclosure programs—including later OVD programs in 2011 and 2012—resulting in the collection of $6.5 billion in back taxes and penalties (IRS, 2014). It is important to note that these figures do not include what we call “quiet disclosers,” taxpayers who started reporting their foreign accounts in response to the increased risk of detection without participating in the OVD program. In addition, because the IRS figures combine taxes and penalties and pool payments relating to many tax years, they do not provide information about voluntary compliance via increased reporting of capital income following disclosures, nor do they provide annualized information.

2.3 Conceptual Framework

We next describe the decision options faced by a potentially non-compliant taxpayer. We use this framework to motivate a number of empirical strategies that examine the
full range of potential effects of the IRS enforcement initiatives. Figure 2.1 illustrates the decision-making process for taxpayers with offshore wealth, and how their behavior may change as a result of the 2008-2009 enforcement, which consisted of an increase in detection probabilities and an increase in the salience of the penalties for failure to file an FBAR. One should think of the reasoning presented here as the reduced form of a more complicated structural model describing each decision taxpayers make.

We divide taxpayers with foreign bank accounts into three groups prior to the enforcement policy change. The first group is fully compliant with the tax law and FBAR reporting before the enforcement and is thus unaffected by enforcement. The second group is compliant with their tax obligations, but due to compliance costs or ignorance of their filing responsibilities, they did not file FBARs prior to 2009. Increased publicity of the requirements and non-filing penalties in 2008 may induce these individuals to file an FBAR. The third group consists of individuals who, prior to the policy change, are non-compliant with their tax obligations and also do not file an FBAR. Some members of this group might continue to risk detection and not change their behavior at all, especially with regard to accounts in countries where U.S. tax authorities are not yet able to obtain information from foreign banks. Others shift the location of accounts to less cooperative jurisdictions or change the structure of their foreign asset holdings to make them even harder to detect. The other possibility is that many of these individuals will file an FBAR and start remitting taxes due on the income in the accounts. Note that this type of response to enforcement could occur for high-wealth tax evaders deliberately concealing wealth, but also for individuals who were unintentionally non-compliant. Detecting and characterizing this response is a key part of our empirical analysis.

Individuals who decide to start complying fully must also decide whether to enter the OVD program. Entering the OVD effectively shields individuals from criminal prosecution for tax fraud, but it exposes them to the substantial penalties incurred by OVD participants, as described in the previous section. The alternative to entering OVD is to come into compliance simply by filing the correct forms and reporting the correct income, without explicitly admitting any prior wrongdoing—a “quiet disclosure.” Quiet disclosers would avoid the sizable OVD penalties, but they also risk criminal prosecution if their prior non-compliance is discovered. Quiet disclosures are therefore an attractive option when individuals believe

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9One can imagine a fourth group that is compliant with FBAR filing requirements but not with tax obligations. It seems sensible to rule this out ex ante, as admitting the existence of an account to the authorities without remitting taxes on the income in that account would be exceedingly risky.

10Many unintentional noncompliers evaded relatively little tax. The fact that some individuals with little tax due entered 2009 OVD and were subject to the offshore penalty was the main motivation for changes to the OVD penalty structure introduced (and retroactively applied) for small accounts and non-willful non-compliance in later years.
that criminal prosecution in the near future is unlikely, due for example to their perception of limited resources of the IRS and/or the probable existence of larger-scale evaders the IRS might be more likely to prosecute. Finally, quiet disclosers might not file amended tax returns and FBARs for prior years, thus remitting no back taxes or penalties.

Our analysis of FBAR filings, OVD participation, and income reporting will shed light empirically on each of the decisions described thus far. One final decision newly compliant taxpayers make is whether to repatriate the wealth once enforcement makes holding offshore wealth relatively less tax-attractive. We are limited in our ability to directly observe this type of behavior, though we discuss some potential traces of repatriation in our empirical results.

2.4 Data

We examine data from the IRS Compliance Data Warehouse (CDW), which provides access to a wide variety of tax return, enforcement, compliance, and other data. De-identified taxpayer data are extracted from filed tax returns, enforcement information, and narrative data that sequence taxpayer history. The individual returns file includes transcribed tax returns for individuals and includes most taxpayer-filed forms and schedules, plus third-party-filed information documents. We observe the information reported on Form 1040, the individual income tax return, including nearly all the line items on the main form and supplemental schedules, as originally filed by the taxpayer. We also have indicators of whether and when amended 1040 returns were filed, although we do not have access to line-by-line information from the amended returns.

2.4.1 Foreign Bank Account Reports (FBARs)

Crucial to our analysis is micro data from the Report of Foreign Bank and Financial Accounts. The official name of this form is FinCEN Form 114, where FinCEN is short for Financial Crimes Enforcement Network, but it is generally known as the FBAR (Foreign Bank Account Report), and we refer to it as such.

United States “persons” are required to file an FBAR if the person had a financial interest in or signature authority over at least one financial account located outside of the United States, and the aggregate value of all foreign financial accounts exceeded $10,000 at any time during the calendar year reported. As defined by the instructions to the FBAR,

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11Our data include the earlier version of this form, TD Form 90-22.1, which has been required since the Banking Secrecy Act of 1970, and which was superseded as of September 30, 2013 by FinCEN Form 114 (FBAR).
a United States person includes “U.S. citizens; U.S. residents; entities, including but not limited to, corporations, partnerships, or limited liability companies, created or organized in the United States or under the laws of the United States; and trusts or estates formed under the laws of the United States.” Extensive rules are designed to ensure that individuals cannot avoid an FBAR filing requirement for assets they own by holding them indirectly, for example through a shell corporation in a foreign country. Indirectly-held financial assets are subject to FBAR reporting rules, and are within the purview of the enforcement crackdown.\textsuperscript{12}

The FBAR is a calendar-year report that during the period of our analysis had to be filed on or before June 30 of the year following the calendar year being reported. Effective July 1, 2013, the FBAR must be filed electronically and, as of 2017, the filing date is April 15. The FBAR is filed, separately from federal tax returns, with FinCEN, which is a distinct agency from the IRS.\textsuperscript{13} Unlike the filing of federal tax returns, there is no provision for requesting an extension of time to file an FBAR. The filer of an FBAR is required to report account numbers and identifying information for the U.S. person who owns the assets in the account (directly or indirectly), including an address and the maximum value of each account for the year. Prior to 2009, filers were required to report the account value within various ranges, but beginning in 2009 they were required to report the exact maximum dollar amount.

\subsection*{2.4.2 Voluntary disclosure}

The final component of our analysis in this paper relies on data regarding participation in the offshore voluntary disclosure programs (the Offshore Voluntary Disclosure Programs/Initiatives of 2009, 2011, and 2012, all referred to here as OVD). Our data on the voluntary disclosure programs consist of whether an individual participated in one of the voluntary disclosure programs, the date that an IRS official recorded receiving their application to participate in the program, and the opening and closing dates for the case. We use the first of these dates to determine when an individual participated in the OVD program. In some cases, processing delays could cause the date of receipt of an application to be after the actual submission of the application, and the opening date of the case can be later still, which is important to bear in mind when considering some of the results regarding the timing of OVD participation and the associated income reporting.

\begin{footnotesize}
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\item[12]In some cases, individuals may hold assets through networks of accounts, trusts, and corporations in multiple countries. The FBAR filing requirements essentially require that each account that an individual owns directly or indirectly and in any country be reported individually on the FBAR.
\item[13]IRS obtains data on FBARs from FinCEN; like many enforcement procedures, the exact way in which the IRS uses FBARs for tax enforcement is not publicly known.
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2.5 Aggregate Data Analysis

2.5.1 Total FBAR and OVD filings

In this section, we present evidence suggesting that the enforcement efforts in 2009 were associated with a sizable increase in tax compliance. In particular, we use information on filings of FBARs and enrollment into the OVD programs to document a sharp increase in disclosures of foreign wealth in 2009 and to show that the increase in disclosures was much stronger for the types of foreign accounts that are a priori most likely to be used for tax evasion.

Figure 2.2 shows the number of individuals filing an FBAR (left axis) and the number of individuals participating in the OVD programs (right axis) in each year over the period 2001-2011. The number of FBAR filers grew from 131,000 filers in 2001 to around 402,000 filers in 2011. There is a noticeable jump in the number of FBAR filers between 2004 and 2005, which is plausibly due to the introduction in 2004 of a penalty for non-willful failure to file an FBAR, and a much larger jump in 2009 coinciding with the enforcement efforts. There were around 15,000 OVD participants in both 2009 and 2011; the two years in the sample period where a voluntary disclosure program was in place. The fact that we record a positive number of OVD participants in 2010 is attributable to the processing delays mentioned in Section 2.4.2.

Table 2.1 provides descriptive statistics on FBAR filers and their foreign accounts in 2008 and 2009, highlighting several important properties of the sample. First, recall that all U.S. taxpayers with accounts greater than the threshold size held outside of the U.S. are required to file FBARs, whether they reside in the U.S. or not. Approximately one-third of the FBAR filers were residing outside of the U.S. as indicated by the address reported on the FBAR. We expect that, conditional on having a foreign account, the probability of using the account to evade U.S. income taxes is higher among individuals living in the U.S. than among individuals living in foreign countries, simply because the latter have a clear transaction motive for holding an account in the country where they live. Second, in 2008 about one-sixth of the FBAR filers reported at least one account in a tax haven, which we define in this paper as the OECD (2000) list of uncooperative tax havens plus Switzerland, Singapore, Hong Kong and Luxembourg. When a taxpayer discloses a tax haven account, this is arguably more likely to represent an increase in compliance because tax haven accounts are known to be largely undeclared for tax purposes (Alstadster, Johannesen and Zucman, 2019). Third, a small fraction of FBAR filers (1% in 2008) amends FBARs for previous years. Although there may be cases where taxpayers discover non-deliberate errors on previous years’ FBARs and choose to correct them, the filing of amended returns
is generally a strong indication of new compliance. Finally, the table shows that many FBAR filers have multiple accounts (59% in 2008 and 65% in 2009), so that the number of reported accounts is almost three times as large as the number of filers in 2008 and almost four times as large in 2009. As of 2008, most reported accounts were located in Europe (45%), North America (28%) and Asia (24%) and most disclosed accounts are relatively small, with values between $10,000 and $100,000 being the most frequent range. The analysis below will devote considerable attention to the change in the nature of FBAR reports around the time of the enforcement efforts.

2.5.2 New disclosers of foreign accounts

To detect the effect on tax compliance of the enforcement efforts that began in earnest in 2009, we construct an annual measure of new disclosers of foreign accounts. For three reasons, the aggregate number of FBAR and OVD filings reported in Figure 2.2 do not directly measure this concept. First, the series do not distinguish between new and continuous FBAR filers. Second, the aggregate FBAR series includes taxpayers living outside of the U.S. for whom a non-U.S. account is most often not a “foreign” account but rather is an account in their country of residence, in part to facilitate local transactions. Third, while OVD participants represent new disclosures by definition, they may or may not be included in the number of FBAR filers in the year they apply to participate in the OVD; depending on the precise timing of the application and the processing time at the IRS, the disclosed assets may be recorded on an FBAR for the first time in the application year or in a later year.

To address these issues, we construct a measure of “new disclosers” of foreign accounts, which comprises two distinct groups: “OVD filers” in year $t$ who are counted in the year they file an OVD application regardless of their FBAR filings; and “first-time FBAR filers” in year $t$, defined as tax payers that file an FBAR in year $t$ and did not file an FBAR in years $t-1$, $t-2$ and $t-3$. To avoid double counting, the latter group excludes taxpayers who participated in an OVD at any time during the sample period and taxpayers with non-U.S. addresses.

Figure 2.3 reports statistics on these groups of new disclosers over the period 2005-2011. Figure 2.3 Panel A shows that the annual number of new disclosers hovered at about 40,000 individuals in each of the years from 2005 to 2008, and then surged to around 90,000 individuals in 2009. The increase of about 50,000 contains about 15,000 OVD participants, but mostly reflects individuals who file a new FBAR outside of the OVD program. There was another surge in first-time FBAR filing in 2011 coinciding with the second OVD program, but again the majority of new filers did so outside of the OVD
program.

Figure 2.3 Panel B shows the aggregate value of the accounts reported by the new disclosers.\textsuperscript{14} The value was between $20 and $28 billion in the years 2005-2008 with a slightly increasing trend after 2006, but in 2009 jumped by a factor of over four and a half to $135 billion, and then returned to $40 billion in 2010. These data patterns suggest that the enforcement policies in 2008-2009 had a significant effect on new disclosers of foreign accounts. Simple difference estimates suggest that the policies induced around 50,000 taxpayers to disclose accounts with a total value of around $100 billion, with three-quarters of the response occurring in the form of quiet disclosures outside of the OVD program.

2.5.3 The characteristics of newly disclosed accounts

The spectacular surge in the number of taxpayers who filed an FBAR for the first time in 2009 without participating in the OVD initiatives suggests that the enforcement efforts induced a significant number of quiet disclosures of foreign accounts previously used for tax evasion. To further probe this interpretation, we describe the heterogeneity of the surge along two dimensions, account country and account value. Throughout we exclude OVD participants, to focus on potential quiet disclosers.

First, in Figure 2.4, we plot the increase in the number of new filers in 2009 along two dimensions: whether or not the FBAR filer reported a U.S. address on their FBAR, and whether or not the filer disclosed an account located in a tax haven according to our definition. If the primary cause of increased disclosures by U.S. filers in 2009 depicted in Figure 2.3 was not enforcement but, rather, coincident shocks affecting both U.S. and non-U.S. residents—e.g. the economic turbulence of 2009—we should observe similar trends in first-time FBAR filers among the two groups.

Even among filers with U.S. addresses, we might expect some people to hold a foreign account for legitimate reasons. Moreover, filers not holding an account explicitly for eva-

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\textsuperscript{14}There are a number of measurement issues. First, prior to 2009, FBAR filers were not required to report exact account values, but were asked to choose between four value ranges: below $10,000, between $10,000 and $100,000, between $100,000 and $1 million, and above $1 million. We impute aggregate values before 2009 by assuming that the (unobserved) distribution of values within each range was the same as the (observed) distribution in 2009. Second, on a few FBARs, reported account values are so extremely large that they almost certainly reflect typing errors. For instance, in a number of observations the FBAR account value was concatenated with the account number from the next line, so that the FBAR account value appeared to be in the trillions of dollars. We address this issue by trimming account values at $1 billion. Third, our OVD dataset does not contain information on the precise value of the disclosed assets. For OVD filers in year $t$, we approximate this with the aggregate value of the accounts reported on the FBAR in year $t$ (or in year $t + 1$ if no FBAR is filed in year $t$) minus the value of the accounts reported in year $t - 1$ (if any). This procedure is reasonable given that OVD participants were required to file delinquent FBARs.
sion might be affected by enforcement, especially the increased salience of FBAR reporting requirements in 2009, so it is useful to know whether the increase in new filers in 2009 could be entirely due to filers who are not deliberately evading taxes. We cannot directly observe whether an account is held for evasive purposes or not; instead, we split the sample by whether or not new filers disclosed an account in tax havens to help us assess this issue.

The results in Figure 2.4 suggest that a large portion of new disclosures were previously evasive accounts. The four series plotted in the Figure all have very similar trends in the period 2005-2008, but diverge sharply in 2009. We observe a 65% increase for filers with U.S. addresses and no haven accounts, and a 200% increase for filers with U.S. addresses and haven accounts. In contrast, we observe little change in the number of disclosures by filers with non-U.S. addresses—whether or not they have haven accounts. The stark increase in disclosures of tax haven accounts for filers with U.S. addresses suggests that a significant fraction of the new FBAR filers were previously evading taxes through their foreign accounts. Motivated by this result, the remainder of this analysis excludes taxpayers reporting an address outside of the U.S. (whose non-U.S. accounts are less likely to be used for tax evasion purposes), in order to focus more precisely on potential quiet disclosers.

Second, in Figure 2.5, we further highlight the difference between FBAR reporting in tax havens (red bars) and non-havens (blue bars) by displaying the percent change from 2008 to 2009 in the number of first-time FBAR filers reporting accounts in individual countries. Individuals with accounts in multiple countries are counted multiple times, once for each country in which they have an account. Clearly, increases were disproportionately concentrated in havens. For example, the number of new FBAR filers disclosing an account in the notorious tax haven of the Cayman Islands increased by more than 4,000 filers from 2008 to 2009, for an increase of over 1000%!

Third, in Figure 2.6, we show the number of new FBAR filers within account size categories. Individuals with multiple foreign accounts are placed into a category based on their largest reported account. The increases in 2009 were larger for those reporting larger accounts, which are more likely to serve wealth storage purposes, and much more modest for smaller account sizes (below $100,000), which are more likely to be transactional accounts. The largest relative surge was among those reporting accounts over $1 million. In sum, by showing that the surge in first-time FBAR filings in 2009 was particularly pronounced for accounts that were more likely used to evade taxes, accounts in tax havens and accounts with large balances, Figures 2.4-2.6 constitute further evidence of a surge in quiet disclosures at the time of the enforcement initiatives.
2.5.4 Retrospective disclosures

When taxpayers disclose existing foreign accounts outside of the OVD, they may choose to file FBARs for past years. Because this is implicitly admitting to prior non-compliance, the number of such FBAR amendments represents a direct measure of at least one form of quiet disclosure. It obviously conveys no information about the number of taxpayers who disclose foreign accounts quietly without admitting to prior non-compliance.

In appendix Figure B.1, we show the number of new disclosers who filed amended and non-amended FBARs without participating in the OVD program. The number of filers with amended FBARs was relatively constant over the period 2005-2008, but increased by 600% in 2009. In absolute terms, however, the increase was modest, from around 1,000 amendments pre-2009 to around 7,000 amendments in 2009. This suggests that most of the taxpayers disclosing quietly in 2009, estimated at around 35,000 in Section 2.5.2, did not at the same time amend their FBARs for previous years.

2.5.5 The intensive margin of disclosure

The analysis to this point has focused on disclosures on the extensive margin of FBAR reporting: individuals who did not report their foreign accounts before 2008, but started reporting in 2009, apparently in response to enforcement. Next, we investigate whether there are also quiet disclosures on the intensive margin: individuals who reported some foreign accounts before 2008 (for instance, small accounts in non-havens serving transactional purposes), but in 2009 started reporting additional accounts (for instance, large accounts in havens serving wealth storage purposes).

To explore this behavioral response, we define three indicators of potential quiet disclosers among taxpayers who did not participate in the OVD program: (i) FBAR filers who reported exactly one account in year $t-1$ and at least two accounts in year $t$ (“new multiple account holders”); (ii) FBAR filers who reported only accounts below $100,000 in year $t-1$ and at least one account above $1$ million in year $t$ (“new large accounts”); and (iii) FBAR filers who reported only non-haven account(s) in year $t-1$ and at least one haven account in year $t$ (“new haven account holders”). Figure 2.7 shows only slightly increasing trends from 2005 to 2008, followed by sharp increases in 2009 for all three groups: new multiple accounts increased by 63%; new haven accounts increased 70%; and new large accounts increased by 160%. These patterns are clearly consistent with a large increase in quiet disclosures in 2009 on the intensive margin.
2.5.6 The decision to participate in the OVD Program, conditional on disclosure

For a taxpayer who decides that continued evasion is too risky in the new post-2009 enforcement environment, the decision to disclose quietly or participate in the OVD should weigh the risks and penalties associated with each option. As discussed in Section 2.3, OVD effectively eliminates the risk of criminal prosecution and the harshest possible penalties, but it also subjects the taxpayer to the OVD’s reduced offshore penalty with certainty in addition to back taxes. Theory therefore suggests that the accounts with the highest probability of prosecution conditional on quiet disclosure should be the ones in which taxpayers participate in OVD. We hypothesize that, relative to quiet disclosure, OVD participation is more likely to be attractive for the largest accounts, and for accounts in locations where the enforcement crackdown was especially strong, most notably Switzerland.

In order to compare quiet disclosers to OVD participants, it is useful to have a more refined way to estimate the characteristics of FBARs filed in response to enforcement, as not all new FBAR filers in 2009 were induced by enforcement, and the above analysis suggests that the characteristics of quiet disclosers may differ from that of other new FBAR filers in 2009. To do this, we assume that in the counterfactual where the 2009 crackdown did not occur, 1) the overall number of new filers and 2) the distribution of characteristics of new filers would have been the same in 2009 as in the actual population of new filers in 2008.\(^\text{15}\) We label individuals who filed because of the enforcement crackdown in 2009 “FBAR compliers.”\(^\text{16}\) By the first assumption above, we calculate the number of FBAR compliers as the simple difference between the number of new FBAR filers in 2008 and 2009. By the second assumption, we compute the probability of some characteristic occurring among FBAR compliers as the change in new FBAR filers with the characteristic scaled by the number of FBAR compliers.\(^\text{17}\)

In Figure 2.8, we show how account characteristics vary across quiet and non-quiet disclosures. Panel A shows that FBAR compliers had significantly higher account values than new FBAR filers overall, but also that the OVD participants had still larger account

\(^{15}\)We observe from Figures 2.3, 2.4, and 2.6 that the number and characteristics of new FBARs filed was relatively stable from 2005 to 2008, which suggests that these assumptions are correct up to a reasonable approximation.

\(^{16}\)We use this term to distinguish between all new filers in 2009 and the subset that were induced to file by the enforcement initiatives. The latter may include some “FBAR-only” compliers, who had been reporting income and remitting taxes correctly all along. Regardless of whether they are engaging in a true quiet disclosure, these taxpayers are newly compliant with the FBAR filing rule, and they are compliers in the sense of the Imbens and Angrist (1994) treatment effects framework.

\(^{17}\)For example, suppose the overall number of new filers increases from 40,000 to 90,000 from 2008 to 2009—an increase of 50,000. Suppose further that among filers with accounts in some haven country \(C\), disclosures increased from 4,000 in 2008 to 14,000 in 2009—an increase of 10,000. Our assumptions would imply that of the 50,000 FBAR compliers, 10,000, or 20% of all FBAR compliers, disclosed an account in \(C\).
values. This finding is consistent with the hypothesis that OVD participants should have larger account values than FBAR compliers, as larger account values are associated with a larger probability of detection. Panel B shows that around 45% of OVD participants disclosed a Swiss account, compared to less than 10% of FBAR compliers. In sharp contrast, 10% of FBAR compliers disclosed an account in the Cayman Islands, compared to a negligible share of OVD participants. As the enforcement efforts in 2009 targeted accounts in Switzerland, but not those in the Cayman Islands, the patterns are consistent with our hypothesis about the role of prosecution risk in shaping the mode of disclosure. Figure 2.8 Panel B suggests that, although they are less important overall, OVD disclosures were much more concentrated in Liechtenstein and Luxembourg than quiet disclosures. Tax evaders may have perceived these countries as risky as they both signed information exchange treaties with the U.S. in 2008 and Liechtenstein was home to the first leak of customer data from an offshore bank in the same year (Johannesen and Stolper, 2017).

2.6 The Response of Reported Capital Income

To this point, we have focused on the impact of the enforcement initiatives on reported foreign accounts. Of more direct tax policy interest is the effect of enforcement on income reported, and subjected to tax, on U.S. tax returns. It is conceivable, although inconsistent with evidence above, that our results to this point could be obtained without an increase in income tax compliance, if individuals filing new FBARs had been paying tax on the income in those accounts but failing to declare them on an FBAR. In this section, we analyze capital income reporting behavior, by linking individuals’ income tax returns with their FBAR reports and information on OVD participation.

We examine whether the disclosure of an account was associated with increased reported financial capital income for two groups of disclosers: OVD participants and first-time FBAR filers with U.S. addresses outside the OVD program. To remove confounding trends due to the business cycle, we difference reported income in this group against a comparison group, who owned offshore wealth but were compliant before the enforcement crackdown. Specifically, our comparison group consists of individuals that filed FBARs continuously from 2006 to 2009 and reported the same number of accounts on their FBARs in each of these years. The latter restriction helps purge the comparison group of intensive margin compliers of the type discussed in Section 2.5.5.\(^\text{18}\)

\(^{18}\)Removing the latter restriction from the comparison group yields very similar results. The point estimates of interest are slightly smaller if we remove the restriction on the number of accounts being reported by continuous filers, which is consistent with the presence of increased tax compliance among some continuous FBAR filers.
We analyze data on reported incomes for these groups for four years before and four years after each group’s initial disclosure of an offshore account in 2009. Specifically, we estimate a flexible difference-in-differences (DD) model of the form

\[ \textstyle f(y_{it}) = \alpha + \sum_{s = -4, s \neq -1}^{4} \beta_s D^s_{it} + \omega_i + \delta_t \times \text{agegrp}_i + \varepsilon_{it}, \]  

(2.1)

where \( D^s_{it} \) are event-time dummies equal to 1 when an individual is observed in the disclosure group in year \( s \); \( s = 0 \) is the year of disclosure. We estimate the same specification separately for OVD participants and other first-time FBAR filer group; the comparison group is the same throughout. Our specification also includes individual fixed effects, \( \omega_i \), and year fixed effects, \( \delta_t \), interacted with age groups. The interaction of year fixed effects with age groups helps to control for life-cycle wealth accumulation and career paths.\(^{19}\) The coefficient \( \beta_s \) represents the change in income from the year before disclosure, \( s = -1 \), to year \( s \). Under the assumption that aggregate shocks to the various age groups affect the disclosure and comparison groups in the same way before and after the event, we can interpret \( \beta_s \) as the change in income attributable to new disclosures of offshore accounts.

We examine various sources of income as the outcome \( y_{it} \); we expect to observe impacts for capital income flows specifically. To accommodate zeros and, in some cases, negative values (due to capital losses) of the dependent variable, we use an inverse hyperbolic sine (IHS) transformation. For positive ranges of \( y_{it} \), the coefficients of the event-time dummies can be interpreted exactly like a log specification. Interpreting the results in the presence of an effect on the propensity to report zero capital income is more complicated. Nonetheless, we prefer the IHS transformation because we believe it is more appropriate to assume that the underlying trends are parallel in approximately logarithmic terms, but we do not wish to exclude zeros, as doing so can introduce bias and, as we show in Appendix Figures B.2 and B.3, individuals reporting zero in the pre-disclosure period are apparently an important part of the effects of the policy.\(^{20}\)

Table 2.2 presents statistics on the incomes of individuals in the two disclosure groups and the comparison group in the year before their disclosure of an offshore account (\( s = -1 \) in equation (2.1)). These individuals have very high incomes compared to the rest of the U.S. tax filing population, although they do not all have the extremely high level of income some popular characterizations of offshore account holders might suggest. About

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\(^{19}\)Age groups are defined as of year 2010 and are 25-40 years, 41-50 years, 51-60 years, and 61-80 years.

\(^{20}\)Using instead a traditional log transformation and simply dropping zero and negative observations gives similar results (see, e.g., Table B.2).
60% of either OVD participants or new FBAR filers are in the top 10% of the income distribution. Median annual income (as measured by adjusted gross income) is about $160,000 in each group. However, at the top of the income distribution in both disclosure groups we examine, there are some very high-income individuals. The 90th percentile of income is almost $1.25 million among OVD participants and $885,000 for other new FBAR filers, an income level that puts all of these individuals in the top 0.5% of the overall U.S. income distribution by a considerable margin.

2.6.1 Reported income response of OVD participants

To establish the validity of our DD method, as well as to learn about the reported income responses of admitted non-compliers upon the time of disclosing an account, we first apply this method to 2009 OVD participants. Figure 2.9 plots estimated coefficients on the event time dummies and corresponding 95% confidence intervals for various income sources (Table B.1 reports the regression coefficients). The first panel shows results for reported interest income, dividend income and capital gains. OVD participants and the comparison group exhibit very similar trends in all three outcomes in pre-disclosure years but diverge sharply following disclosure. For interest income, we observe a coefficient of 1.06 for event time 1 corresponding to an increase of approximately 189%. The corresponding estimates are 0.49 (63%) for dividend income and 0.21 (23%) for capital gains. The second panel shows the results for total financial capital income, which combines interest, dividends, and capital gains. We observe a coefficient in event year 1 of 0.75 (112%).

These patterns indicate, unsurprisingly, that disclosures through the OVD program were associated with large increases in financial capital income reporting. We return to these estimates below when we estimate the compliance effect of the enforcement initiatives in terms of reported taxable income and tax revenue. Additionally, we find an increased propensity to report any capital income at the time of disclosure. By estimating Eq. (2.1) using a binary dependent variable indicating whether the individual reported any positive capital income as the outcome, we find a 2.9 percentage point increase in the probability of reporting any positive capital income (see Figure B.2 Panel B).

\footnote{This approximation is the exponential of the coefficient minus 1. We use this approximation because the IHS transform approximates the log transformation for positive values of the outcome variable. Refer to the discussion of equation (2.1)) for more details.}

\footnote{We show in appendix Figure B.2 that repeating this exercise for wage and salary income, income from sole-proprietorships (1040 Schedule C) and income from pass-through businesses (1040 Schedule E) reveals no differential income reporting following disclosure.}
2.6.2 Reported income response of other 2009 first-time FBAR filers

We now turn to the group of individuals that we suspect contains a large number of previously non-compliant individuals: first-time FBAR filers with U.S. addresses who did not participate in an OVD program. We therefore compare the qualitative and quantitative patterns observed in Figure 2.9 with the income reporting patterns around first-time FBAR filing, defined in exactly the same way as in the previous subsection.

Figure 2.10 plots the coefficients and corresponding 95% confidence intervals for the event study of various types of income for first-time FBAR filers. Appendix Table B.3 shows the estimated coefficients. In most respects, the patterns are very similar to those observed for OVD participants, with large increases in reported capital income at the time of first-time FBAR filing and virtually no changes in other types of income.

The magnitudes of the estimated percentage change for capital income components are slightly smaller compared to the OVD group, but surprisingly similar given that the increases seen for voluntary disclosure program participants consist entirely of admitted non-compliers, and the group of first-time filers admitted no non-compliance and likely contains people who were previously compliant. The estimated coefficient in event year 1 is 0.62 (86%) for interest income, 0.20 (22%) for dividend income and 0.10 (10%) for capital gains income. These are all at least 50% of the estimated increase for voluntary disclosure program participants. We estimate a coefficient in event year 1 of 0.49 (63%) for total financial capital income. A larger amount of the response in total financial capital income in this group comes from the extensive margin: we estimate a 4.2 percentage point increase in the probability of reporting any positive financial capital income.\footnote{We also find little to no estimated change in wages and salary income or income of sole proprietorships and other forms of pass-through business income as reported on 1040 Schedules C and E, respectively. The results for these income sources and for the probability of reporting positive capital income can be found in appendix Figure B.3.}

Because only a subset of this group filed an FBAR because of enforcement, we interpret the effects presented in Figure 2.10 and Table B.3 as the reduced form estimates of a two-stage model in which in the first stage, enforcement induces disclosures of a set of compliers to file FBAR (see Section 2.5.6), and in the second stage, the enforcement-driven disclosures affect reported income. Assuming that income does not jump when a legitimate first-time FBAR filer discloses an account, we can obtain the effect of disclosure on reported income for compliers by scaling the estimates here by the fraction of the 2009 first-time FBAR filers who were compliers. From Figure 2.3 Panel A, we concluded that roughly 50 percent of the approximately 75,000 individuals in this group disclosed because of enforcement – the exact estimate based on a simple difference from 2008 to 2009 is 46
percent. The estimate of the effects on compliers for each type of income would therefore be around twice as large as the estimates depicted in Figure 2.10 and reported in Table B.3—the implied point estimate for total financial capital income in event year 1 is 1.05. This effect is similar to, but slightly larger than, the comparable estimate for OVD filers.\textsuperscript{24}

With respect to the validity of the research design we observe that, unlike with the OVD participants, there are slightly increasing trends in the pre-disclosure period for interest and dividend income. This is not entirely surprising, given that some portion of first-time FBAR filers will be legitimately opening new accounts. We might thus expect that the timing of the first filing contains information about the income path prior to filing. Nevertheless, we see a large, sharp jump in capital income at first-time filing, which is a clear break from trend for each type of capital income. The size of this jump suggests that the magnitude of the bias from slightly divergent pre-trends is likely small.

We next provide further evidence that the increases in reported income accompanying account disclosures did indeed result from disclosures of foreign accounts and not some confounding source. To do so, we leverage the fact that interest and dividend income from assets held in the US are already subject to third party information reporting from US financial institutions. Forms 1099-INT and 1099-DIV report the amount of interest and dividend income accruing to taxpayers in their US accounts. We therefore decompose total reported interest and dividend income from the individual’s tax return into income reported by US financial institutions, and income reported by the taxpayer but not reported by domestic financial institutions. For both interest and dividends, we calculate the total domestic income as the sum of the Form 1099 income received by the taxpayer (including that of the taxpayer’s spouse for married taxpayers filing jointly), and we impute reported income from foreign sources as the difference between the total income reported by the taxpayer and the domestic income reported on 1099 forms.\textsuperscript{25} We then estimate our event study specification on each type of income separately. We do not analyze capital gains here, as directly held capital gains and losses in domestic accounts were not subject to complete information reporting until 2011, and even then only for assets acquired after January 1, 2011. Figure 2.11 depicts the results, with the point estimates reported in Table B.5. In Figures 2.11 Panel A and B we observe that the estimated effects on overall reported interest and dividend income are disproportionately driven by income not appearing on Form 1099 domestic information reports, and are thus almost certainly driven by reporting

\textsuperscript{24}An alternate estimate in Appendix Table B.9, puts the fraction of compliers at 62 percent. Scaling by this number instead gives an estimate for total income of 0.79, which is very close to that of the OVD sample.

\textsuperscript{25}Adding income from pass-through entities reported on Schedule K-1’s to the 1099 income for our concept of third-party reported income has little effect on the results. Relatedly, it is unlikely that the $10 minimum for issuance of a domestic 1099 form for interest or dividend income affects the results.
We investigate one additional margin of response to enforcement: the extent to which individuals amended earlier income tax returns to report previously unreported income, without participating in an OVD program or paying the associated penalties. Studying amended returns provides evidence about a margin of response quiet disclosers may consider, and it provides strong evidence on the existence of quiet disclosure responses, as there is no other reason we should expect an increase in amended returns upon filing a new FBAR. We estimate a linear probability model like Eq. (2.1), with an indicator for filing an amended tax return for one of the last four years in year $t$ as the outcome (see Appendix Figure B.5). We estimate no differential pre-trend. Filers are 3.3 percentage points more likely to submit an amended tax return when they file a new FBAR, relative to the comparison group. This represents a doubling of the rate of filing an amended tax return: the rate of amendment in the reference period ($t - 1$) is 3 percent. This result suggests that almost 50% of individuals filing amended tax returns when they file a new FBAR are quiet disclosers.

2.6.3 The total effect of enforcement

In this section, we use the event study results above to estimate the implied effect on total reported capital income and tax revenues for OVD participants and first-time FBAR filers. We use two related methods of estimating the total effects and ultimately present a range of estimates for the effect of the enforcement initiatives on capital income reporting and revenue collections.

2.6.3.1 Direct method

What we call the “direct method” of estimating the total effect of enforcement uses the average effects from the results in Section 2.6.1 and 2.6.2 to estimate the change in total reported capital income for OVD participants and first-time filers. Specifically, we assume a uniform effect of disclosure in IHS terms to impute a counterfactual reported capital income in year $t + 1$ for each individual in the disclosure group. The counterfactual of total reported income, $Y_{cf}$, is calculated as $Y_{cf} = \sum_i f^{-1}(f(y_i) - \beta y)$, where $f()$ is the IHS transformation, $y_i$ is reported income of individuals in the disclosure group in year $t + 1$, and

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26 Our measure of the total effect on tax revenue does not account for some ways in which taxpayers might change other income tax reporting to offset the impact on their tax liability of reporting additional income, as in Slemrod et al (2017). Our results suggest that some forms of offsetting, such as reduced reporting of business income, are uncommon.

27 Our revenue estimates only account for federal income taxes and not for income taxes imposed in some U.S. states.
$\beta_y$ is the $t + 1$ estimated coefficient from the event study for income source $y$. We estimate the total change in reported income attributable to enforcement as the difference between total income actually reported and the counterfactual total. To facilitate the analysis of tax revenues, we estimate total effects separately for interest, dividends, and capital gains; the results are similar if we apply the method to total financial capital income.

The top row of each of the three panels of Table 2.3 shows the results from this method; details of the calculation can be found in the appendix Table B.7. For OVD participants, we estimate a change in total reported capital income of almost $700 million. For first-time filers, our estimate is about $3.5 billion. Assuming non-qualified dividends and short-term capital gains are negligible, so that all dividends and capital gains are taxed at a top marginal tax rate of 15 percent, our calculation suggests that OVD participants incurred $184 million more in taxes due to their disclosure of offshore wealth, while other first-time FBAR filers owed $1 billion more in taxes.²⁸

### 2.6.3.2 Indirect method

In this section we discuss potential bias in the previous approach and implement a complementary, indirect approach. We model the change in reported capital income accompanying a disclosure as

$$
\Delta y_i = d_i r_i V_i,
$$

(2.2)

where $\Delta y_i$ is the change in reported income (in dollars), $d_i$ equals one if the individual was non-compliant prior to disclosure and zero otherwise, $r_i$ is the rate of return (excluding unrealized capital gains), and $V_i$ is the newly reported account value. Dividing by a baseline (non-zero) value $y_{i,t-1}$ yields

$$
\frac{\Delta y_i}{y_{i,t-1}} = d_i r_i \frac{V_i}{y_{i,t-1}}.
$$

(2.3)

In Figure B.6, we show that in our data the ratio $V_i / y_{i,t-1}$ is decreasing in $y_{i,t-1}$. Assuming homogeneous effects in our direct method therefore imposes an effect that is too large at the top of the income distribution and too small at the bottom. As the capital income distribution has a thick top tail (Piketty, 2013), using an approach that overestimates the effect at the top likely over-estimates the total effect. The first key assumption of our in-

²⁸Note that these tax liabilities are calculated for a single year following disclosure of an offshore account. These figures do not include any back taxes or penalties that are paid by the taxpayer as a result of disclosure. The total effect we estimate is thus the annual forward-looking effect from voluntary tax compliance not counting the penalty components of the payments made during participation in the OVD program or amending of tax returns.
direct approach is that the ratio $V_i/y_{i,t-1}$ does not co-vary with the compliance-adjusted rate of return, i.e. $\text{cov}(d_i r_i, V_i/y_{i}) = 0$. Taking expectations of Eq. (3) and applying this assumption, we have

$$E[d_i r_i] = \frac{E[\Delta y_i/y_{i,t-1}]}{E[V_i/y_{i,t-1}]}.$$ (2.4)

We estimate the numerator of the right-hand side of Eq. (2.4) in the regressions in Section 2.6.1 and 2.6.2, and we estimate the denominator directly. We can thereby estimate $E[d_i r_i]$ separately for OVD participants and first-time FBAR filers. Our second key assumption is that compliance-adjusted rates of return do not vary by offshore wealth: $\text{cov}(d_i r_i, V_i) = 0$. Under this assumption we can apply the estimates of $E[d_i r_i]$ to estimate the total change in income reporting (the sum of $\Delta y_i$ using Eq. (2.2)). Most plausible ways in which our two zero-covariance assumptions would fail—e.g. if those with larger accounts or higher income earn higher rates of return (Piketty, 2013) or are more likely to be ex ante noncompliant—imply that this method gives a lower bound on the total effect.

The results of this approach are summarized in the second row of each panel of Table 2.3 (with details in Table B.8). This method yields an estimate of a change in reported capital income of approximately $450 million for OVD participants and $1.5 billion for first-time filers. These estimates of the total effect of enforcement are smaller than what we obtain from the direct method. This is consistent with the intuition discussed above that the direct and indirect approaches are likely to provide upper and lower bounds on the total effect, respectively.

Finally, we note that estimates from the direct and indirect methods imply sensible values for the rates of return. As reported in Table 2.3, with details provided in Tables B.7-B.9, the compliance-adjusted rates of return we estimate, in the range of 1 to 3 percent, are reassuringly reasonable. Our estimates reflect increases in taxable income and are therefore not immediately comparable to market returns. First, to the extent that some new FBAR filers were fully tax compliant, their compliance-adjusted return was zero. Second, to the extent that quiet disclosers did not realize capital gains or adopted the well-known avoidance strategy of selling stocks with latent losses and keeping stocks with latent gains (Shefrin and Statman, 1985), capital gains do not enter our estimates.\footnote{Market returns in 2009 indeed consisted largely of capital gains: interest rates were generally low (e.g. 0.1% return on a 3-month bill) and while stock market returns were high (e.g. 25% return on S&P 500), only a small fraction was dividends (e.g. 2.5% on S&P 500).}

\footnote{When calculating statistics for the ratio $V_i/y_{i}$, we exclude observations with zero or negative $y_{i}$, and, due to the extreme skew of the distribution from observations with a very small denominator, we trim the distribution at its 95th percentile.}
2.7 Conclusion

We find that enforcement initiatives on the taxation of offshore wealth increased the number of individuals reporting foreign accounts to the IRS by around 50,000 taxpayers and increased the total amount of wealth disclosed by about $100 billion. Most of this response occurred outside of the Offshore Voluntary Disclosure programs. Even outside the OVD programs, newly disclosed accounts were disproportionately concentrated in countries often characterized as tax havens. Overall patterns of response suggest that the increase in foreign account reporting reflected an increase in tax compliance.

The reporting of new foreign accounts coincided with substantial increases in financial capital income flows reported on tax returns, even for those who never participated in a voluntary disclosure program. Our results suggest that a number of individuals made quiet disclosures to avoid the significant penalties that would be otherwise be due under the voluntary disclosure program. In total, we estimate that enforcement efforts led individuals to report $2 to $4 billion annually in total financial capital income, which corresponds to an increase in tax revenues of $570 million to $1.25 billion annually. On the whole, these results imply that the increase in tax compliance induced by this set of policy initiatives was significantly larger than suggested by official statistics based solely on backward-looking information about tax and penalty payments made under the voluntary disclosure programs (e.g. IRS, 2014).

Our estimated total effect of enforcement is sizable, but small relative to independent estimates of the amount of concealed offshore wealth and capital income overall (Zucman, 2013; Alstadster, Johannesen and Zucman, 2018). An increase of $100 billion in disclosed wealth would constitute 10% of total US-owned offshore wealth as estimated in prior work. Significant non-compliance likely remained after the enforcement initiatives studied in this paper were implemented. However, the policy regime in the period we study was one of targeted enforcement. Further research should examine the subsequent, more comprehensive enforcement efforts undertaken by the U.S. and other countries, and also account for the compliance costs of these policies.
2.8 Figures

Figure 2.1: Decision-Making over Tax Compliance with Foreign Assets and the 2008-2009 Enforcement Initiatives

Notes: This figure illustrates the decisions faced by individuals with foreign accounts in following 2008-2009 enforcement efforts. The first column divides individuals into three groups based on their compliance with FBAR filing and/or tax obligations. The second column examines the potential responses of each group to enforcement. The third column examines the additional decision by a previously non-compliant individual who opts to come into compliance over how to do so. We note that there are some potential behaviors not covered by this figure; the intention is to convey here the most likely behavior given the institutional environment.
Figure 2.2: FBAR Filers and OVD Participants

Notes: This figure illustrates the number of individuals filing FBARs and participating in OVD over time. We observe a gradually increasing trend in the number of FBAR filers prior to 2008, and a sharp increase in 2009. The increase in 2009 is much larger than the number of OVD participants.
Figure 2.3: New Disclosers of Foreign Accounts

Panel A: Number of new disclosers

Panel B: Value of accounts disclosed by new disclosers

Notes: This figure plots aggregates on new disclosers of foreign accounts (those not filing FBAR in previous years, see text for details) by year. The first panel reports the number of individuals, the second the total disclosed account values. We observe a sharp increase in new filers and reported assets in 2009, only a small portion of which is accounted for by OVD participants.
Figure 2.4: FBAR Filers and OVD Participants

Notes: This figure plots aggregates on new disclosers of foreign accounts (those not filing FBAR in previous years, see text for details), normalized by the 2008 level of new disclosers. Series are plotted separately by whether the FBAR filer reports having a U.S. or non-U.S. address and by whether the FBAR filer reports holding an account in a tax haven. We define tax havens using the OECD (2000) list of uncooperative tax havens plus Switzerland, Singapore, Hong Kong and Luxembourg. The 2008 levels for each category are: 5,025 for U.S. filers with haven accounts; 36,649 for U.S. filers with no haven accounts; 4,804 for non-U.S. filers with haven accounts; 23,272 for non-U.S. filers with no haven accounts.
Figure 2.5: Percent Change in First-time FBAR Filings, 2008-2009, by Country

Notes: This figure plots the percent change in the number of new disclosers of foreign accounts (those not filing FBAR in previous years, see text for details), from 2008 to 2009 by the country in which new filers reported accounts. OVD participants and non-US address filers are excluded from the tabulations. Tax havens are shown with red bars; we define tax havens using the OECD (2000) list of uncooperative tax havens plus Switzerland, Singapore, Hong Kong and Luxembourg. Percent changes are calculated relative to the 2008 level. We exclude countries with fewer than 50 new filers in 2008.
Figure 2.6: First-time FBAR Filers, by Account Value, 2005-2011

Notes: This figure plots aggregates on new disclosers of foreign accounts (those not filing FBAR in previous years, see text for details), by year and the value of the largest account disclosed by the new filer. Series are normalized by the 2008 level of new filers. OVD participants and non-US address filers are excluded from the tabulations. The 2008 levels are 6,059 filers, 25,427 filers, 8,893 filers, and 1,295 filers for the four categories, respectively, in ascending order of the account value categories.
Figure 2.7: Additional Account Disclosures for Previous FBAR Filers

Notes: This figure plots aggregates on disclosures of additional accounts by individuals who had already been filing FBARs by year. We count individuals who previously disclosed only one account and start declaring multiple accounts, individuals who previously disclosed only non-haven accounts who start disclosing haven accounts, and individuals who previously only disclosed small accounts and start disclosing large (> $1 million) accounts (see text for details). OVD participants and non-US address filers are excluded from the tabulations. The series are normalized by the 2008 levels. We observe a large an increase in each intensive margin measure of new account disclosure.
Figure 2.8: Account Characteristics among OVD Participants and FBAR Compliers

Panel A: Account value

Panel B: Account country

Notes: This figure estimates the distribution of account characteristics for new FBAR filers (excluding OVD participants and non-U.S. addresses) filing in 2009 because of enforcement (called FBAR compliers) and compares them to the characteristics of accounts disclosed by OVD participants. The first panel reports account value and the second considers account country.
Figure 2.9: Event Study of Reported Income for OVD Participants

Panel A: Interest, Dividends and Capital Gains

Panel B: Total capital income

Notes: This figure plots the coefficients on event-year dummies in the event study regression for given income sources. Event-year 0 represents the tax year associated with the year of initial OVD participation. The 95% confidence interval is calculated from estimated standard errors clustered at the individual level. The outcome variable is an inverse hyperbolic sine transformation of a given income source. Capital gains income in Panel A includes realized gains and losses. Total capital income in Panel B is defined as the sum of interest, dividends, and capital gains and losses.
Figure 2.10: Event Study of Reported Income for First-Time FBAR Filers

Panel A: Interest, Dividends and Capital Gains

Panel B: Total capital income

Notes: This figure plots the coefficients on event-year dummies in the event study regression for given income sources. Event-year 0 represents the tax year associated with the year of first-time FBAR filing. The 95% confidence interval is calculated from estimated standard errors clustered at the individual level. The outcome variable is an inverse hyperbolic sine transformation of a given income source. Capital gains income in Panel A includes realized gains and losses. Total capital income in Panel B is defined as the sum of interest, dividends, and capital gains and losses.
Notes: This figure repeats the exercise the previous two figures for interest and dividend income, decomposing these types of income into income reported by domestic financial institutions (on Forms 1099-INT and 1099-DIV) and income reported by the taxpayer but not reported by domestic financial institutions. Event-year 0 represents the tax-year associated with the year of first-time FBAR filing. The 95% confidence interval is calculated from estimated standard errors clustered at the individual level. The outcome variable is an inverse hyperbolic sine transformation of the given income source such that point estimates can be interpreted similarly to a log transformation.
Table 2.1: Characteristics of FBAR filers and accounts in 2008 and 2009

<table>
<thead>
<tr>
<th>Total number of FBAR filers</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>247,106</td>
<td>330,525</td>
</tr>
<tr>
<td>U.S. address</td>
<td>150,362</td>
<td>230,723</td>
</tr>
<tr>
<td>non-U.S. address</td>
<td>96,744</td>
<td>99,802</td>
</tr>
<tr>
<td>haven account</td>
<td>39,584</td>
<td>64,584</td>
</tr>
<tr>
<td>no haven account</td>
<td>207,522</td>
<td>265,941</td>
</tr>
<tr>
<td>amended return</td>
<td>2,767</td>
<td>4,581</td>
</tr>
<tr>
<td>no amended return</td>
<td>244,339</td>
<td>325,944</td>
</tr>
<tr>
<td>multiple accounts</td>
<td>145,992</td>
<td>213,975</td>
</tr>
<tr>
<td>single account</td>
<td>101,144</td>
<td>116,550</td>
</tr>
<tr>
<td>Total number of FBAR accounts</td>
<td>721,091</td>
<td>1,297,591</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>322,727</td>
<td>574,248</td>
</tr>
<tr>
<td>Asia</td>
<td>176,252</td>
<td>329,911</td>
</tr>
<tr>
<td>North America</td>
<td>199,702</td>
<td>350,834</td>
</tr>
<tr>
<td>Other</td>
<td>22,410</td>
<td>42,598</td>
</tr>
<tr>
<td>&lt;$10,000</td>
<td>242,769</td>
<td>367,801</td>
</tr>
<tr>
<td>$10,000 - $100,000</td>
<td>341,759</td>
<td>601,317</td>
</tr>
<tr>
<td>$100,000 - $1 million</td>
<td>118,894</td>
<td>264,259</td>
</tr>
<tr>
<td>&gt;$1 million</td>
<td>17,669</td>
<td>64,214</td>
</tr>
</tbody>
</table>

Notes: This table summarizes the characteristics of all FBAR filers and accounts in 2008 and 2009, which serves as the baseline for our analysis of the increase in reporting from 2008 to 2009.
Table 2.2: Statistics on Reported Income in the Year before Disclosure

**OVD Participants**

<table>
<thead>
<tr>
<th>Income</th>
<th>mean</th>
<th>median</th>
<th>p25</th>
<th>p75</th>
<th>p90</th>
<th>p95</th>
<th>p99</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest</td>
<td>78,317</td>
<td>7,924</td>
<td>1,136</td>
<td>31,603</td>
<td>103,667</td>
<td>225,915</td>
<td>952,520</td>
</tr>
<tr>
<td>Dividends</td>
<td>67,463</td>
<td>6,231</td>
<td>253</td>
<td>30,482</td>
<td>94,557</td>
<td>192,184</td>
<td>806,017</td>
</tr>
<tr>
<td>Capital Gains</td>
<td>42,472</td>
<td>2,139</td>
<td>0</td>
<td>15,169</td>
<td>56,469</td>
<td>123,942</td>
<td>532,772</td>
</tr>
<tr>
<td>Wages</td>
<td>199,754</td>
<td>37,209</td>
<td>0</td>
<td>155,200</td>
<td>364,250</td>
<td>638,270</td>
<td>2,253,626</td>
</tr>
<tr>
<td>AGI</td>
<td>781,731</td>
<td>177,080</td>
<td>78,873</td>
<td>427,060</td>
<td>1,236,501</td>
<td>2,643,073</td>
<td>10,266,601</td>
</tr>
<tr>
<td>Total Tax</td>
<td>175,310</td>
<td>25,193</td>
<td>6,076</td>
<td>90,541</td>
<td>277,893</td>
<td>599,687</td>
<td>2,451,757</td>
</tr>
<tr>
<td>Sched C Income</td>
<td>25,787</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>22,226</td>
<td>79,817</td>
<td>441,208</td>
</tr>
<tr>
<td>Sched E Income</td>
<td>117,307</td>
<td>0</td>
<td>0</td>
<td>12,000</td>
<td>179,009</td>
<td>556,395</td>
<td>2,811,869</td>
</tr>
</tbody>
</table>

**First-time FBAR Filers**

<table>
<thead>
<tr>
<th>Income</th>
<th>mean</th>
<th>median</th>
<th>p25</th>
<th>p75</th>
<th>p90</th>
<th>p95</th>
<th>p99</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest</td>
<td>57,692</td>
<td>1,240</td>
<td>112</td>
<td>8,009</td>
<td>44,537</td>
<td>131,660</td>
<td>970,424</td>
</tr>
<tr>
<td>Dividends</td>
<td>57,968</td>
<td>369</td>
<td>0</td>
<td>6,442</td>
<td>49,889</td>
<td>144,004</td>
<td>850,591</td>
</tr>
<tr>
<td>Capital Gains</td>
<td>42,551</td>
<td>118</td>
<td>0</td>
<td>3,474</td>
<td>29,456</td>
<td>88,328</td>
<td>550,640</td>
</tr>
<tr>
<td>Wages</td>
<td>280,804</td>
<td>114,126</td>
<td>19,290</td>
<td>238,357</td>
<td>481,447</td>
<td>807,758</td>
<td>3,073,700</td>
</tr>
<tr>
<td>AGI</td>
<td>649,312</td>
<td>159,224</td>
<td>72,466</td>
<td>335,236</td>
<td>885,327</td>
<td>1,928,447</td>
<td>10,059,205</td>
</tr>
<tr>
<td>Total Tax</td>
<td>156,427</td>
<td>21,622</td>
<td>4,570</td>
<td>65,140</td>
<td>203,777</td>
<td>457,561</td>
<td>2,372,693</td>
</tr>
<tr>
<td>Sched C Income</td>
<td>17,865</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9,811</td>
<td>51,349</td>
<td>363,155</td>
</tr>
<tr>
<td>Sched E Income</td>
<td>123,919</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>57,866</td>
<td>333,075</td>
<td>3,033,635</td>
</tr>
</tbody>
</table>

**Control Group Filers**

<table>
<thead>
<tr>
<th>Income</th>
<th>mean</th>
<th>median</th>
<th>p25</th>
<th>p75</th>
<th>p90</th>
<th>p95</th>
<th>p99</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest</td>
<td>53,288</td>
<td>3,659</td>
<td>496</td>
<td>15,262</td>
<td>52,050</td>
<td>118,473</td>
<td>745,906</td>
</tr>
<tr>
<td>Dividends</td>
<td>76,831</td>
<td>2,403</td>
<td>0</td>
<td>16,935</td>
<td>69,607</td>
<td>162,246</td>
<td>951,457</td>
</tr>
<tr>
<td>Capital Gains</td>
<td>55,479</td>
<td>678</td>
<td>0</td>
<td>7,639</td>
<td>38,585</td>
<td>100,887</td>
<td>639,977</td>
</tr>
<tr>
<td>Wages</td>
<td>259,340</td>
<td>98,700</td>
<td>0</td>
<td>224,562</td>
<td>472,293</td>
<td>821,417</td>
<td>2,736,528</td>
</tr>
<tr>
<td>AGI</td>
<td>661,073</td>
<td>166,995</td>
<td>78,664</td>
<td>356,801</td>
<td>972,078</td>
<td>2,033,361</td>
<td>9,755,223</td>
</tr>
<tr>
<td>Total Tax</td>
<td>142,965</td>
<td>21,611</td>
<td>4,736</td>
<td>63,841</td>
<td>194,384</td>
<td>419,169</td>
<td>2,027,565</td>
</tr>
<tr>
<td>Sched C Income</td>
<td>11,846</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6,909</td>
<td>45,116</td>
<td>297,234</td>
</tr>
<tr>
<td>Sched E Income</td>
<td>90,962</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>22,523</td>
<td>145,043</td>
<td>1,956,672</td>
</tr>
</tbody>
</table>

Notes: This table shows mean and median incomes by source for the disclosure groups – OVD participants and first-time FBAR filers – and the comparison group of continuous FBAR filers used in the event study regression analysis. Capital gains includes realized capital gains and losses; AGI stands for Adjusted Gross Income; Schedule C is income from sole-proprietorships; Schedule E is income from pass-through businesses. All statistics are calculated in event-year -1, which is the baseline year in the regression specification.
Table 2.3: Summary of Total Income and Revenue Estimate Results

<table>
<thead>
<tr>
<th></th>
<th>Total Reported Assets (millions USD)</th>
<th>Total Reported Capital Income (millions USD)</th>
<th>Compliance Adjusted Rate of Return (E[d*r])</th>
<th>Revenue Estimate (millions USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OVD Participants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td>20,700</td>
<td>691</td>
<td>0.033</td>
<td>184</td>
</tr>
<tr>
<td>Indirect</td>
<td>20,700</td>
<td>454</td>
<td>0.022</td>
<td>121</td>
</tr>
<tr>
<td><strong>First-time Filers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td>114,467</td>
<td>3,580</td>
<td>0.031</td>
<td>1,052</td>
</tr>
<tr>
<td>Indirect</td>
<td>114,467</td>
<td>1,568</td>
<td>0.014</td>
<td>449</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td>135,167</td>
<td>4,271</td>
<td>0.032</td>
<td>1,236</td>
</tr>
<tr>
<td>Indirect</td>
<td>135,167</td>
<td>2,022</td>
<td>0.015</td>
<td>570</td>
</tr>
</tbody>
</table>

Notes: This table summarizes our estimates of the change in total reported capital income and tax revenues using the direct and indirect method as described in Section 2.6.3 of the text. (See appendix Tables B.7, B.8 and B.9 for details of the calculations.)
CHAPTER III

Independent Contractors in the U.S.: New Trends from 15 Years of Administrative Tax Data

From a work with Katherine Lim, Alicia Miller and Eleanor Wilking

Abstract

In recent decades, there has been growing concern about a shift among workers and firms towards independent contractors (ICs) and away from employees. However, many existing datasets do not track independent contractor relationships, complicating the task of understanding this change. We develop coherent criteria to identify “independent contractors”–individuals who provide labor services to firms outside of an employment relationship–using administrative data from tax filings. Using these criteria, we corroborate previous studies, finding that the share of the workforce with some IC income has grown substantially since 2001, by 1.4 percentage points, or 20 percent, with much of the growth pre-dating the rise of the online platform economy. Next, we leverage two features of the tax data - the ability to link ICs to various individual and household income sources, and to the firms which contract them - to analyze trends in the independent contractor workforce in the U.S. from 2001 to 2015. We find that the growth of the IC workforce is not associated with a single type of worker or labor relationship. The largest share of ICs are those in the top quartile of the income distribution who use IC earnings as supplemental labor income. Yet, the fastest growing type of ICs is those whose primary household income source is contractor earnings, and over 50 percent of these individuals are in the bottom quartile of the income distribution. These trends are particularly pronounced among female ICs, who have contributed over 60 percent of the total growth in IC labor over the period. Additionally, we find that the share of firms using IC labor increased by 20 percent and that the largest relative increase has been among small firms which saw a 30 percent increase. Together, these trends suggest that the long-run growth in IC labor in the U.S.
cannot solely be attributed to individuals seeking supplemental income, or to the rise of a few online platform firms, but may represent a more structural shift in the labor market, particularly for women.

**JEL Codes**: J21, J33  
**Keywords**: Labor Force Composition, Independent Contractors

### 3.1 Introduction

The U.S. workforce has always contained both employees and self-employed individuals providing services to other businesses. In recent decades, there has been growing concern among policymakers and economists that there has been a shift among workers and firms towards independent contractors (ICs) and away from employees. While ICs provide firms and workers with flexibility and may lower firms’ overall labor costs, these jobs may provide less stability and fewer worker protections for individuals.

In this paper, we use administrative tax data to create a definition of independent contractor (IC) that focuses on individuals providing labor services to firms. Using our preferred definition, we find that ICs increased as a share of workers by 1.4 percentage points between 2001 and 2015, representing a 20 percent increase from the 2001 share. This increase pre-dates the introduction of online platform economy companies in the 2010s and was driven primarily by women contractors. Our results highlight the varied experiences that drive the overall trend. There have been large increases in those who use contracting to supplement wage and salary income, but the fastest growth has been among individuals whose labor income comes primarily from contract labor. We find both very high income and low income individuals have rising rates of contracting. The findings suggest that a variety of factors have contributed to the long-run increase of ICs over the previous decades. Our work presents new statistics on firms’ use of ICs. We show that 24.7 percent of firms in 2015 use at least some contractors, an increase from 20.4 percent in 2001. IC use has risen the fastest among low wage firms and small firms with few employees. We find little evidence of employees being converted to ICs at the same firm, but some evidence that firms are increasingly likely to hire new contractors rather than new employees, particularly since the Great Recession. Again, this trend is concentrated among small firms.

Our paper contributes to the current policy and research discussion surrounding a perceived shift towards contracting relationships as a substitute for more traditional employee-employer relationships. The classification of workers as employees or ICs matters because
it affects the firm’s labor and regulatory compliance costs and the worker’s labor protections, benefits eligibility, and tax treatment. For example, employers are subject to minimum wage, Family Medical Leave Act, unemployment insurance, workers compensation, and Affordable Care Act requirements for employees but not ICs. While these laws ensure a social safety net for employees, they also raise labor costs for firms. Individuals who work as ICs do not receive these protections from the firm that they provide services to, but they may receive a higher payment for their services by forgoing these benefits and protections. Additionally, they may have more control over how their work is completed and the hours that they work. ICs are also eligible to deduct from their taxable income expenses associated with providing their services because they are treated as a sole proprietorship for tax purposes.\textsuperscript{1} The many differences between employees and ICs imply that some individuals may prefer to work as ICs and others as employees. Similarly, for certain positions some firms may benefit from the potentially lower cost and employment flexibility of using contractors, while others may see productivity gains and lower transaction costs by using employees.

The overall share of work being completed by employees versus ICs depends on both the individual-side supply and firm-side demand for ICs. Our paper provides new evidence on the trends of IC use in the economy at both the worker and firm level to better understand what drives contractor use and how it has changed in recent decades. We begin by developing a methodology to consistently identify workers in administrative tax data who we call ICs. Conceptually, these are individuals who are being compensated primarily for providing labor services to a firm, but who are not an employee of that firm. In the data, we identify potential ICs as individuals who file a Form 1040 and receive non-employee compensation on a Form 1099-MISC, which is generally issued by a firm to individuals for providing services. We also include Form 1099-K recipients as potential ICs because those working for platform economy companies often receive these because the payments from customers are made via electronic payments or credit cards. In our preferred definition, we refine this group to focus on those workers who are the closest substitutes for employees by excluding individuals who claim over $10,000 of business deductions, not including deductions for vehicles or travel. We exclude these individuals because large levels of deductions suggest that the individual has a business with substantial capital investment meaning their compensation includes payment for both their labor services and their capital. We use a 1 percent random sample from the universe of 1099-MISC recipients and a 5

\textsuperscript{1}Some independent contractors may create a C or S corporation to provide labor services. We find this is a small fraction of individuals who meet our definition of independent contractors, and we exclude them from our main analysis.
percent sample of 1099-K recipients for our worker-level analyses and a 2 percent sample of all W-2 issuing EINs for our firm level analysis.²

We show that the estimated size of the IC workforce can vary substantially depending on how contractors are identified. In 2015, the broadest measure of independent contracting, including all individual taxpayers that receive a Form 1099 payment, suggests that 11 percent of workers are contractors, while our preferred definition finds 8 percent. We corroborate previous research showing that ICs make up a growing share of workers (Jackson et al. (2017), Katz and Krueger (2019), Collins et al. (2019)), and show that this increase is driven almost exclusively by individuals who meet our preferred definition, those who look most like employees. We find that, using the broadest IC measure, 34.7 percent of firms use contractors, while using our preferred definition reduces that fraction to 24.7 percent. We see roughly a 4 percentage point increase in the fraction of firms using ICs between 2001 and 2015 and again almost all of the increase occurred among firms using contractors that meet our preferred definition. Importantly, much of the increase in contractor prevalence that we find at the individual and firm levels pre-date the introduction of online platform economies. Additionally, we find an increased prevalence in the number of firms using contractors, particularly amongst smaller firms, instead of a large increase in the number of contractors at a small set of large firms as would be the case if online platform companies such as Uber and Task Rabbit were the main drivers of the growth in this sector. While these types firms likely contributed to the increase, as shown in Collins et al. (2019), there is a broader trend that cannot be explained only by the emergence of these firms.

Next, we use our preferred definition of ICs to examine individual characteristics and to shed light on factors that may have contributed to the increase in ICs. We show that ICs are a diverse group of workers implying that there are likely a number of contributing explanations for why individuals are increasingly likely to be contractors. ICs tend to either make almost all of their earnings from contracting or have IC earnings as a small supplement to a wage and salary job, and we find substantial growth in both types of ICs. In percentage terms, we find stronger growth among those who are primarily contractors, which suggests that the trend cannot merely be explained by individuals picking up side contracting jobs to supplement their main earnings. For both types of ICs, the median IC earnings is relatively low suggesting that this work is often not full-time full-year employment, or generates less income than traditional full-time employment relationships, even

²Throughout the paper we use the term firm to refer to the economic concept of a business entity; however, our entity data is at the employer identification number (EIN) level. Firms may have many EINs, but linking them to measure a parent business entity is beyond the scope of this paper.
among those who earn the majority of their income as a contractor.

We find that women account for approximately 60 percent of the total increase in the number of ICs from 2001 to 2015, a period over which female employment has been relatively flat. The number of female ICs has increased by 70 percent over this period, while the increase for men has been 30 percent. We compare the individual and household income of female contractors and do not find evidence that the trend is driven by secondary household earners finding increasing opportunities to acquire IC jobs, perhaps facilitated by the rise of the platform economy. We, instead, find that female primary earners contribute the largest share of the growth in the IC workforce over this period. Primary earning women whose IC income is supplemental to employment earnings account for 22 percent of the total increase in IC labor over this period, and primary earning women for whom IC labor is their primary income source account for 19 percent of the total increase. Though the absolute growth between these groups is similar, the latter group exhibited the largest relative growth, increasing by almost 85 percent over this period. There has also been growth in the number of secondary earning female ICs whose main labor income is from IC earnings, but this accounts for a relatively small share of aggregate trend. We further show that the largest share of ICs, those that use IC income as supplemental labor income, are most likely to be in the top quartile of the income distribution. Yet, for the fastest growing type of ICs, those whose primary household income source is contractor earnings, over 50 percent are in the bottom quartile of the income distribution.

On the firm side, our results suggest that more firms are using IC labor over our sample period. We find a 4.1 percentage point, or 20 percent, increase in the fraction of firms hiring any ICs. By 2015, ICs make up 18.6 percent of the workers at the average firm up from 15.9 percent in 2001. The share of total compensation paid to ICs relative to W-2 workers has remained relatively flat at around 13 to 14 percent over our sample period even though IC compensation from 1099 forms represents payment before including expenses. This suggests that ICs have lower non-employee compensation relative to W-2 wage earners and that this gap has grown over time. Our data cannot distinguish between the explanations that ICs are hired for shorter time frames or fewer hours, or that they have lower hourly compensation. When we disaggregate the trends by the median wage paid at each firm, we find that firms across the wage distribution are increasingly likely to hire ICs, but the share of workers that are ICs rises most sharply for firms paying low median wages. In general, IC use is highest at high wage firms with 33.1 percent of top quartile wage firms using ICs compared to 17.6 percent of bottom quartile firms.

In theory, the determination of whether a worker is an employee or an IC is made according to various criteria about the nature of the work being performed and the rela-
tionship between the firm and the worker. In practice, there is substantial legal ambiguity about which classification is appropriate in a given firm-worker arrangement, and enforcement is challenging. Evaluating the holistic nature of the worker-firm arrangement is factually intensive and requires a significant commitment of agency audit resources. Given the differences between the two types of arrangements, it is possible that firms and workers would prefer different classifications over time. To understand whether workers are being re-classified, we examine the extent to which workers switch employment types with the same firm each year. In 2015, we find that only about 3.7 percent of workers switch statuses each year and 4 percent of firms have at least one worker changing statuses within the same firm. From 2001 to 2015 there has been a steady increase in the number of workers continuing to work as an IC year over year. Interestingly, while it is three times more common for individuals to switch from employees to ICs in the population, switching from an IC to an employee within the same firm is more common than switching from employee to contractor, a difference which originated after the Great Recession. We find that firms in the information and educational services industries are most likely to have workers switching statuses, corresponding with audit evidence suggesting that these industries have relatively high rates of worker misclassification (Carr and Wilson (2004)).

Since we do not see evidence that the rise in IC use is coming from firms converting their employees to IC status, we look at new hires at firms. We find that in 2015 around 18 percent of firms hired at least one new contractor each year compared to around 57 percent who hired a new employee. Over our sample period the fraction hiring a new contractor grew by 2 percentage points while the fraction hiring a new employee has fallen by 7 percentage points. We show that these trends were strongest for the smallest firms. Firms with 1-4 employees were 16 percent less likely to hire an employee in 2015 relative to 2001 and 20 percent more likely to hire an IC.

This paper adds to a growing literature about various groups of workers who do not resemble permanent employees with fixed schedules. Evidence from administrative data suggests the number of workers in the U.S. who are classified as self-employed, yet still have substantial relationship with firms is on the rise (Jackson et al. (2017); Abraham et al. (2018)). Some of this increase reflects technological changes in how work is carried out, most notably in the “gig” or “platform” economy where ICs monetize their time, vehicles, and dwellings (Abraham et al. (2018); Harris and Krueger (2015)), but our results suggest that the rise in ICs began before the introduction of platforms like Uber and Lyft. Evidence from survey data sources do not demonstrate the same increase in self-employment among U.S. workers with one possible explanation for the discrepancy being that workers perceive
an employee relationship but, in reality, they are classified by the firm as an IC (Abraham et al. (2018)). Our finding that the rise is largest among individuals with very large and very small shares of contracting income is consistent with the hypothesis that in surveys individuals may either fail to mention a secondary contracting job or believe that their primary contracting position represents an employee-employer relationship.

Our findings do not suggest a simple explanation for why more firms are using contractors and more workers are becoming contractors. ICs are a diverse set of individuals who may have varied motivations for becoming a contractor. The welfare implications of the rise of IC jobs providing supplementary income, perhaps attributable to changes in technology, and of those that represent a primary earnings source for low income households may be very different. We cannot determine whether these trends are driven by an increase in demand for these types of workers or an increase in supply. Katz and Krueger (2019) argue that strong labor markets decrease alternative work arrangements suggesting that at least some of these workers may prefer an employee position. Although it appears that firms are increasing contractor use through new hires, we also see higher rates of workers switching from contractor to employee. Further work on the career trajectories of IC workers could shed light on whether these positions are a stepping stone to earnings growth either as an IC or employee or if they represent inferior arrangements for many workers seeking to be employees. Understanding the role of IC work within a career is particularly important given that ICs are increasingly female, in the bottom half of the income distribution, and have IC income as a primary earnings source.

The remainder of the paper proceeds as follows. Section 3.1.1 situates this paper in the context of recent studies of alternative work arrangements. Section 3.2 describes the process of identifying ICs using administrative tax data. Section 3.3 establishes aggregate trends in the characteristics of ICs from 2001 to 2015. Section 3.4 analyzes changes in firms’ usage of IC labor over this period. Section 3.5 studies transitions between employment and IC labor relationships, particularly within firms. Section 3.6 examines the dramatic increase in female ICs over this period and the share of the growth of the IC labor force attributable to primary and secondary earners, and Section 3.7 concludes.

3.1.1 Relationship to Recent Literature on Independent Contractors in the U.S. Economy

In this paper, we focus on a group of individuals providing services to firms who we call independent contractors (ICs). These individuals directly contract with businesses and receive payments for their services on either a Form 1099-MISC or 1099-K. Because we are interested in how firms decide whether to use contract labor or employees, we
further focus our analysis on individuals who are likely to be receiving payments mainly for labor services by using information about their contracting business from their Schedule C filings. These individuals are the contractors who are most likely to be close substitutes for employees. ICs are a subset of the self-employed more generally. Jackson et al. (2017) show that only around half of self-employed individuals receive a Form 1099. There are a number of reasons that these individuals may not receive a Form 1099. They may be providing services to households rather than businesses, and households do not issue Form 1099s. They may operate a cash only business or receive credit card payments but be below the 200 transaction and $20,000 requirement for issuance of a Form 1099-K. Additionally the Form 1099-K was only introduced in 2011 so some payments reported on the form may have previously been unreported while others may have been reported on a Form 1099-MISC.

Our work relates to a number of recent studies that document trends in the prevalence of workers outside of traditional employee-employer relationships. The broadest of these study a class of workers known as “alternative” workers, which generally include ICs, temp agency employees, workers at contracting firms, and on-call workers. These papers have found mixed results depending on the data source and exact definition of non-traditional work. Katz and Krueger (2019), using survey data, find a 1-2 percentage point increase in alternative work between 2000 and 2015 while the Bureau of Labor Statistics’ (BLS) contingent worker survey (CWS) finds no increase in alternative work between 2005 and 2017 (Bureau of Labor Statistics (2018)). Our paper examines a subset of these workers characterized as ICs. Katz and Krueger’s (2019) preferred estimate suggests a very small increase in ICs between 2005 and 2015 of 0.2 percentage points while the CWS suggests a decrease between 2005 and 2017; however, the CWS does find a large increase in IC use between 2001 and 2005 of 0.9 percentage points. Overall these results suggest that we should see small increases in the prevalence of ICs over our sample period of 2001 through 2015, but, as described below, because our paper uses administrative data we may expect to find greater increases than found in these studies.

Another set of studies has focused on an overlapping, but distinct group of individuals characterized as the self-employed using both survey and administrative data. Generally survey sources show no change or small declines in self-employment rates while administrative tax data show increases in recent decades. Abraham et al. (2018) combine the two types of data to show that there has been a rise in the types of self-employment income reported in tax data that is not reported in surveys. They argue this may be because the work represents a secondary job that is not reported or well measured in some surveys or that the individual does not consider herself self-employed and may respond as a wage
and salary employee. Similar to our results, these increases in self-employment pre-date the introduction of online platform economy companies such as Task Rabbit, Uber, and Lyft. Jackson et al. (2017) also focus on self-employed individuals identified using administrative tax data. They document similar trends: small increases in self-employment with the increase arising from individuals with low levels of business deductions.

Our paper focuses on ICs as identified by Form 1099 receipt, which are a subset of the self-employed conceptually. In practice, these individuals often do not file a Schedule SE, which is the form that many previous researchers have used to identify self-employed individuals in tax data. These differences make our population both broader and narrower than those studied in Abraham et al. (2018) and Jackson et al. (2017). A recent paper by Collins et al. (2019) highlights the differences between the two populations finding that around 40 percent of Form 1099 recipients in 2016 did not file a Schedule SE and that around 45 percent of those with a Schedule SE do not receive a Form 1099. By focusing on individuals who receive a Form 1099, we include those with net profits from their business that are less than $400, which is the level above which a Schedule SE is required. We will also include individuals who do not claim their Form 1099 compensation on a Schedule C possibly due to confusion about where to report the income. Collins et al. (2019) use tax data to identify individuals receiving a Form 1099 with a specific focus on those working for an online platform economy firm. They also find increases in the number of Form 1099 recipients and an increase in the share of the workforce receiving a Form 1099 between 2000 and 2016 of around 1.9 percentage points. They argue that recent increases after 2013 are driven almost entirely by online platform economy activity. We find that there have also been long-run increases in IC labor from 2001 to 2015, largely pre-dating the rise of the platform economy.

### 3.2 Identifying Independent Contractors using Administrative Tax Data

Independent contractor is a legal class of worker, but there is no one tax form that identifies this group. Therefore, we use a variety of data sources from the administrative tax records to identify individuals who are likely to be ICs. In this section we discuss our method for identifying ICs and present evidence on how the measurement of the size of, and trends in, the IC workforce depend on how they are identified in the tax data.
3.2.1 Linking Administrative Data Sources

We draw our initial sample from the universe of information reports on firm payments for non-employee services. In contrast to starting with a sample of individual tax payers, starting with “transactions” ensures that we observe all relationships in which an individual or firm is issued a 1099, allowing us to begin with the broadest definition of potential ICs. We begin by selecting a 1 percent random sample of 1099-MISC recipients with positive reported non-employee compensation (“box 7 income”) for each tax year from 2001 to 2016. The IRS requires that businesses issue Form 1099-MISC to individuals, or other businesses, for services provided by someone who is not an employee of the issuing business. In general, these forms are not required to be issued to corporations. This population of 1099-MISC recipients likely includes some individuals and businesses whose owners we would not consider ICs. For example, a 1099-MISC could be issued to a catering company with many employees or to a law firm for attorney services. To refine the sample to focus on ICs, we complete a series to steps to match the 1099-MISC recipients to other tax forms that provide more information on the recipient.

A 1099-MISC can be issued to an individual’s social security number (SSN) or to a business’s employer identification number (EIN). Non-employee compensation reported on a Form 1099-MISC issued to an individual’s SSN or the EIN of a sole proprietorship should be reported on the individual’s Schedule C. Our first step is to match the 1099-MISC recipients to Schedule C filings, which contain information on the income and expenses of the sole proprietorship business that provided the services. If a 1099-MISC is issued to an SSN, but does not match to Schedule C, we attempt to match the 1099-MISC recipient directly to their household tax return, Form 1040. The group of individuals who filed Form 1040s but not Schedule Cs are individual taxpayers, but they may have reported their 1099-MISC income elsewhere on their tax return, or failed to report it.

Next we turn to the 1099-MISC forms issued to EINs, but that do not match to a Schedule C. We attempt to match these recipients with their respective business income returns. We focus on recipients that filed a partnership return using Form 1065, a C-corporation return using Form 1120, or an S-corporation return using Form 1120-S. We use information from the business returns on the number of owners and amount and type of deductions to further characterize whether the owners may be ICs.

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3 Exceptions include fish purchases for cash, attorneys’ fees and payments by a federal executive agency for services, which can generate a 1099-MISC issuance to a corporation and are reported in box 7.

4 The Schedule C nominally reports profits or losses from sole-proprietorship businesses, but all 1099-MISC payments received by an individual as business or self-employment income should be reported on a Schedule C, even if the individual receiving the Form 1099-MISC is not a small business owner per se.

5 We distinguish “individual” and “business” recipients by whether the recipient tax identification number
Finally, Form 1099-K was introduced in 2011 as an information report on credit card transactions and third party payments that exceed both $20,000 and 200 transactions in a year.\(^6\) ICs that receive compensation in the form of credit card payments would report part or all of their contract income on Form 1099-K. We incorporate the 1099-K into the analysis in two ways. First, we match 1099-MISC recipients with Form 1099-K to identify those who receive income on both forms. Second, we draw a 5 percent random sample from the universe of 1099-K recipients in each year from 2011-2016 and repeat the entire matching exercise that we use for 1099-MISC recipients. This allows us to separately analyze potential ICs for which all of their contract income is reported on Form 1099-K.\(^7\)

Many Form 1099-K recipients will not be considered ICs because these forms are issued to any business that accepts credit cards as payment for goods or services, an issue which underscores the importance of using additional information on recipients to define ICs.

### 3.2.2 Moving from 1099 Recipients to Independent Contractors

Figure 3.1 presents an initial characterization of the 1099 economy, displaying the time series of the universe of 1099 recipients by our broadest characterization based on matches with other tax return information. The bold lines represent 1099-MISC recipients and the dashed line represents all 1099 recipients, including those that received a 1099-MISC and/or a 1099-K. The difference between the solid and dashed line represents those who receive a 1099-K but no 1099-MISC. The top line in black represents the universe of 1099 recipients. The number of 1099-MISC recipients increased from approximately 18 to 26 million from 2001 to 2016. When including 1099-Ks, there are over 30 million recipients in 2016. The second line in blue shows all individual 1099 recipients over time, where individuals are defined as either 1099 recipients with an SSN or recipients with an EIN that can be matched directly to an EIN reported on the Form 1040 Schedule C. Therefore, the difference between the black series and the blue series represents non-sole proprietorship businesses that are 1099 recipients. This difference shows that many 1099 recipients are businesses other than sole proprietorships; we analyze this group further in Figure 3.2. Additionally, we see that there are almost 5 million recipients receiving a 1099-K but no 1099-MISC as of 2016, about half of which are non-sole-proprietor businesses.

\(^6\)(TIN) is a social security number (SSN) or an employer identification number (EIN). Our main analysis distinguishes between two groups: individuals (or SSN recipients) and Schedule C EIN recipients versus non-sole proprietorship EIN recipients.

\(^7\)Although these are the legal threshold requirement to issue a Form 1099-K, many firms issue the forms to recipients with fewer transactions or lower dollar values.

\(^{121}\)An example of an independent contractor that would receive all or most of their income on Form 1099-K as opposed to 1099-MISC would be a ride share driver who receives their payments directly from customers using credit cards/electronic payments as mediated through the ride share app.
Because 1099-Ks may be issued to any individual or business receiving substantial credit card or electronic payments, we expect that many 1099-K recipients are businesses using these payment methods for transactions, which underscores the need to use additional information to distinguish between ICs and businesses.

Focusing on individual recipients, we see that the majority, but not all, can be matched with a Form 1040 tax return (approximately 86 percent in 2016), as represented by the red series in Figure 3.1. Those that cannot be matched with a 1040 may represent non-filers, potentially those with very low income or those that incorrectly provided taxpayer identification numbers (TINs). While the majority of individual filers can be matched to a Schedule C, as represented by the green series, a substantial proportion, about 30 percent, cannot be matched each year. Since 1099-MISC box 7 income should be reported on Schedule C, this implies that many tax filers may be incorrectly reporting their 1099-MISC income, or potentially are not reporting it at all, and that many are not claiming any Schedule C deductions for their contract labor.

Figure 3.1 shows that using either 1099 information reports or individual filed Schedule C’s alone to identify ICs would provide very different pictures of the size of the IC economy. We also see that the introduction of the 1099-K in 2011 produces a discontinuous jump in the number of 1099 recipients. The jump in 2011 diminishes when focusing on individual contractors and particularly those filing a Schedule C. Because of the large variation in the size of the potential IC pool when using these coarse measures, we use additional elements of the tax data to establish a sufficiently narrow and consistent concept that can be informative for economic analysis of a coherent group of workers as ICs.

Next, we use the information on the matched tax returns to classify 1099 recipients as likely ICs. We focus on two definitions of ICs. The first definition is more expansive and includes all 1099 recipients that are matched to a Schedule C and/or a Form 1040s, and 1099 recipients with an EIN that matched to an S-corporation tax return reporting one owner and no employees. The restrictions on the non-sole proprietorship business 1099 recipients are designed as the broadest way to identify incorporated ICs. The second definition uses the deductions claimed by the 1099 recipient as a way of differentiating between small businesses and ICs. In this definition, we only include individual 1099 recipients with fewer than $10,000 in Schedule C deductions, excluding car and travel related deductions, and non-sole proprietorship business 1099 recipients with fewer than $10,000 in total deductions reported on their business tax return. We exclude car and

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8We focus on S corporation owners because partnerships by definition have multiple owners. C corporations generally do not receive Form 1099-Miscs except in certain circumstances, and we cannot identify their owners in our data; however, they comprise a small fraction of Form 1099 recipients.

9Vehicle and travel expenses are separately reported on the Schedule C, but are not similarly on the Forms
travel deductions on the Schedule C because these are common deductions for ICs and are becoming even more relevant with the prevalence of contracting through online platforms. These restrictions are designed to remove businesses that have substantial capital investments in order to focus on ICs who are receiving income mainly from their labor services.\textsuperscript{10}

Figure 3.2 plots time series for these two definitions of ICs. The top two series in black and blue represent the broader definition of ICs, making no restrictions on deductions. The black line represents all independent contractors and the blue series shows the individual ICs, so that the difference between the two series represents S corporations that meet our broader definition of likely ICs. In Figure 3.1 we saw that many 1099 recipients were non-sole proprietorship businesses, approximately 5 million in 2016. Figure 3.2 shows that most of these business 1099 recipients are likely not ICs. A small proportion, under a million each year, of the non-sole proprietorship business 1099 recipients fit the profile of a potential IC – having one owner and no employees.

The second set of series, in red and green, use the stricter definition of IC applying the deduction restrictions. The qualitative trend over time is similar to the broad definition, and the majority, about three quarters, of the broadly defined ICs have less than $10K in deductions. Additionally, these contractors constitute almost 75 percent of the total increase in individual 1099 recipients over this period.

Using this definition, even fewer non-sole proprietorship business 1099 recipients qualify as ICs, just over 100,000 in 2016. The large majority of ICs are non-incorporated individuals, and for this reason, going forward, we exclude non-sole-prop EIN recipients from our main analyses. We also observe a difference in how the inclusion of 1099-K recipients affects the series when using the deductions restriction. Incorporating the introduction of the 1099-K recipients in 2011 no longer creates a jump in the series of ICs. This signals that the deductions restriction is likely effective in purging the series of small businesses, allowing for a consistent definition of independent contract labor.

We find that restrictions based on the level of deductions play an important role in determining the number of ICs but have little effect on the qualitative time trend. Figure 3.3 shows the sensitivity of the IC classification to various restrictions on declared deductions for individual ICs. Moving from the least restrictive $10,000 deduction limit to the most restrictive $5,000 deduction limit reduces the number of ICs by about 3.5 million in 2016. We also see that car and travel expenses are important for independent contractors, so for

\textsuperscript{10}See Knittel et al. (2011) as a precedent for using deductions to differentiate small businesses from contractors and large businesses.
the remainder of the paper we exclude car and travel deductions from the total deductions restriction in our baseline analysis. Finally, we see that time trends are very similar regardless of the level of the deduction restriction so the trends analysis is not very sensitive to the level of the restriction around this range.

To further understand how the deduction restrictions relate to the IC labor concept, we analyze the number of distinct payers from which a contractor receives a 1099. We expect that individuals providing labor contract services, on average, contract with fewer firms than do businesses which may sell goods and services as broadly as possible. This distinction is more relevant for Form 1099-MISC recipients than Form 1099-K because a recipient could receive one 1099-K from one payment processor that represents payments from many customers. Table 3.1 disaggregates the different potential IC definitions by the number of distinct payers from which the individual receives a Form 1099. The top row shows the number of 1099 recipients for each definition in 2014. The subsequent rows display the shares of the total for each definition that fit the payer restrictions. Those with less than $10K or $5K in deductions have fewer 1099 payers than the broader definitions, and the profiles are very similar regardless of whether using the $10K or $5K restrictions. For these definitions, 99 percent of ICs have fewer than five distinct payers.

Our definitions of ICs are imperfect and will certainly include some 1099 recipients who are not ICs and exclude some ICs. Our definitions include recipients that match to a Form 1040 but have no Schedule C. For these individuals, we do not have information on the deductions or activities associated with the non-employee compensation so these individuals may not be ICs. However, we believe it is unlikely that these individuals have large deductions associated with the payments because they failed to file a Schedule C in order to claim those deductions. Additionally, 1099 information reports are sent directly to the IRS, creating a high risk of detection for a business owner with substantial business income who would avoid filing a Schedule C in order to evade taxes.

In our more restrictive definition, we use information from the Schedule C to exclude owners with large levels of deductions under the assumption that the deductions are associated with the business receiving the 1099. It is possible that the Schedule C does not perfectly reflect the activity of the individual receiving the 1099 for two reasons. First, the individual taxpayer may have multiple sole proprietorships in which case the Schedule C deductions may represent deductions from various contracting activities and not only the activity associated with the given 1099. In this case the deduction restriction is conservative in that we only count an individual as an IC if they have a less than $10,000 deductions in total. Second, prior to 2007, Schedule Cs did not have information on whether the sole proprietorship was associated with the primary or secondary filer for joint filers. In these
cases, the spouse of the 1099 recipient may have a sole proprietorship that we incorrectly associate with the 1099 recipient, through the Schedule C. Therefore, prior to 2007 we are only able to restrict on the total household Schedule C deductions. Again, this means that the restriction is conservative because there may be individual household member IC with less than $10,000 in deductions but whose household deductions are greater than $10,000, and these ICs will be excluded based on the deduction restriction. Finally, in our sample, there are a non-trivial percentage of 1099 forms that do not match to an individual or a business entity. These forms could represent instances where an individual is acting as an IC but provided an incorrect social security number or EIN and we would fail to include them in our definition.

We highlight the importance of carefully considering the combinations of information available in administrative tax records for analyzing the size, though less so the trends, in the IC workforce. We also want to emphasize that though the process is somewhat involved, and remains subject to potential misclassification, there are evident benefits to combining various sources of information in order to identify a coherent group of ICs. Using the 1099 as a frame for identifying ICs is useful because it allows us to link individuals to the businesses which contract them, but the group of all 1099 recipients is very broad and includes many business to business payments that would not typically be considered IC relationships. The Schedule C is useful for identifying individuals or small businesses with non-wage earnings, but the presence of non-wage earnings alone, as is used in some linked survey datasets to identify ICs, is insufficient for defining a coherent group of ICs because i) many small businesses will fall in this category which may supply goods or services quite distinct form IC labor, particularly for 1099-K recipients, and ii) we observe that many individual 1099 recipients cannot be linked to a Schedule C even if they can be linked to a 1040, perhaps because they file their tax returns improperly. We also highlight the importance of excluding businesses from the group of potential ICs using claimed business deductions to distinguish ICs from self-employed individuals more generally, refining previous work using all Schedule C or Schedule SE filers (e.g. Abraham et al. 2018). We present evidence that focusing on individuals that can be matched to Form 1040s and report less than $10K in deductions appears to be effective in identifying IC workers. When using the deductions restriction, the inclusion of Form 1099-K recipients does not create a break in the trend of ICs, implying that the large share of businesses receiving 1099-Ks are successfully purged from the sample. Additionally, the 1099 recipients with low deductions contract with relatively few payers, unlike businesses which may sell goods and services to a broad market.

For the remainder of the paper, our primary definition of ICs are individual 1099 recip-
ients reporting less than $10K in deductions, excluding car and travel expenses, and with no employees. We will occasionally compare our primary definition with the broader definition of individual 1099 recipients with no deductions restriction in order to highlight the differences or similarities between these concepts. Additionally, we will generally group together 1099-MISC and 1099-K recipients under these definitions.

3.3 Who are the Independent Contractors and How Have They Changed?

In this subsection we use information from the tax returns and information reports of ICs to analyze the long-run trends in IC labor in the U.S. economy from 2001 to 2015. Unless otherwise stated, we use our preferred definition of ICs, individual 1099 recipients with no employees and less than $10K in Schedule C deductions, excluding car and travel deductions. Additionally we examine the characteristics of ICs and how they have changed over time relative to W-2 employees.

3.3.1 Long-run Trends for Independent Contractors in the U.S. Economy

The time series in Figures 3.1-3.3 display a steady increase in the number of ICs in the U.S. from 2001-2016. To put these trends in context, we compare the trends in IC labor to trends in traditional W-2 employment over the same period. To do so, we randomly sample a repeated cross section of 0.2 percent of all W-2 recipients in each year from 2001 to 2015. In Figure 3.4 we present the trends in total workers, inclusive of ICs; the corresponding numbers are presented in Table 3.2. Panel A of Figure 3.4 shows three series: the top series in black shows the total workforce defined as those with W-2 and/or IC income in that year. The next series, in red, shows all workers with some W-2 earnings, and the third series in blue shows those with W-2 earnings only. Therefore, the difference between the top and middle series represents those with IC earnings only and the difference between the middle and bottom series represents those with both W-2 and IC income.

Panel A shows that W-2 employment represents the dominant share of the labor force, but a significant share of the workforce has some IC income, about 11 percent in 2015. Also, a non-trivial share of the workforce receives IC earnings but no W-2 employment earnings, representing approximately 5 percent of the workforce in 2015. The trends presented in Panel A are dominated by the trends in W-2 employment, so Panel B normalizes the series by the 2001 levels to highlight the relative trends in three groups of interest. IC labor has grown substantially faster than W-2 labor since 2001, becoming an increasing share of the workforce. The number of ICs with no W-2 earnings has grown by 30 percent
while the number of workers with both IC and W-2 earnings has grown by 22 percent since 2001. The share of the workforce with some IC earnings has increased by 16 percent over this period, while the share of the workforce with only a W-2 has decreased by approximately 1.5 percent.

Additionally, Panel B displays divergent trends in the years after the Great Recession. While the number of W-2 employees shrank, the number of workers with IC earnings continued to grow almost uninterrupted. The number of workers with both W-2 and IC earnings decreased as a function of the job losses, but began to recover at a faster rate than W-2 only workers. The number of workers with only IC earnings grew steadily throughout the recession either because these relationships were not lost or as those who once had W-2 earnings transitioned to only receiving IC income. This figure shows that there are large and rapidly increasing numbers of ICs, both using IC labor as a primary income source and in conjunction with traditional W-2 employment. One implication of this is that individuals use IC labor in different ways, a finding we investigate in some detail in throughout the remainder of the paper.

Using our preferred definition, we find that ICs have increased as a share of the workforce by 1.4 percentage points between 2001 and 2015 (Figure 3.4, Panel C and Table 3.2). The majority of the increase occurred prior to 2011. Individuals who are primarily ICs represent 65 percent of the growth in the IC workforce. These results are similar in magnitude to those reported in Collins et al. (2019) who find a 1.9 percentage point increase in the “1099 workforce”; however, they find that half of that increase occurred after 2013. One possible explanation for the different trends is our restriction on deductions, which removed many Form 1099-K recipients. Outside of the platform economy, most ICs will not receive Form 1099-Ks for their services (Abraham et al. (2018)) so we are not concerned that our method removes many of the individual recipients of the Form 1099-Ks. The BLS CWS finds an increase of independent contractors of around 0.9 percentage points (from 6.1 percent to 7 percent) between 2001 and 2005. Our preferred definition shows that ICs make up 6.6 percent of the workforce in 2001 and 7.0 percent in 2005. The levels are relatively similar to those found in the BLS survey, but we see growth between 2005 and 2015 that the contingent worker survey does not. As discussed by Abraham et al. (2018), there has been an increasing divergence between administrative and survey data in measuring self-employment, which might help explain why we find increases in ICs between 2005 and 2015 while the CWS does not.
3.3.2 Characteristics of Independent Contractors

3.3.2.1 Income and Income Dependency

Figure 3.4 showed that there are large numbers of ICs who do and do not have traditional W-2 employment relationships. To further investigate the variation in these labor relationships, we categorize ICs by the share of total labor earnings that they receive from Form 1099 income. We define IC income as a share of labor income as \( \frac{\text{total 1099 earnings}}{\text{total 1099 earnings} + \text{W-2 earnings}} \), and compare ICs with greater than 75 percent of labor income from 1099s, those with 50-75 percent, those with 25-50 percent, and those with less than 25 percent from 1099s. We also investigate total 1099 income as a share of adjusted gross income (AGI). Panel A of Figure 3.5 shows the number of ICs by shares of labor income for our preferred IC definition. We see that almost the same number of IC have greater than 75 percent and less than 25 percent of labor earnings from 1099s. Much fewer ICs have contractor earnings between 25 and 75 percent. There are broadly two types of ICs of approximately equal size, those for which IC earnings are the primary income source and those for which IC earnings are supplemental. Panel B shows the relative growth rates for each category. The number of ICs in each category has grown rapidly since 2001, with the largest growth among those with predominantly IC earnings, in part because of the larger relative growth among this group through the recession.

Panels C and D of Figure 3.5 repeat the exercise but with IC earnings as a share of AGI. Perhaps unsurprisingly those with 1099 earnings comprising less than 25 percent of AGI are the largest group, but perhaps more surprisingly, there are more ICs with earnings greater than a 75 percent share of AGI than those with earnings between 25 and 75 percent. This again underscores the divide between supplemental income earnings IC and primary earners, though somewhat differently. AGI is a household concept, so the divergence between the equal shares with high and low labor income seen in Panel A, and the dominant amount of those with low AGI shares seen in Panel C may be attributable to ICs being secondary earners in a household, something we investigate further in Section 3.6. Together, these results suggest that the types of IC labor and IC laborers may be quite diverse. It may be particularly valuable to distinguish between types of contractors as the welfare implications associated with the growth of this sector may be very different for different types of labor relationships.

\[11\] 1099 income and W-2 income are not, in general, directly comparable income concepts. 1099 income represents gross income paid to a contractor while W-2 income is net earnings. Because our primary definition of independent contractors only included those with less than $10K in deductions, this distinction makes very little difference for our results. We have reproduced the results using a conservative net income concept, 1099 income minus total Schedule C deductions, and the results are almost identical.
Characteristics of Independent Contractors Relative to W-2 Employees

Table 3.3 and Figure 3.6 show characteristics of ICs and compare them to characteristics from a random sample of W-2 employees. Figure 3.6 shows trends in the shares of ICs and employees who are women, that claim dependents (“kids”) and that receive the earned income tax credit (EITC). The share of contractors with kids is higher than the share of employees with kids and both trends decline slightly over time. The share of ICs receiving the EITC is about 6 percentage points higher than the share of employees. The share of all workers receiving the EITC increased during the Great Recession, but more so for ICs. The difference in the trends for women is noticeable. While the share of female employees has been constant over the last 15 years, at about 49 percent, the trend in the share of female ICs has been steadily increasing over this time, from 39 to 46 percent. The large relative growth rate of female contractors compared to female employees or male contractors is striking, and we will investigate this trend in greater detail in Section 3.6.

Table 3.3 provides summary statistics for ICs and W-2 employees for two years, 2001 and 2015. We see that the mean AGI and taxable income are higher for ICs than employees in 2001 and 2015, but that the medians are lower. Further, the median AGI of ICs has fallen by over $4,500 in real terms between 2001 and 2015, and median taxable income has fallen as well. Mean 1099-MISC income has increased for ICs, but the median has decreased between 2001 and 2015 suggesting an increase in inequality among ICs. The mean wage and salary earnings (including zeros) for ICs were almost as high as for employees in 2001, but the median was much lower. In 2015, the wage earnings of ICs falls in real terms and relative to employees, commensurate with the increasing share of ICs with only, or large shares of, IC income over the period.

Next we investigate regional and sectoral variation in the growth of ICs. We compare the variation in growth in ICs across states to the growth of W-2 employment to understand whether the growth of the IC sector is a function of general state-level growth or something distinct. Figure 3.7 shows the percent change in the number of ICs (in blue) and W-2 employees (in red) between 2001 and 2015 for each state. The horizontal blue dashed line represents the average growth rate in ICs across states; the red dashed line represents the average growth rate in employees across states. We find that the increase in ICs varies greatly over states, from negative growth to almost a 60 percent increase. Second, the growth of ICs has been larger than the growth of employees for almost all states. Third, though correlated, the states with the largest IC growth are not necessarily the states

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12 Taxable income and AGI are household measures, so these statistics do not necessarily represent the income of individual ICs and employees, but their households, including spousal income.

13 Appendix Figure C.1. shows the corresponding levels for contractors in 2001 and 2015.
with the largest employment growth. There are many states where IC growth is well above average but employee growth is below average (eg. Kansas, California, Maryland, Georgia, New York, Oklahoma, Wisconsin, New Mexico and New Jersey). Similarly, there are many states that had negative employment growth but increases in IC labor. This pattern is somewhat consistent with better economic conditions leading to lower levels of contracting as argued in Katz and Krueger (2019). In general state-level growth in ICs does not simply follow employment growth in a state.

Turning to across industry variation, Figure 3.8 displays the number of contractors in each major industry, defined by 2-digit NAICS codes, for 2001 and 2015.¹⁴ The largest industry for ICs is professional, scientific and technical services in 2001 and 2015. The “other services” and health care industries are also large IC hiring industries and have grown substantially between 2001 and 2015, as have the administrative, support and waste management industry, arts, entertainment and recreation industry and educational services industry. Other industries such as finance and insurance, information, construction, and manufacturing hire many ICs, but the number of ICs within these industries has not grown substantially.¹⁵ It would be useful to analyze occupations in addition to industry, for example, to know whether the ICs in the professional, scientific and technical services are the scientists or administrative assistants. Unfortunately occupation information is not available in the data we use for these analyses, so the survey data discussed in Section 3.1 are a better source for analyzing occupational changes among contractors.

Figures 3.5 and 3.6 imply that some workers rely more heavily than other on IC income. In Figure 3.9 and Table 3.4 we investigate these differences further. Figure 3.9 shows the number of ICs in each quartile of the annual income distribution, as measured by AGI. First, we see that the largest group of contractors is those in the top quartile of the income distribution. We also see that a large number of ICs are in the bottom quarter of the income distribution. The number of contractors in each quartile of the income distribution is growing, but the number of ICs in the bottom of the income distribution is growing relatively faster.

Panel B of Figure 3.9 shows the percent growth in the number of ICs in each AGI quartile for our primary definition, for a broad definition which includes all individual 1099 recipients who file a Form 1040, and for the subset of the primary definition ICs who receive the majority of their labor income as IC earnings. The first set of bars represents our primary definition of ICs, corresponding to the group shown in Panel A. We see larger

¹⁴We were only able to match 75 percent of independent contractors to valid industry codes of the employing firms, so the sum of IC across industries does not equal the total number of IC in the population.

¹⁵Appendix Figure C.2. shows the percent change in IC from 2001 to 2015 by industry.
growth in the number of contractors in the bottom half of the income distribution relative to the top half, showing that a growing share of the contractor workforce are relatively low income households. The second set of bars replicates the exercise for the broader definition of individual ICs, removing the deductions restriction. We see the same pattern of faster relative growth that the bottom of the AGI distribution providing evidence that our deductions restriction is not introducing differential selection that eliminates high AGI ICs. The third set of bars focuses on a subset of our primary definition ICs, those with primarily IC labor income. Among this group the trends are somewhat different. The largest growth is still at the bottom of the income distribution, but there is also large growth at the top. As we show in Table 3.4, this is likely attributable to many secondary earners in a household using IC labor as their primary income source. Finally, the last set of bars shows the growth rates for W-2 employees, which for every AGI category saw only a small fraction of the growth shown in ICs.

Table 3.4 presents select summary statistics presented by the ICs’ positions in the AGI distribution in 2015. Starting with the first set of columns which present statistics for our primary IC definition, we note that the median 1099 earnings is very similar across quartiles of the AGI distribution. The difference is in the share of AGI or taxable income represented by 1099 earnings. For those in the bottom of the income distribution, IC earnings constitute a large portion of annual income, but for those at the top it is a very small portion. While retired workers and teenagers may play some role in this - the average age is 10 years older at the top relative to the bottom of the income distribution - this is not the whole story as the average age of ICs in the lowest quartile is 40 years. We also see that those in the bottom quartile are less likely to be claiming dependents and much less likely to be married. The marriage result is partly mechanical because AGI is a household concept so joint filers with two earners will be more likely to be higher in the income distribution. But, this also highlights that ICs at the bottom of the income distribution are more likely to be using IC earnings as their primary income source while for ICs at the top of the income distribution the IC earnings are more likely to be secondary – either supplemental income earned by the primary earner or primary earnings for a secondary earner.

The next set of columns, providing statistics separately for those who receive the majority of their labor income from 1099s, shows the distinction even more sharply. These workers are more likely to be in the bottom half of the income distribution, and in the bottom half of the income distribution almost all of household income comes from 1099 income. Again, on average these are prime age workers and a large share are married. In contrast, at the top of the income distribution the 1099 earnings are not substantially
higher than at the bottom, but they represent a very small share of household income. Therefore, for these households, many ICs are clearly secondary household earners whose form of labor is IC labor. This interpretation corresponds with the 93 percent of these households being married, and we see the highest share of women in this category, though we note that a large share of men are in this category as well. Taken together, these statistics highlight that different individuals and different households use IC labor very differently. All of these groups are growing quickly, but failing to account for this variation, and conflating the welfare implications of this growth across groups, will likely provide an incomplete understanding of the aggregate trends.

3.4 Firm use of Independent Contractors

In the previous sections, we focused on the individual characteristics of independent contractors and how the population of contractors has evolved over time. In this section, we analyze how firms use ICs and how the use of IC labor has changed over time.

3.4.1 Construction of the Firm-Level Dataset

The analysis sample, a repeated cross-section, is constructed by drawing a 2 percent random sample from the universe of employer identification numbers (EINs) that issue at least one Form W-2, separately during each tax year from 2000-2015. Firms are identified by their TINs, as they appear on Form W-2 (for employees) or Form 1099-MISC or Form 1099-K (for independent contractors). Linked to each sampled EIN are all employees who receive a W-2 from that EIN in the sample year and all workers issued a 1099-MISC or 1099-K in that year. The ideal unit of analysis for our paper is the level at which labor demand decisions are being made within a firm. Unfortunately, we are not able to easily construct a firm level concept using the tax data so our analysis will be at the EIN level. For convenience, we will use the term firm throughout the paper, but an important caveat to our analysis is that firms can have multiple EINs. In practice, an EIN is likely to be associated with some boundary within the firm. For example, if one EIN is used for payroll and another for general operations our analysis would be unaffected. However, if one EIN is used to pay contractors and another to pay employees, our analysis would fail to pick up on the substitution between the two types of employment at that firm.

16This restriction is partly for convenience: all firms with at least one employee is in the cleaned SOI Databank, which is already linked to W-2 workers. Additionally, this definition mirrors the definition of an employing firm that would be identified in other datasets and that has analyzed in previous literature.
The sample contains approximately 130,000 EINs per tax year. We measure firm size as the number of employees issued a Form W-2. The size distribution of firms follows a power law distribution, with very few large firms in the population. As a result, within each tax year, the sample contains approximately 3,000 EINs with over 100 employees, or 2 percent of EINs.

3.4.2 Cross-Sectional Time Trends

We define two broad measures of IC usage by firms. We define extensive margin IC usage using an indicator for whether a firm hired at least one IC in a given tax year. It is likely that hiring at least one worker as an IC represents a significant fixed cost to the firm relative to the marginal cost of hiring an additional IC, as IC contracting is governed by different tax and labor regulations that require some consultation, or at least active decision by the firm. Extensive margin usage provides information on the prevalence of IC labor usage.

We define intensive margin usage as a continuous ratio which captures the firm’s comparative reliance on ICs relative to employees in a given tax year. We define the “Worker Ratio” as the ratio of ICs to the total number of workers (ICs and employees). The “Compensation Ratio” is calculated as the ratio of IC compensation (from Form 1099-MISCs and Form 1099-K) to aggregate worker compensation (the sum of compensation to ICs and employees). While conceptually similar, the “Worker Ratio” is informative about the composition of a firm’s workforce, while the “Compensation Ratio” can be interpreted as the relative allocation of a firm’s labor expenses.

3.4.2.1 Extensive Margin Usage of Independent Contractors

Extensive margin usage increased for nearly every type of firm, but subtle differences in trends and levels merit discussion. Figure 3.10, Panel A plots extensive margin IC usage for two categories of ICs, those fitting our primary definition and for a broad definition which includes all individual 1099 recipients that can be matched with a Form 1040. The trends presented in this figure yields two insights. First, the trend in IC usage using the broad definition tracks the trend in our preferred IC definition closely, suggesting that the overall observed increase in extensive use is driven by hiring of ICs providing labor services, rather than an increase in contracting relationships with other firms. Second, with our preferred

The compensation from the Form 1099s is a gross concept while the W-2 wages are more of a net concept; however, this distinction is much less important for our preferred IC definition because those individuals have low levels of deductions by construction.
definition, we find that there has been a large increase in the fraction of firms with at least one IC; the fraction has increased by 4.1 percentage points, or by 20 percent, from 2001 to 2015. The overall fraction of firms using contractors peaked in 2012 and has been relatively steady since then.

Figure 3.11, Panel A shows the change in firms’ extensive margin IC usage by quartiles of the firm’s median wage using our preferred IC definition.\textsuperscript{18} Extensive margin IC usage rose consistently from 2001 to 2012 for firms in all quartiles. By 2015, extensive margin IC usage rose by almost 20 percent for firms in the top three wage quartiles, and by almost 30 percent for firms with lowest median wages, relative to 2001 levels. Figure 3.12, Panel A shows that the increase in extensive margin IC usage was also shared across firms of different sizes, though relative growth was highest in small firms with four or fewer employees. Extensive margin use is higher throughout the series for large firms, i.e. firms with more than one hundred employees. Appendix Figure C.3, Panel A plots extensive use by industry. Most industries exhibit a modest upward trend, excepting manufacturing services, which increases sharply after 2010.\textsuperscript{19}

### 3.4.2.2 Intensive Margin Usage of Independent Contractors

Figure 3.10, Panel B plots the average worker ratio, defined as the number of ICs divided by the number of workers (ICs plus employees). As with the extensive margin, it appears that the increase in the share of contractors per firm is most pronounced when contractors are defined using our preferred definition, ICs likely to be supplying labor services. In contrast, for our preferred definition, the average compensation-ratio, defined as total 1099 compensation issued by the firm to ICs divided by total worker compensation (IC 1099 compensation plus employee wage and salary compensation), is flat over this period (Figure 3.10 Panel C). This trend is notable given that Form 1099 compensation is a gross of business expense deductions so might be expected to grow faster than the worker-ratio. The results imply that ICs are lower paid than employees either because they work fewer hours or because they have a lower hourly compensation rate.

The comparatively rapid growth in extensive margin IC usage by small and low wage firms resonates with the trends in intensive margin use. While larger and higher wage firms have higher levels of IC use, smaller and lower wage firms grew rapidly in the intensity with which they used ICs. Figures 3.11 and 3.12, Panels B and C show analogous results are assigned to quartiles based on their median employee compensation within the tax year. Similar results obtain when assigning firms to quartiles based on their average, 25th percentile, 75th percentile, or 90th percentile employee compensation.

\textsuperscript{18}Data limitations caution against inferring too much here. NAICS codes are missing for approximately one-third of the firm-level sample, particularly among smaller firms, which are growing quickly in IC use.
information but for intensive margin usage. Although higher-paying firms use contractors more intensively throughout the series, low wage firm intensive margin use, as measured by worker ratio, grew more rapidly. For firms with median wages in the highest quartile, the worker-ratio grew by approximately 15 percent from 2001 to 2015 compared to firms in the lowest quartile, which grew by 22 percent. The compensation ratio, in contrast, grew only 1 percent and 3.4 percent for high and low wage firms respectively. This could be consistent with several scenarios: firms could be hiring a larger number of IC but using each contractor to perform less work; firms could be shifting employees from part-time or part year to full time; or firms could be increasing hiring of relatively low skilled IC. Likewise, small firms with fewer than twenty employees saw their intensive IC usage (worker-ratio) grow by over 10 percent, on average, between 2001 and 2015, about twice as fast as medium firms (20-100 employees) and a third faster than very large firms (more than 100 employees). The share of labor compensation fell slightly for all but the smallest firms (i.e. those with fewer than 4 employees.) Overall, the worker ratio was upward trending for most industries, but more noticeably so for service sectors (Appendix Figure C.3, Panel B).

In short, virtually all types of firms were more likely to use ICs, and to use more of them, in 2015 relative to 2001. However, while high wage and large firms use more ICs on both the intensive and extensive margin throughout the series, the increase for these firms was small during this period relative to the growth in small and low wage firms. This differential in growth is particularly pronounced on the extensive margin, where IC use among firms in the bottom median wage quartile grew at nearly twice the rate as those in the top quartile, and firms with fewer than 4 employees increased 32 percent relative to an approximately 12 percent increase among firms with more than 100 employees.

3.5 Transitions between Independent Contractor and Employee Status

3.5.1 Within-Firm Switching

In this section, we provide information on the prevalence of workers changing the nature of their employment relationship with the same firm and on the worker classification of new hires. To do so, we begin with the sample of firms described in Section 3.4.1. For each individual issued a W-2, Form 1099-MISC, or Form 1099-K by one of the firms in our sample in the sample year, we construct a panel of their Form 1040 and Schedule C filings as well as their W-2, 1099-MISC, and 1099-K information returns. For this analysis
we focus only on income received from the firms in our sample to identify workers who have changed their method of compensation within the same firm over time. We limit our sample to individuals who file a Form 1040. For each year of the data, the individual is characterized as an IC, a wage and salary employee or to have no relationship with the firm. If individuals receive both a W-2 and a Form 1099 in the same tax year, we generally characterize them as employees because there are reasons a firm may also issue a Form 1099 to their workers.\textsuperscript{20} We consider individuals who receive no information returns or receive only a Form 1099-MISC or Form 1099-K and fail to meet our IC definition as not working at that firm in that year.\textsuperscript{21}

We define transitions between employment types as movements between wage and salary employee status and IC status in consecutive years. Because our data are annual, we allow for one year in between these transitions when the individual is characterized as both. For example, if a person was an IC for a firm and became an employee in July, he or she would receive both wage and non-employee compensation from the firm that year even if the employment types did not overlap in time. There are other reasons that individuals may receive both types of compensation so we do not consider the mere receipt of both types of income within a year as signifying a change in employment type.

### 3.5.1.1 Main Results

We begin by discussing the trends in worker transitions between employment types. The first part of our analysis focuses on movements between wage and employee status and IC status for the same individual at the same firm. The second portion of our analysis focuses on the worker classification of new workers.

Our sample is a representative repeated cross-section so we show statistics on transitions for workers in the year that the firm was sampled. Figure 3.13 shows the fraction of firms in our sample with any workers making a transition between the two employment types over time. Our main results focus on two definitions of contractors: all individuals receiving a Form 1099 who also file a Form 1040 (represented by dotted lines), and our preferred IC definition, individual 1099 recipients with no Schedule C or Schedule C deductions less than $10,000 excluding vehicle and travel expenses (represented by solid lines). In Panel A, the black series represents individuals switching from ICs to employees within the same firm and the blue series those switching from employees to ICs.

\textsuperscript{20}As described below, we do consider the first year of a transition to being a contractor as occurring in a year when the individual received both a W-2 and a Form 1099 if the individual received only a Form 1099 in the following year.

\textsuperscript{21}This restriction is consistent with our focus on individuals providing labor services to a firm and on ICs that are close substitutes for employees.
We see that the fraction of firms with any workers moving from employees to contractors is similar to the fraction that have workers moving from contractors to employees. The trends look similar across the two definitions of ICs; however, the levels are different. Using the less restrictive definition of ICs, we see that 2.6 percent of firms have at least one worker moving from contractor to employee status in 2016 while using our preferred definition that figure is 2.3 percent. Interestingly the two types of transitions seem to be negatively correlated. The post-Great Recession years see an increase in the fraction of firms with contractors becoming employees and a slight decline in the fraction of firms with employees becoming contractors. Using our preferred IC definition, prior to 2008 the fraction of firms with the two types of worker switching was similar, but after 2009 a greater fraction of firms have contractors moving to become employees. Panel B shows that only 0.3 percent of firms have both types of switching occurring in a year implying that the majority of firms with workers who switch classifications are either moving employees to contractors or contractors to employees, but not both. Again the prevalence of switching depends on the definition of an IC. Under our broader definition, around 4.6 percent of firms have a worker switching categories in 2016, but if we use our preferred definition that fraction decreases to around 4 percent.

Figure 3.14 shows the average across firms of the proportion of workers switching employment status to show the intensive margin of switching behavior. We see that the fraction of workers switching from contractor status to employee status is much larger than the fraction switching from employee to contractor status although both fractions are small. Over time the average firm has seen the fraction of workers moving from contractor to employee status rise from 0.26 percent to 0.38 percent using our preferred IC definition. The average fraction of workers moving from employee to IC has remained around 0.2 percent of workers over our entire sample period.

Taken together Figures 3.13 and 3.14 do not suggest that there has been an increase in employees being reclassified as ICs by their employers. If anything, there appears to be an increase in ICs becoming employees. It is possible that firms hire ICs as a low risk way to gain information about a worker, and then they convert the best contractors into employees with all of the benefits and legal protections afforded to W-2 employees. Future work on how independent contracting fits into the career paths of workers could shed light on how this practice affects workers earnings trajectories.

Our individual and firm level analyses suggest that independent contracting is becoming more prevalent over time. One potential mechanism for this rise could be that firms are converting existing employees to ICs. Figures 3.13 and 3.14 do not provide support for this argument. Another mechanism could be that firms are hiring more ICs as new hires,
which could contribute to the rise in the average fraction of workers being converted from contractors to employees in Figure 3.14.

In Figure 3.15 we focus on the classification of new workers only. New employees are individuals who receive a W-2 in the year that the firm was sampled, \( t \), but did not receive a Form 1099-MISC, Form 1099-K, nor W-2 in the prior year from that firm, \( t - 1 \). Similarly new contractors are individuals who meet our preferred contractor definition in year \( t \) and did not receive a Form 1099-MISC, Form 1099-K, nor W-2 from that firm in year \( t - 1 \). Panel A shows the fraction of firms with any new employees or ICs in each year. Between 55 percent and 65 percent of firms hire a new employee each year. The fraction fell sharply during the Great Recession and has increased since, but not to its pre-recession value. By 2016, 57 percent of firms hired a new employee that year, down 6 percentage points from the 2001 levels. The fraction of firms hiring a new independent contractor has risen between 2001 and 2016, with a particularly strong rise in the post-recession years. Using our preferred definition of independent contractors we find that in 2016, 18 percent of firms hired a new IC, down from 19 percent in 2011 but an increase of around 1 percentage point from pre-2008 levels. In Panel B, we show the average fraction of total workers who are new employees or new ICs. The patterns mirror those in Panel A. The average fraction of new employees has fallen from around 31 percent to 26 percent between 2001 and 2016, with a sharp decline in 2009. The average fraction of new ICs, using our preferred definition, has been relatively constant at around 4 percent.

Overall, we find limited evidence that employers are changing their existing employment relationships to convert employees to ICs. We do find evidence that firms are more likely to hire new workers as ICs rather than employees. We also find increases in the fraction of workers being converted from an IC to an employee, implying it may be becoming relatively more common for individuals to start working as a contractor, eventually moving to employee status. An alternative explanation is that individuals are moving between firms as independent contractors and becoming overall less likely to enter formal employer-employee relationships. Further work to distinguish between these explanations would provide information to help understand the importance of addressing concerns about the lack of social safety net programs for ICs.

### 3.5.1.2 Results by Firm Size and Industry

Next we provide evidence on employee and IC switching prevalence by firm size and industry. Additional information on the characteristics of firms using ICs and any changes in these characteristics may help identify areas with misclassified workers. It may also help target future policies that aim to provide additional protections for contract workers.
Our results show large differences across firm size in the prevalence of workers switching statuses within firm, and in the new hires of employees and ICs. We divide firms into size categories based on their number of W-2 employees. This size measure has the benefit of not changing across different potential definitions of independent contractors, and it more closely matches the definition of firm size that can be developed using other data sources such as unemployment insurance records. In Figure 3.16 Panel A, we see that the fraction of firms with any workers switching between employee and contractor from year to year rises strongly with the size of the firm. This is to be expected since larger firms have more workers and thus are more likely to have a worker switch. Panel B shows that changes over time to the fraction of firms with a worker switching from employee to contractor do not appear to differ systematically by the size of the firm. However, in Panel D we see that changes in the fraction of firms with a worker switching from contractor to employee is increasing the most for the smallest firms. While the smallest firms start at the lowest levels, in percentage terms they are rising much faster than larger firms.

Figure 3.17 shows that, as would be expected, larger firms are more likely to make a new hire of an IC or an employee than smaller firms. When we examine changes to these levels over time in Panels B and D, we see that firms have increased their hiring of new contractors across the board, but that small firms have increased it the most. Across firm size, almost all groups are less likely over time to hire a new employee, but we see the sharpest drop among the smallest firms. Taken together these results suggest that the changes in overall trends that we discussed in Section 3.5.1.1 are driven by small firms. These firms are hiring fewer employees and more contractors and some of these contractors are becoming employees in the future. These findings are consistent with those discussed in Section 3.4 showing that small firms are increasing their hiring of ICs the most over our sample period.

Previous studies have shown that the level of worker misclassification varies across industries. Likewise the prevalence of self-employment, some of which represents independent contracting, also varies across industry (Pew (2015)). We match the firms in our sample to information about the entity to categorize the firm into a two-digit NAICS sector. We are able to identify an industry for approximately 75 percent of our sample.\footnote{We keep the closest year match to the entity file with a limit of 10 years difference. The match rate generally increases over time from around 68 percent in 2001 to 79 percent in 2016.} Table 3.5 shows the fraction of firms with any workers switching statuses in 2015 and the fraction of firms making any new hires of each type of worker in 2015 by industry. Firms in the information and education sectors are the most likely to have workers switching statuses.
or to hire a new IC while firms in accommodations or food services are the least likely. This switching of worker classification could merely be the result of higher use of contractors in those industries, but it also may indicate higher levels of worker misclassification. Audits of firms to determine the prevalence of worker misclassification found that the information and education sectors had relatively high rates of misclassification while leisure and hospitality had some of the lowest rates (Carr and Wilson (2004)). While we find low rates of switching statuses within firm on aggregate, we observe substantial variation across industries, and the patterns correspond with variation in misclassification across industries.

3.5.2 Transitions into and out of Independent Contracting

In the previous sections, we found that ICs are an increasing share of the workforce and that more firms are hiring ICs over time. In this section, we explore individual transitions between IC and employment status each year and over time. To do so, we draw a 0.2 percent random sample of all taxpayers in each year $t$, and for each sampled taxpayer we link Form 1099s, W-2, Schedule C and Form 1040 information for years $t - 1$ to $t + 1$. We define a transition for a given individual by the status of that individual in year $t - 1$ and year $t$. In Figure 3.18 we show the number of individuals making transitions between employment status each year: “IC any to IC any” are those who had some IC labor income in year $t - 1$ and some IC labor income in year $t$; “W-2 to IC only” are those with W-2 income in year $t - 1$ and IC income but no W-2 income in year $t$; “IC only to IC only” are those with only IC labor income and no W-2 earnings in both years; “No” represents having no W-2 or IC income in a year.

Figure 3.18 shows that there has been a large increase in the number of people who have some IC income year over year, “IC any to IC any.” Approximately half of the increase in this group can be attributed to those that have only 1099 labor income from year to year, “IC only to IC only.” We also find that, following the Great Recession, there has been an increase in those transitioning from having no employment income to having IC earnings. The majority of the increase is among those who transition from having no earnings to having only IC earnings and no W-2 earnings, “No to IC only.” We find that there is growth in the number of workers continuing IC labor across years, and in the number moving from no labor earnings to IC labor. Together, a majority of the growth is among those transitioning into states where all labor income is from IC labor. The transitions observed, therefore, do not simply reflect increases in the number of people picking up supplemental labor income by way of IC income.

Table 3.6 presents summary statistics describing those that make transitions year to
year, for year $t = 2014$, and includes the within-firm switchers represented in this sample where within-firm switching is defined in the same way as in Section 3.5.1. Consistent with the findings in that section, there has been an increase in the number of individuals switching between IC to W-2 labor within their firm, up by 36 percent from 2002, while there has been a slight decrease (3 percent) in those switching from W-2 to IC workers within their firm.

### 3.6 Variation in Independent Contractor Labor Trends

#### 3.6.1 The Rapid Increase in Female Independent Contractors

In this section, we explore the worker side of growth in independent contracting by further detailing the characteristics of the groups that have seen the largest increases in independent contracting. In Figure 3.6, we documented a stark increase in the share of female ICs from 2001 to 2015, a period over which female employment has been essentially flat. This section focuses on historically important factors that determine female self-employment and labor supply more generally including the presence of children, eligibility of the EITC, marital status, and other household income to shed light on the potential mechanisms behind the increase in female ICs. We compare characteristics of female ICs over time to male ICs and female employees to understand the types of labor relationships that characterize this trend. As in our previous analyses, we find that the aggregate trend cannot be easily characterized by the rise of a single type of independent contractor.

We find that over 60 percent of the growth in independent contracting from 2001 to 2015 is attributable to the increase in female ICs, a period over which the share of female ICs increased from 39 percent to 46 percent. The difference in relative growth rates between men and women can be seen in Figure 3.19 Panel B, which shows the trends relative to the 2001 levels. There were fewer female ICs in 2001, but the growth was much faster for women, with a 70 percent increase, than for men, who saw 30 percent growth. The panel also shows the growth in W-2 employees for comparison, which was relatively flat over this time period. In Panels C and D, we show that the share of the female workers who are ICs increased from 5.3 percent to 7.5 percent from 2001 to 2015, while the IC share of the male workforce remained essentially constant over this period. Panel A shows that the absolute number of female ICs has been larger than that of men between 2001 and 2015 for any definition of IC labor although 90 percent of the increase in female ICs is coming from those women meeting our preferred definition (Figure 3.19 Panel A). This suggests that the rise in female Form 1099 recipients does not represent
an increase in female owned businesses but is driven by women providing contract labor services. Additionally we find that half of the increase in female ICs is among women who receive the majority of their labor income from IC earnings (Panel A and C). Though female ICs who earned the majority of their labor income from IC earnings were only 17 percent of the IC workforce in 2001, this group constituted over 30 percent of the total growth in ICs from 2001 to 2015.

Next, we examine the demographic characteristics of female ICs to those of male ICs and female employees in Figure 3.20. Male and female ICs are equally likely to be married; female ICs are slightly younger than male ICs on average, are more likely to have a dependent child and are slightly more likely to receive the EITC. We also see that most of the trends are relatively flat over time and track relatively evenly between men and women, providing no clear evidence of compositional changes among female ICs over time along these dimensions. Panel B compares female ICs to female employees. Female ICs are more likely to have children than employees, but this gap does not appear to be growing over time, implying that a desire for flexible work among mothers is not likely a major contributor to the rise in female ICs. Female ICs are older on average than employees. A study by the Bureau of Labor Statistics found that the share of women 55 and older participating in the labor force increased from 12.6 to 22.2 percent from 2000 to 2015 (Bureau of Labor Statistics (2017)). It could be that independent contracting provides a pre-retirement option for women and that the increasing share of women ICs is related to the increasing working age for women in the labor market in general. This trend could also be more broadly related to the finding that, on average, male and female IC are getting older over this period, as seen in Panel A. We also see that the fraction of female ICs receiving the EITC is growing faster than female employees. This is consistent with previous research finding that increasing EITC generosity increases self-employment (LaLumia (2009), Lim and Michelmore (2018)) and that the self-employed may have a greater ability to target their income to receive a higher EITC (Saez (2010), Chetty et al. (2013), Mortenson and Whitten (2018)). Further research is needed to understand the extent to which changes to EITC policies have contributed to the increase in female ICs over this time period.

Figure 3.21 shows male and female ICs are concentrated differently across industries and that the growth in ICs from 2001 to 2015 was differential across industries for men and women. Increases in the number of female ICs was broad and not concentrated in one industry, as shown by Panel A. The largest IC hiring industries for women in both 2001 and 2015 are professional, scientific and technical services and health care and social assistance. These industries both saw large absolute increases in the number of female ICs with those in health care almost doubling over this time period. There was also large
growth in service industries, retail trade, educational services and arts, entertainment and recreation. Panel B compares the changes in the number of female ICs in each industry between 2001 and 2015 to those of male ICs, displaying substantial variation. The growth in male ICs was much smaller in the health care industry, retail trade and educational services, but larger in construction, agriculture, transportation and warehousing and arts and entertainment. Generally, we find that female ICs are more prevalent in service industries than male ICs. The growth of service industries over this time period may be contributing to the relative growth in female ICs.

Next, we look at the household income of female ICs. Table 3.7 shows the characteristics of female independent contractors by AGI quartile in 2015, separately for all individuals who meet our preferred IC definition and for the subset of ICs who receive the majority of their labor income from IC earnings. Interestingly, there are similar median IC earnings throughout the distribution suggesting that women’s IC earnings generally do not make-up the majority of household income at the top of the AGI distribution. The overall level of IC earnings is low with a median of around $2,000. Other characteristics change much more across the AGI distribution including age, marital status, EITC receipt, and taxable income. We see that, on average, women in the top quartile are much more likely to be married and have children relative to the bottom quartile. In the bottom quartile, IC income is greater than W-2 earnings at the medians, and IC income is a large share of AGI. Though younger than at the top of the distribution, the median age is 40 years old, prime working age. The second set of columns presents statistics for those with primarily IC labor earnings (1099 income / 1099 + W-2 income) > 0.50. Approximately two-thirds of ICs in the bottom quartile are primarily IC earners, and IC earnings make-up essentially all of AGI for this group. Again median IC earnings is relatively constant across AGI quartiles, implying that women in high AGI households who receive most of their income from contracting are likely to be secondary earners. Indeed, 93 percent of these women are married. In general, we find that almost 50 percent of female ICs are primary IC earners.

The statistics suggest that individuals who are primarily IC earners are dominated by two types. The largest group consists of those near the bottom of the income distribution and for whom IC earnings are their primary household income source. The next largest group is those at the top of the income distribution for whom IC earnings are the primary individual income source, but are secondary household earnings. We show that the level increase in female ICs has been concentrated among these two groups, but in percentage terms the growth in females has been highest in the bottom half of the AGI distribution. Panel A of Figure 3.22 shows that the absolute increase in the number of female ICs is the same in the top and the bottom AGI quartiles. In contrast, for men the increase of those in
the bottom half of the distribution is uniformly greater than in the top half. The increases are larger for women than for men in each quartile. In percentage terms, the changes in the bottom half of the distribution are larger than in the top for both men and women, as they started from lower levels. The rise in female contracting at both ends of the household AGI distribution suggests multiple changes over this time period encouraging women to become ICs.

When we focus on the subset of ICs who receive a majority of their labor income from IC labor, \( \frac{1099 \text{ income}}{1099 + W-2 \text{ income}} > 0.50 \), we find that the growth in the bottom quartile of the distribution is larger than at the top for women, although there is also substantial growth in the top quartile. Also, we find that the largest percentage increase in female ICs is among those who receive a majority of their labor income from IC labor, across all quartiles. This underscores that the growth in female ICs is not only among those picking-up IC labor as a secondary income source. There has been larger growth among women using IC income as their primary income source, both at the bottom and the top of the income distribution, though more so at the bottom. Though much of the growth is among female ICs whose individual labor income is primarily from IC labor, it could be that these women are secondary earners and IC income is secondary household income.

### 3.6.2 Independent Contractor Growth for Primary and Secondary Earners

Now we explore the growth in IC participation among primary and secondary earners within a household. Figure 3.23 explores the dependency of individuals and households on IC earnings over time. The figure displays the time series for ICs by whether they are primary or secondary earners in their households, and by whether their primary labor income source is IC or W-2 income. ICs are split into four categories along these two dimensions. “Primary earners” are primary earners in their household defined as either non-married, or married and with labor income contributing more than half of household income. “Secondary earners” are married with labor income contributing less than half of household income. “IC primary” are individuals with more than half of their labor income as IC income, and “IC secondary” are IC with a majority of their labor income from W-2s.

The majority of ICs are primary earners for whom IC income is a secondary income source, at just over 40 percent in 2015 (Figure 3.23 Panel A). The second largest category is primary household earners for whom IC income is their primary labor income source comprising almost 30 percent of ICs in 2015. Secondary earners for whom IC income is their primary income source make-up 20 percent of ICs and secondary earners with secondary IC income make-up the remaining 10 percent. Panel B shows the relative growth in these categories since 2001. We find that the fastest growth has been among primary
earners with primarily IC earnings. The slowest growth has actually been among primary earners with IC as a secondary income source, though there has been fast growth amongst this group since 2013 perhaps attributable to the rise of the platform economy. These results suggest that the long-run growth in IC labor cannot simply be attributed to the rise of the platform economy providing new opportunities for individuals and households to pick-up supplementary income. For an increasing number of individuals, IC labor is their primary income source even though the median worker has relatively low IC earnings.

Next, we investigate differences in the four categories between men and women. Comparing the relative growth across groups, depicted in Panels D and F, reveals substantial variation. By far the largest growth has been among women who are primary earners and have primarily IC earnings who have increased by almost 50 percent since 2001. There has also been large growth among women with IC income as a secondary income source, for both primary and secondary earners in the household. Comparing Panels D and F, we see that the growth of ICs of each type for women has greatly outstripped that for men. The growth rates across the four categories has been roughly even for men.

Table 3.8 summarizes the contribution of each of the four groups to the total increase in the IC labor force over this period. The top panel shows the share of the total increase in IC labor for each group by gender. The two largest components are female primary earners for whom IC income is a secondary labor income source, contributing 22 percent, and female primary earners with primarily IC earnings, contributing 19 percent. These groups not only have the largest relative growth, but they also contributed the largest shares to the absolute growth over this period. The next largest contributors were men of these same types, at 15 percent and 13 percent respectively, followed closely by female secondary earners for whom IC earnings are the majority of labor earnings, contributing 12 percent. The large growth in female ICs cannot be explained by secondary earners in the household, who perhaps would not otherwise work, finding new options to enter the labor market as the platform and online economy has grown. While there has been large growth among female ICs that would fit this profile, it explains a relatively small portion of the trend.

Table 3.9 shows summary statistics for each of these groups, for all contractors and separately for women and men. The fastest growing group - primary household earners with IC income as their primary labor income source (shown in the second set of columns) – has substantially larger IC income than each of the other groups. The median IC earnings for this group is over $17,000 gross (or $11,000 net of Schedule C deductions), while for the largest group of ICs, primary earners whose IC income is a secondary income source (shown in the first set of columns), the median IC earnings is $2,500 gross (or $1,400
net of Schedule C deductions). At the same time, primary earners with primarily IC labor income are much more likely to be in the bottom quartile of the income distribution, with over 57 percent of this group in the bottom quartile and only 8 percent in the top quartile. In contrast, 32 percent of primary earners with supplemental IC labor earnings are in the top quartile of the income distribution, and only 18 percent are in the bottom quartile. Clearly, the IC labor relationship represents something very different for these large and growing groups of contractors.

Female ICs who are primary earners with primarily IC labor income, which has been the fastest growing group of ICs from 2001 to 2015 by far, are the most likely of any group to be in the bottom quartile of the AGI distribution, with 62 percent in the bottom quartile and only 6 percent in the top quartile. Another fast growing group, female ICs whose primary labor income comes from IC earnings but who are secondary earners in their household (shown in the third set of columns), are instead quite likely to be in the top of the income distribution, with 51 percent in the top quartile.

Taken together, we find that the largest share of ICs use contracting income as a supplementary individual labor income source, and that this group continues to grow particularly since 2012, which is consistent with previous work (e.g. Collins et al. (2019)). But we find that to characterize the long-run growth in IC labor in the U.S. as individuals seeking supplemental income, may miss a more structural shift in the labor market, particularly for women. Importantly, the fastest growth has occurred among those for whom IC income is their primary individual and household income source, and the absolute growth in IC labor is dominated by an increase in female ICs. The trend in female IC growth has pre-dated the rise of the platform economy. Our results suggest that policy concerns associated with the “1099 economy” are likely to be varied. The largest share of ICs receive the majority of their income from wage and salary employment and are in the top quartile of the income distribution, which mitigates concerns about a loss in labor protections and fringe benefits. On the other hand, the fastest growth in ICs has been among those who receive their primary earnings from contracting. For these individuals the loss in protections and benefits are more concerning, particularly since the majority of these individuals find themselves in the bottom quartile of the income distribution.

3.7 Conclusion

This paper uses administrative tax data to identify a group of workers as independent contractors—individuals who provide labor services to firms outside of an employment relationship—and to investigate trends in IC labor usage and characteristics of IC work-
ers over a fifteen year period, from 2001 to 2015. We begin by developing our preferred definition of ICs using individual tax returns and information reports. We focus on individual 1099-MISC or 1099-K recipients with less than $10,000 in Schedule C deductions, excluding deductions for vehicle and travel, who are not employers. We show that the deductions restriction is important for accurately establishing the size of the IC workforce, by helping to exclude small businesses which may supply goods or services to firms in transactions that are conceptually distinct from ICs. This restriction is particularly important for identifying ICs that receive Form 1099-K. Using our preferred definition, we corroborate previous studies using survey or administrative data sources, finding that the share of the workforce with some IC income grew substantially between 2001 and 2015, by 1.4 percentage points, or 20%. We find that much of this growth occurred prior to the rise of the major online platform businesses in the 2010s.

We find that the growth of the IC workforce is not associated with a single type of worker or labor relationship, implying that there are likely a number of contributing explanations for why individuals are increasingly working as ICs. Approximately equal shares of ICs make almost all of their labor earnings from contracting or have IC earnings as a small supplement to wage and salary employment. Both of these groups have been growing over time, but we find significantly faster growth among those who are primarily contractors, which suggests that the trend cannot merely be explained by individuals picking up side contracting jobs to supplement their main earnings.

Additionally, we find that women account for approximately 60 percent of the total increase in the number of ICs from 2001 to 2015, a period over which female employment has been relatively flat. We find that the largest group of ICs earn relatively small amounts of IC income as supplemental labor income, the majority of which are in the top half of the income distribution. Yet, the fastest growing type of ICs is those whose primary household income source is contractor earnings, over 50 percent of which are in the bottom quartile of the income distribution. These trends are particularly pronounced among female ICs.

Next we examine firms’ use of ICs and find a 4.1 percentage point, or 20 percent, increase in the fraction of firms hiring any ICs between 2001 and 2015. By 2015, ICs make up 18.6 percent of the workers at the average firm up from 15.9 percent in 2001. We find that virtually all types of firms were more likely to use ICs, and to use more of them. High wage and large firms with many employees use more ICs, but the increase in IC usage was fastest for small and low wage firms. We also find that over our sample period the fraction of firms hiring a new contractor grew by 2 percentage points while the fraction hiring a new employee has fallen by 7 percentage points. Again, these trends were strongest for the smallest firms.
To understand whether workers are being re-classified, we examine the extent to which workers switch employment types with the same firm each year. In 2015, we find that only 4 percent of firms have at least one worker changing statuses within the same firm. While the number of individuals switching status within firm are low, we find that firms in the information and educational services industries are the most likely to have workers switching statuses, corresponding with audit evidence suggesting that these industries have relatively high rates of worker misclassification (Carr and Wilson (2004)).

Together, these trends suggest that the long-run growth in IC labor in the U.S. cannot solely be attributed to individuals seeking supplemental income, or to the rise of a few online platform firms, but may represent a broad-based, structural shift in the labor market, particularly for women. We do not determine whether these trends are driven by an increase in demand for these types of workers or an increase in supply, but our findings suggest that the growth in contracting may be attributable to multiple factors, and that policy concerns associated with the “1099 economy” are also likely to be varied. Further research to disaggregate the supply and demand side factors and the implications for individual career paths and business trajectories associated with these trends will certainly be an important line of inquiry moving forward.
3.8 Figures

Figure 3.1: Form 1099-MISC and Form 1099-K recipients in the U.S.

Notes: The solid lines represent 1099-MISC, Box 7 income recipients and the dashed lines show the sum of all 1099-MISC and/or 1099-K recipients. The black series represents all unique 1099 recipient TINs. The blue represents “individual 1099 recipients”, those with an SSN or an EIN that can be matched to a Schedule C. The red series represents individual 1099 recipients which can be matched to a 1040 tax return. The green series represent individual 1099 recipients which can be matched to a Schedule C.
Figure 3.2: Potential Independent Contractors, with Deduction Restrictions

Notes: The solid lines represent 1099-MISC recipients and the dashed lines show the sum of 1099-MISC and/or 1099-K recipients. The black series is all 1099 recipients which are potential ICs: i) individual 1099 recipients which can be matched to a 1040 or a Schedule C and are non-employers (do not declare any employment deductions) and ii) potential incorporated ICs, defined as EIN recipients that match with a business income return 1120S, have only one owner and are non-employers. The blue series shows individual 1099 recipients and excludes potential incorporated IC. The red series contains the subset of all potential IC which declare less than $10K in total deductions, excluding car and travel deductions, and the green series includes only the individual ICs with less than $10K in total deductions. The differences between the black and blue series and between the red and green series represent the potential incorporated ICs.
Figure 3.3: Sensitivity to Deduction Restrictions

Notes: The solid lines represent 1099-MISC recipients and the dashed lines show all 1099-MISC and/or 1099-K recipients. The black series shows all individual potential IC who claim less than $10K in total deductions on Schedule C, not including deductions for car or travel. The blue series shows potential IC with <$10K in total deductions including all types of deductions. The red and yellow series repeat these definitions, respectively, but for a stricter $5K limit.
Figure 3.4: Independent Contractors Relative to W-2 Employees over Time

Panel A: Total Workforce

Panel B: Changes in Composition (rel. to 2001)

Panel C: Independent Contractors as a Share of the Workforce

Notes: This figure shows 1099 recipients as a share of the total workforce including ICs and employees. Panel A shows the number of workers over time. The black series represents all individual ICs and workers, where ICs are defined using our preferred definition, individual ICs with less than $10K in deductions excluding car and travel deductions. The red series shows all employees, inclusive of those with some IC earnings, and the blue series shows W-2 employees with no IC earnings. Panel B shows the growth of these groups relative to 2001 levels. The black series represents ICs with no W-2 earnings; the red series are those with both W-2 and IC income; the blue series are those with only W-2 earnings. Panel C shows ICs as the share of the total workforce, (ICs+employees), for various definitions of ICs. The red series shows the share of the workforce that are individual 1099 recipients matched with a Form 1040; the black series shows the share of the workforce that are ICs by our preferred definition; and the yellow series shows the share of the workforce that are the subset of ICs (by our preferred definition) that earn the majority of their labor income from 1099 income, or with \((1099\text{ income }/(1099 + W-2\text{ income})) > 0.5\).
Figure 3.5: Dependence on 1099 Income

Panel A: 1099 Income as a Share of Total Labor Income

Panel B: 1099 Income as a Share of Total Labor Income (trends)

Panel C: 1099 Income as a Share of AGI

Panel D: 1099 Income as a Share of AGI (trends)

Notes: These figures explore IC income as a share of total labor income and total household income. Panel A shows. In each panel we define ICs according to our preferred definitions, individual 1099 recipients with <$10k in Schedule C deductions excluding car and travel. Panel A shows the number of ICs by individual IC income as a share of total income, or 1099 income / (1099 + W-2 income). The yellow series are those for whom the IC income share is less than 25% of labor income; the black series are those with a greater than 75% share; the red series are those with a 25-50% share; and the blue series a 50-75% share. Panel B shows trends for these groups, relative to the 2001 level. Panels C and D repeat the exercise but for IC income as a share of household income as measured by adjusted gross income (AGI). The income dependency measure is individual 1099 income / AGI.
Figure 3.6: Characteristics of Independent Contractors Relative to Employees

Notes: This figure shows the share of independent contractors (ICs) and employees by individual characteristics, over time. The solid lines represent the share of ICs with a given characteristic, using our preferred definition of ICs, 1099 recipients with less than $10K in Schedule C deductions, excluding car and travel expenses. The dashed lines represent shares of employees, defined as those who receive a W-2 with positive income. The black lines represent the share of workers that are women; the blue lines represent the share of workers that have any claimed dependent children on their Form 1040 in that year; the green lines represent the share of workers whose household receives the earned income tax credit (EITC).
Notes: This figure shows the percent change in independent contractors (IC) and employees from 2001-2015 by state. The blue bars show the percent change in IC, where IC are defined as 1099 recipients that report less than $10K in deductions on a Schedule C, excluding car and travel expenses. The red bars show the percent change in employees, defined as those who receive a W-2 with positive income. The horizontal blue dashed line represents the average growth rate in IC across states; the red dashed line represents the average growth rate in employees across states.
Figure 3.8: Number of Independent Contractors by Industry, 2001 and 2015

Notes: This figure shows the number of ICs by industry of the 1099 issuing firm for the years 2001 and 2015. ICs are defined according to our preferred definition, 1099 recipients that report less than $10K in deductions on a Schedule C, excluding car and travel expenses. Industries are defined as two-digit NAICS categories are reported on the firm's income tax return.
Figure 3.9: Independent Contractors in the Income Distribution

Panel A: Number of Independent Contractors by AGI Quartile

Panel B: Percent Growth in IC by AGI Quartile and Worker Category

Notes: These figures show ICs by their position in the AGI distribution by year, categorized by their position in each quartile of the AGI distribution where the distribution is taken over the universe of taxpayers in each year. Panel A shows the number of contractors in each quartile by year and uses our preferred definition of ICs, those with less than $10K in Schedule C deductions, excluding car and travel. Panel B shows the percent change in the number of ICs in each quartile from 2001 to 2015 for various definitions of IC labor. “Main Definition” corresponds with our preferred definition; “Broad Def.” are all individual 1099 recipients matched with a Form 1040, with no deductions restriction; “Primarily IC income” are the subset of the main definition that receive a majority of their labor income from IC earnings, $(1099 \text{ income} / (1099 + \text{W-2 income})) > 0.5$; and the last set of bars shows the change for W-2 employees.
Figure 3.10: Firm use of Independent Contractor Labor

Panel A: Percent of Firms with any IC (Extensive Margin)

Panel B: Average Worker Ratio (Intensive Margin)

Panel C: Compensation Ratio (Intensive Margin)

Notes: Panel A plots the average extensive margin measure “Any IC” which is equal to one if the firm has hired at least one independent contractor in the given tax year. The series in black represents all individual 1099 recipients which can be matched to a 1040. The blue series represents our preferred IC definition, individual ICs with less than $10K in Schedule C deductions, excluding car and travel expenses. Panels B and C plot intensive margin IC use among firms that hire at least one IC (i.e. Any IC=1). Panel B plots the average worker ratio, defined as the number of contractors divided by the number of workers (ICs plus wage and salary employees). Panel C plots the compensation ratio, defined as total 1099 compensation issued by the firm divided by total worker compensation (IC 1099 compensation plus employee wage and salary compensation).
Figure 3.11: Firm use of Independent Contractor Labor, by Firm Wage Quartile

Panel A: Percent of Firms with any IC
(Extensive Margin)

Panel B: Average Worker Ratio (Intensive Margin)

Panel C: Compensation Ratio (Intensive Margin)

Notes: These figures decompose the extensive and intensive margin measures of firm IC as presented in Figure 3.10 by firms’ median wage. Firms are categorized by their position in the distribution of firm median wages. Panel A shows the extensive margin; Panel B shows the intensive margin defined by the worker ratio; and Panel C the intensive margin as defined by the compensation ratio. Q4 represents average for firms in the top quartile of the median wage distribution, Q3 the 50-75th percentile, Q2 the 25-50th percentile, and Q1 the lowest quartile firms, or below the 25th percentile. ICs correspond with our preferred IC definition, individual ICs with less than $10K in Schedule C deductions, excluding car and travel expenses.
Figure 3.12: Firm use of Independent Contractor Labor, by Firm Size

Panel A: Percent of Firms with any IC (Extensive Margin)

Panel B: Average Worker Ratio (Intensive Margin)

Panel C: Compensation Ratio (Intensive Margin)

Notes: These figures decompose the extensive and intensive margin measures of firm IC as presented in Figure 3.10 by firm size, defined by the number of W-2 employees. Panel A shows the extensive margin; Panel B shows the intensive margin defined by the worker ratio; and Panel C the intensive margin as defined by the compensation ratio. Each series corresponds to the average for firms within the range of the labeled number of employees. ICs correspond with our preferred IC definition, individual ICs with less than $10K in Schedule C deductions, excluding car and travel expenses.
Figure 3.13: Share of Firms with Any Workers Switching Status within Firm

Panel A: Fractions by Type of Switching

[Graph showing fractions by type of switching from IC to employee and employee to IC for both a broader IC concept and the preferred IC definition.]

Panel B: Fraction with Either or Both Types of Switching

[Graph showing the fraction of firms with either type of status change (black) or both in a year (blue) for the two IC definitions.]

Notes: Panel A shows the fraction of firms with at least one worker switching from IC to employee status in black and those with at least one worker switching from employee to IC status in blue. The dotted lines show the rates using a broader IC concept that includes all individual Form 1099-MISC recipients matched to a Form 1040 while the solid lines show the rates using our preferred IC definition of individuals with no Schedule C employee deductions and less than $10K in deductions excluding car and travel. Panel B shows the fraction of firms with either type of status change (black) or both in a year (blue) again for the two IC definitions.
Figure 3.14: Average Fraction of Workers Switching Status within Firm

Notes: This figure shows the average of the fraction of workers who switch from IC to employee (black) and employee to IC (blue) across firms. The dotted lines show these fractions using a broader IC concept that includes all individual Form 1099-MISC recipients matched to a Form 1040 while the solid lines show the fractions using our preferred IC definition of individuals with no Schedule C employee deductions and less than $10K in deductions excluding car and travel.
Figure 3.15: Firms with New Employees or Independent Contractors

Panel A: Fraction of Firms with a New Employee or IC

Panel B: Fraction of Workers that are New Employees or IC

Notes: Panel A shows the fraction of firms with a new employee (black) or a new IC (blue). The dotted line shows the fraction using a broader concept that includes all individual Form 1099-MISC recipients matched to a Form 1040 while the solid line show the fractions using our preferred IC definition of individuals with no Schedule C employee deductions and less than $10K in deductions excluding car and travel. Panel B shows the average fraction of workers who are new employees (black) or ICs (blue) across firms for the two IC definitions.
Figure 3.16: Share of Firms with a Worker Switching Statuses within Firm, by Firm Size

Panel A: Switching from Employee to IC

Panel B: Employee to IC (relative to 2001)

Panel C: Switching from IC to Employee

Panel D: IC to Employee (relative to 2001)

Notes: Panel A shows the fraction of firms with at least one worker switching from employee to IC using our preferred definition of individuals with no Schedule C employee deductions and less than $10K in deductions excluding car and travel by size of the firm measured as number of Form W-2s issued. Panel B shows the percentage change in this fraction since 2001. Panel C shows the fraction of firms with at least one worker switching from IC to employee by firm size and Panel D shows the percentage change in this fraction since 2001.
Figure 3.17: Share of Firms with New Independent Contractors or Employees, by Firm Size

Panel A: Any New IC

Panel B: Any New IC (relative to 2001)

Panel C: Any New Employee

Panel D: Any New Employee (relative to 2001)

Notes: Panel A shows the fraction of firms with at least one new employee by size of the firm measured as number of Form W-2s issued. Panel B shows the percentage change in this fraction relative to 2001. Panel C shows the fraction of firms with at least one new IC using our preferred definition of individuals with no Schedule C employee deductions and less than $10K in deductions excluding car and travel by firm size. Panel D shows the percentage change in this fraction since 2001.
Figure 3.18: Worker Transitions in and out of Independent Contracting

Notes: This figure shows the number of individuals transitioning in and out of IC labor by year. The statistics are derived from a randomly sampled repeated cross section of individual taxpayers. Each line represents a different type of transition between states, for transitions between IC labor and W-2 employment and between IC labor and no labor income, defined as no positive W-2 or 1099 income. A transition in year $t$ is defined as an individual who was in the first state in year $t-1$ and in the new state in year $t$. ICs are defined as those meeting our preferred definition, 1099 recipients with less than $10K$ in Schedule C deductions, excluding car and travel. “IC any” are those with some positive 1099 income, and “IC only” are those with 1099 income and no W-2 income.
Figure 3.19: Male v. Female Independent Contractor Growth

Panel A: Levels

Panel B: Relative Growth

Panel C: Female ICs as Share of the Female Workforce

Panel D: Male ICs as Share of the Male Workforce

Notes: These figures show time trends in IC labor for men and women separately. Panel A shows the level trends. The solid series represent female workers recipients and the dashed series males. The black series represents all individual 1099 recipients; the blue series represents our primary definition of IC, 1099 recipients with less than $10K in Schedule C deductions excluding car and travel; the red series shows the subset of our primary IC definition that receives the majority of their labor income from 1099 income, $(1099\ income/1099\ +\ W-2\ income)>0.5$. Panel B shows the number of contractors relative to 2001 to highlight relative the relative increases in each group. It also includes a series (in gold) for W-2 employees as a comparison. Panel C shows the share of the female workforce (ICs plus employees) that are ICs, for various definitions. The black shows all individual 1099 recipients as a share of the female workforce; the blue series shows the share of the female workforce that are ICs by our preferred definition; the red series shows the subset of our primary IC definition that receives the majority of their labor income from 1099 income. Panel D repeats the exercise for male ICs.
Figure 3.20: Demographic Trends for Female ICs

Panel A: IC Women v. IC Men

Panel B: IC Women v. W-2 Women

Notes: These figures show trends in select demographic characteristics for female ICs. Panel A compares trends in female ICs to male ICs and Panel B compares trends female ICs to female W-2 employees. In each panel the left axis represents the share of workers with a given characteristic and the right axis represents the average age for the workers. “Married” is an indicator equal to one for married individuals; “Children” is an indicator for claiming a dependent child on Form 1040 in that year; “EITC” is an indicator for the household receiving the earned income tax credit. In both panels, the solid series are female IC and the dashed series are the comparison group.
Figure 3.21: Changes in Female Independent Contractors by Industry

Panel A: Female Independent Contractors in 2001 and 2015

Panel B: Change in ICs between 2001 to 2015, Men v. Women

Panel C: Number of IC by Industry in 2015, Men v. Women

Notes: This figure displays female ICs by industry of the 1099 issuing firm. Industries are defined as two-digit NAICS categories are reported on the firm’s income tax return. Panel A shows the number of female ICs by industry in 2001 and 2015. Panel B shows the change in the number of ICs within an industry from 2001 to 2016 for men and women separately. Panel C shows the number of female and male ICs in each industry in 2015. ICs are defined according to our preferred definition, 1099 recipients that report less than $10K in deductions on a Schedule C, excluding car and travel expenses.
Figure 3.22: Independent Contractors in the Income Distribution, Men v. Women

Panel A: Level Growth in IC by AGI Quartile and Worker Category

Panel B: Percent Growth in IC by AGI Quartile and Worker Category

Notes: Panel A shows changes in the number of ICs in each quartile of the AGI distribution from 2001 to 2015, separately for male and female ICs. Individuals are categorized by their position in the AGI distribution where the AGI distribution is taken over the universe of taxpayers in each year. “Main Definition” is our preferred IC definition, individual 1099 recipients with less than $10K in Schedule C deductions excluding car and travel; “Primarily IC income” are the subset of the main definition ICs receiving a majority of their labor income as IC income, \((\text{1099 income} / \text{1099 + W-2 income}) > 0.50\). Panel B shows the percentage change in workers within each quartile of the AGI distribution from 2001 to 2015. The last set of bars shows the change in each quartile for W-2 employees.
Figure 3.23: Independent Contractor Growth by Primary or Secondary Income

Panel A: All Independent Contractors (Levels)
Panel B: Independent Contractors (rel. to 2001)
Panel C: Female ICs (Levels)
Panel D: Female ICs (relative to 2001)
Panel E: Male ICs (Levels)
Panel F: Male ICs (relative to 2001)

Notes: This figure show the time series for independent contractors by whether they are primary or secondary earners in their households and by whether their primary labor income source is IC income. “Primary earners” are primary earners in their household defined as having individual labor income (1099 + W-2 income) more than 50 percent of AGI. “Secondary earners” are married and secondary earners in their households. “IC primary” are ICs that earn the majority of their labor income from IC earnings, \((1099 \text{ income} / 1099 + W-2 \text{ income}) > 0.50\). “IC secondary” are ICs who earn the majority of their labor income as W-2 earnings. All ICs correspond to our preferred definition, individual 1099 recipients with less than $10K in Schedule C deductions, excluding car and travel. Panels A, C, and E show the number of contractors, and Panels B, D and F show the number relative to 2001 to show relative growth.
### Table 3.1: Independent Contractor Definitions and Distinct Payers

<table>
<thead>
<tr>
<th></th>
<th>All 1099 recipients</th>
<th>Individual 1099 recipients</th>
<th>Independent Contractors &lt;$10K deductions</th>
<th>Independent Contractors &lt;$5K deductions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (millions)</td>
<td>24.60</td>
<td>17.77</td>
<td>13.43</td>
<td>11.70</td>
</tr>
<tr>
<td>&lt;$10K deductions</td>
<td>55%</td>
<td>76%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>&lt;$5K deductions</td>
<td>48%</td>
<td>66%</td>
<td>87%</td>
<td>100%</td>
</tr>
<tr>
<td>1 distinct 1099 payer</td>
<td>67%</td>
<td>72%</td>
<td>79%</td>
<td>81%</td>
</tr>
<tr>
<td>3 or fewer 1099 payers</td>
<td>89%</td>
<td>92%</td>
<td>96%</td>
<td>97%</td>
</tr>
</tbody>
</table>

**Notes:** This table shows shares of 1099 recipients by characteristics. Each column represents a different type of 1099 recipients: the first is all 1099 recipients; second is all individual 1099 recipients that can be matched with a Form 1040; third is our preferred definition of independent contractors, individual 1099 recipients with less than $10K in Schedule C deduction, excluding car and travel expenses; fourth is the subset of individual 1099 recipients with less than $5K in Schedule C deduction, excluding car and travel expenses.
<table>
<thead>
<tr>
<th>Year</th>
<th>Share of Workforce</th>
<th>Number of Workers (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All individual 1099 recipients</td>
<td>Preferred IC definition</td>
</tr>
<tr>
<td>2001</td>
<td>0.0899</td>
<td>0.0659</td>
</tr>
<tr>
<td>2002</td>
<td>0.0942</td>
<td>0.0691</td>
</tr>
<tr>
<td>2003</td>
<td>0.0961</td>
<td>0.0700</td>
</tr>
<tr>
<td>2004</td>
<td>0.0976</td>
<td>0.0704</td>
</tr>
<tr>
<td>2005</td>
<td>0.0977</td>
<td>0.0704</td>
</tr>
<tr>
<td>2006</td>
<td>0.0996</td>
<td>0.0719</td>
</tr>
<tr>
<td>2007</td>
<td>0.1012</td>
<td>0.0754</td>
</tr>
<tr>
<td>2008</td>
<td>0.0999</td>
<td>0.0752</td>
</tr>
<tr>
<td>2009</td>
<td>0.0979</td>
<td>0.0747</td>
</tr>
<tr>
<td>2010</td>
<td>0.1002</td>
<td>0.0764</td>
</tr>
<tr>
<td>2011</td>
<td>0.1068</td>
<td>0.0791</td>
</tr>
<tr>
<td>2012</td>
<td>0.1072</td>
<td>0.0794</td>
</tr>
<tr>
<td>2013</td>
<td>0.1070</td>
<td>0.0787</td>
</tr>
<tr>
<td>2014</td>
<td>0.1074</td>
<td>0.0788</td>
</tr>
<tr>
<td>2015</td>
<td>0.1085</td>
<td>0.0795</td>
</tr>
</tbody>
</table>

Notes: The first set of columns shows 1099 recipients as the share of the workforce, defined as all 1099 and/or W-2 recipients. The first column shows the share of all individual 1099 recipients that can be matched with a 1040; the second column, ICs by our preferred definition as a share of the workforce; the third column is the subset of our preferred definition ICs that receive a majority of their labor income as 1099 income, \((1099 \text{ income} / 1099 + W-2 \text{ income}) > 0.50\). The next set of columns show the number of workers with and without IC income, where ICs are those corresponding to our preferred definition, or individual 1099 recipients with less than $10K in Schedule C deductions, excluding car and travel. The first column are those with 1099 income but no W-2 income in that year; the second those with both 1099 and W-2 income; and the third, those with only W-2 income. These figures correspond to the series plotted in Figure 3.4.
Table 3.3: Summary Statistics – Independent Contractors and Employees, 2001 and 2015

<table>
<thead>
<tr>
<th></th>
<th>Independent Contractors</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGI</td>
<td>94,350</td>
<td>94,423</td>
</tr>
<tr>
<td>Taxable Income</td>
<td>70,923</td>
<td>76,552</td>
</tr>
<tr>
<td>Wages</td>
<td>37,401</td>
<td>33,603</td>
</tr>
<tr>
<td>Age</td>
<td>43.6</td>
<td>45.1</td>
</tr>
<tr>
<td>Female</td>
<td>0.39</td>
<td>0.46</td>
</tr>
<tr>
<td>Has children</td>
<td>0.42</td>
<td>0.41</td>
</tr>
<tr>
<td>Married</td>
<td>0.69</td>
<td>0.67</td>
</tr>
<tr>
<td>Receives EITC</td>
<td>0.16</td>
<td>0.22</td>
</tr>
<tr>
<td>1099-MISC income</td>
<td>22,835</td>
<td>31,808</td>
</tr>
<tr>
<td># 1099-MISC payers</td>
<td>1.39</td>
<td>1.41</td>
</tr>
</tbody>
</table>

Note: This table presents summary statistics for independent contractors (IC) and employees for years 2001 and 2015. Dollar values are 2015 real U.S. dollars. IC are defined as 1099-MISC or 1099-K recipients that file a Form 1040 and report less than $10K in deductions on a Schedule C, excluding car and travel expenses. Employees are defined as those who receive a W-2 with positive income. Medians represent the average of 10 individuals around the median so as not to disclose any individual taxpayer information. The variables “female,” “has children,” “married” and “receives EITC” are indicators for that characteristic so the mean represents the share of workers with that characteristic.
Table 3.4: IC Characteristics by AGI Quartiles

<table>
<thead>
<tr>
<th>AGI Quartile:</th>
<th>Independent Contractors (preferred definition)</th>
<th>Independent Contractors (primarily 1099 earnings)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;25th</td>
<td>25-50th</td>
</tr>
<tr>
<td>Individuals (millions)</td>
<td>3.2</td>
<td>2.7</td>
</tr>
<tr>
<td>1099 income (median)</td>
<td>4,665</td>
<td>5,000</td>
</tr>
<tr>
<td>AGI (median)</td>
<td>8,076</td>
<td>23,995</td>
</tr>
<tr>
<td>Taxable Income (median)</td>
<td>0</td>
<td>6,119</td>
</tr>
<tr>
<td>Wages (median)</td>
<td>0</td>
<td>9,634</td>
</tr>
<tr>
<td>Age (mean)</td>
<td>40.1</td>
<td>42.1</td>
</tr>
<tr>
<td>Female (share)</td>
<td>0.46</td>
<td>0.45</td>
</tr>
<tr>
<td>Kids (share)</td>
<td>0.27</td>
<td>0.41</td>
</tr>
<tr>
<td>Married (share)</td>
<td>0.37</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Notes: This table presents select summary statistics for independent contractors. The first set of columns present statistics for our preferred IC definition, individual non-employers with less than $10K in deductions excluding car and travel deductions. The second set of columns show statistics for a subset of these IC, those that earn the majority of their labor income from 1099's, \((1099\text{ income } / 1099 + W-2\text{ income})>0.5\). Statistics are presented by the IC’s position in the AGI distribution in 2015, by quartiles of the AGI distribution.
### Table 3.5: Workers Switching or Entering Firms, by Industry

<table>
<thead>
<tr>
<th>Industry</th>
<th>Fraction of Firms With:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employee to IC</td>
</tr>
<tr>
<td>Agriculture</td>
<td>1.21%</td>
</tr>
<tr>
<td>Mining, Oil, Gas</td>
<td>2.53%</td>
</tr>
<tr>
<td>Construction</td>
<td>1.49%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3.80%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>2.45%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>1.28%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>1.74%</td>
</tr>
<tr>
<td>Information</td>
<td>6.58%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>2.18%</td>
</tr>
<tr>
<td>Real Estate</td>
<td>2.11%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>2.78%</td>
</tr>
<tr>
<td>Administrative, Support, Waste Management</td>
<td>1.69%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>5.21%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>2.28%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>3.49%</td>
</tr>
<tr>
<td>Accommodation and Food Services</td>
<td>0.69%</td>
</tr>
<tr>
<td>Other Services</td>
<td>1.51%</td>
</tr>
</tbody>
</table>

**Notes:** Firms are categorized according to the NAICS two digit sectors (https://www.census.gov/programs-surveys/economic-census/guidance/understanding-naics.html). Utilities, Management of Companies, Public Administration are not reported due to low sample sizes. Column 1 shows the fraction of firms with at least one worker switching from employee to IC using our preferred definition of individuals with no Schedule C employee deductions and less than $10K in deductions excluding car and travel. Column 2 shows the fraction of firms with at least one new employee by size of the firm. Column 4 shows the fraction of firms with at least one new IC using our preferred definition.
Table 3.6: Characteristics of Those Transitioning in and out of IC Labor (2014)

<table>
<thead>
<tr>
<th>Switchers (any)</th>
<th>Within-firm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W-2 to IC</td>
</tr>
<tr>
<td>Switchers (millions)</td>
<td>4.15</td>
</tr>
<tr>
<td>%change from 2002</td>
<td>0.01</td>
</tr>
<tr>
<td>Age</td>
<td>40.2</td>
</tr>
<tr>
<td>Female</td>
<td>0.44</td>
</tr>
<tr>
<td>Married</td>
<td>0.62</td>
</tr>
<tr>
<td>Kids</td>
<td>0.38</td>
</tr>
<tr>
<td>AGI (median)</td>
<td>40,611</td>
</tr>
<tr>
<td>Taxable income (median)</td>
<td>21,885</td>
</tr>
<tr>
<td>Wage and Salary (median)</td>
<td>15,193</td>
</tr>
<tr>
<td>1099 income (median)</td>
<td>2,535</td>
</tr>
<tr>
<td>&lt;25th ptile AGI</td>
<td>0.20</td>
</tr>
<tr>
<td>25-50th ptile AGI</td>
<td>0.20</td>
</tr>
<tr>
<td>50-75th ptile AGI</td>
<td>0.20</td>
</tr>
<tr>
<td>&gt;75th ptile AGI</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Notes: This table presents summary stats for those transitioning in and out of IC labor in 2014. The statistics are derived from a random sample of individual taxpayers. The first set of columns reference transitions between IC labor and W-2 employment and between IC labor and no labor income (no W-2 nor IC income). The second set of columns represents within-firm transitions, or those that transition between IC labor and W-2 employment within the same firm from year \( t - 1 \) to year \( t \).
Table 3.7: Characteristics of Female Independent Contractors, by AGI Quartile (2015)

<table>
<thead>
<tr>
<th></th>
<th>&lt;25th ptile</th>
<th>25-50th ptile</th>
<th>50-75th ptile</th>
<th>&gt;75th ptile</th>
<th>&lt;25th ptile</th>
<th>25-50th ptile</th>
<th>50-75th ptile</th>
<th>&gt;75th ptile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Contractors (millions)</td>
<td>1.55</td>
<td>1.28</td>
<td>1.44</td>
<td>2.08</td>
<td>1.02</td>
<td>0.56</td>
<td>0.55</td>
<td>0.85</td>
</tr>
<tr>
<td>Total 1099 income (median)</td>
<td>4,030</td>
<td>3,924</td>
<td>2,962</td>
<td>3,441</td>
<td>7,056</td>
<td>12,541</td>
<td>7,354</td>
<td>8,600</td>
</tr>
<tr>
<td>Net 1099 income (median)</td>
<td>2,264</td>
<td>2,175</td>
<td>1,500</td>
<td>1,845</td>
<td>4,290</td>
<td>8,294</td>
<td>4,028</td>
<td>5,171</td>
</tr>
<tr>
<td>AGI (median)</td>
<td>8,568</td>
<td>23,786</td>
<td>53,363</td>
<td>125,466</td>
<td>7,876</td>
<td>22,906</td>
<td>53,606</td>
<td>129,951</td>
</tr>
<tr>
<td>Taxable income (median)</td>
<td>0</td>
<td>6,086</td>
<td>31,472</td>
<td>92,115</td>
<td>0</td>
<td>1,792</td>
<td>27,930</td>
<td>94,028</td>
</tr>
<tr>
<td>W-2 income (median)</td>
<td>371</td>
<td>11,955</td>
<td>20,410</td>
<td>23,122</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Age</td>
<td>40.3</td>
<td>41.7</td>
<td>44.6</td>
<td>48.2</td>
<td>43.5</td>
<td>46.0</td>
<td>48.4</td>
<td>51.2</td>
</tr>
<tr>
<td>Children</td>
<td>0.34</td>
<td>0.44</td>
<td>0.43</td>
<td>0.54</td>
<td>0.36</td>
<td>0.50</td>
<td>0.48</td>
<td>0.52</td>
</tr>
<tr>
<td>Married</td>
<td>0.40</td>
<td>0.58</td>
<td>0.70</td>
<td>0.91</td>
<td>0.44</td>
<td>0.71</td>
<td>0.84</td>
<td>0.93</td>
</tr>
<tr>
<td>EITC</td>
<td>0.55</td>
<td>0.41</td>
<td>0.11</td>
<td>0.00</td>
<td>0.57</td>
<td>0.45</td>
<td>0.15</td>
<td>0.01</td>
</tr>
<tr>
<td># 1099 payers</td>
<td>1.29</td>
<td>1.31</td>
<td>1.31</td>
<td>1.35</td>
<td>1.37</td>
<td>1.50</td>
<td>1.53</td>
<td>1.56</td>
</tr>
<tr>
<td># W-2 payers</td>
<td>1.43</td>
<td>1.52</td>
<td>1.37</td>
<td>1.29</td>
<td>1.13</td>
<td>1.11</td>
<td>1.07</td>
<td>1.05</td>
</tr>
</tbody>
</table>

Notes: This table shows summary stats for female contractors by their position in the AGI distribution in 2015, by quartiles of the AGI distribution. The first set of columns shows statistics for our preferred IC definition, or individual 1099 recipients with less than $10K in Schedule C deductions, excluding car and travel. The next set of columns shows statistics for the subset of the main definition that earn a majority of their labor income as IC earnings, \((1099 \text{ income} / 1099 + W-2 \text{ income}) > 0.5\).
Table 3.8: Share of Total Increase in IC Labor by Primary and Secondary Income, by Gender

<table>
<thead>
<tr>
<th>Shares of Total</th>
<th>Primary earners, IC primary</th>
<th>Primary earners, IC primary</th>
<th>Secondary earners, IC secondary</th>
<th>Secondary earners, IC secondary</th>
<th>Total change in IC (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td>0.19</td>
<td>0.22</td>
<td>0.12</td>
<td>0.07</td>
<td>3.947</td>
</tr>
<tr>
<td>Men</td>
<td>0.13</td>
<td>0.15</td>
<td>0.06</td>
<td>0.03</td>
<td>3.947</td>
</tr>
</tbody>
</table>

**Share by Gender**

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shares of Total</strong></td>
<td>0.33</td>
<td>0.31</td>
<td>0.34</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td>0.37</td>
<td>0.37</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>Men</strong></td>
<td>0.19</td>
<td>0.20</td>
<td>0.16</td>
</tr>
<tr>
<td><strong>Total change in IC (millions)</strong></td>
<td>0.10</td>
<td>0.11</td>
<td>0.09</td>
</tr>
</tbody>
</table>

*Notes:* This table shows the share of the increase in independent contractors from 2001 to 2015 attributable to different types of ICs. “Primary earners” are primary earners in their household defined as having individual labor income (1099 + W-2 income) more than 50 percent of AGI. “Secondary earners” are married and secondary earners in their households. “IC primary” are ICs that earn the majority of their labor income from IC earnings, \((1099 \text{ income} / 1099 + W-2 \text{ income}) > 0.50\). “IC secondary” are ICs who earn the majority of their labor income as W-2 earnings. All ICs correspond to our preferred definition, individual 1099 recipients with less than $10K in Schedule C deductions, excluding car and travel. The top panel, “Shares of Total,” shows the share of the total increase in ICs attributable to the each group. The last column shows the total increase in ICs, including men and women. The second panel, “Shares by Gender,” shows the within gender share, or the share of the total change in the last column attributable to each group.
<table>
<thead>
<tr>
<th></th>
<th>Primary Earner, IC Secondary</th>
<th>Primary Earner, IC Primary</th>
<th>Secondary Earner, IC Primary</th>
<th>Secondary Earner, IC Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Women</td>
<td>Men</td>
<td>All</td>
</tr>
<tr>
<td>IC (millions)</td>
<td>5.52</td>
<td>2.27</td>
<td>3.26</td>
<td>3.72</td>
</tr>
<tr>
<td>Total 1099 income (mean)</td>
<td>6,008</td>
<td>4,610</td>
<td>6,962</td>
<td>322,824</td>
</tr>
<tr>
<td>Total 1099 income (median)</td>
<td>2,500</td>
<td>2,115</td>
<td>2,796</td>
<td>17,040</td>
</tr>
<tr>
<td>Net 1099 income (mean)</td>
<td>3,724</td>
<td>2,572</td>
<td>4,509</td>
<td>316,253</td>
</tr>
<tr>
<td>Net 1099 income (median)</td>
<td>1,376</td>
<td>1,200</td>
<td>1,500</td>
<td>11,149</td>
</tr>
<tr>
<td>AGI (mean)</td>
<td>81,795</td>
<td>58,004</td>
<td>98,200</td>
<td>21,837</td>
</tr>
<tr>
<td>AGI (median)</td>
<td>45,978</td>
<td>37,158</td>
<td>53,842</td>
<td>13,087</td>
</tr>
<tr>
<td>Taxable income (mean)</td>
<td>60,694</td>
<td>40,541</td>
<td>74,588</td>
<td>15,706</td>
</tr>
<tr>
<td>Taxable income (median)</td>
<td>26,947</td>
<td>20,451</td>
<td>32,495</td>
<td>0</td>
</tr>
<tr>
<td>Wages (mean)</td>
<td>67,135</td>
<td>47,881</td>
<td>80,427</td>
<td>3,541</td>
</tr>
<tr>
<td>Wages (median)</td>
<td>39,491</td>
<td>33,391</td>
<td>44,550</td>
<td>0</td>
</tr>
<tr>
<td>Share in &lt; 25th ptile AGI</td>
<td>0.18</td>
<td>0.21</td>
<td>0.15</td>
<td>0.57</td>
</tr>
<tr>
<td>Share in 25-50th ptile AGI</td>
<td>0.23</td>
<td>0.27</td>
<td>0.21</td>
<td>0.24</td>
</tr>
<tr>
<td>Share in 50-75th ptile AGI</td>
<td>0.27</td>
<td>0.28</td>
<td>0.26</td>
<td>0.10</td>
</tr>
<tr>
<td>Share in &gt; 75th ptile AGI</td>
<td>0.32</td>
<td>0.23</td>
<td>0.37</td>
<td>0.08</td>
</tr>
<tr>
<td>Share female</td>
<td>0.41</td>
<td>1</td>
<td>0</td>
<td>0.41</td>
</tr>
<tr>
<td>Age (mean)</td>
<td>41</td>
<td>40</td>
<td>41</td>
<td>44</td>
</tr>
<tr>
<td>Share w/ kids</td>
<td>0.40</td>
<td>0.38</td>
<td>0.41</td>
<td>0.34</td>
</tr>
<tr>
<td>Share w/ EITC</td>
<td>0.18</td>
<td>0.23</td>
<td>0.15</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Notes: This table shows summary statistics for types of ICs, for men and women together (“All”) and separately, in 2014. “Primary earners” are primary earners in their household defined as having individual labor income (1099 + W-2 income) more than 50 percent of AGI. “Secondary earners” are married and secondary earners in their households. “IC primary” are ICs that earn the majority of their labor income from IC earnings, \((1099 \text{ income} / 1099 + W-2 \text{ income}) > 0.50\). “IC secondary” are ICs who earn the majority of their labor income as W-2 earnings. All ICs correspond to our preferred definition, individual 1099 recipients with less than $10K in Schedule C deductions, excluding car and travel. The means and medians are presented for all income variables. The shares of each type of contractor in each quartile of the AGI distribution are shown next, followed by the average age, the share claiming dependent children in that year, and the share receiving the earned income tax credit (EITC).
APPENDIX A

Chapter I Supporting Material
A.1 Appendix

A.1.1 Appendix Figures

Figure A.1: Average Earnings in Exposed v. Unexposed Firms - Single Owner Firms

Panel A: Conditional Means

Panel B: DD Coefficients

Notes: Figure A.1 displays evolution of log average earnings for workers in “exposed” firms relative to control firms relative to the pre-reform year 2012 using specification (1.7). All firms in this sample are single owner firms. Exposed firms are those with a top-bracket owner in each year 2010-2012. Panel A shows the conditional means after absorbing baseline firm controls. Panel B shows the coefficients and 95% confidence intervals from the DD specification. The 95% confidence intervals are based on robust standard errors clustered at the firm level.
### A.1.2 Appendix Tables

#### Table A.1: Firm Attrition Rates After 2012 by Top-Bracket Owner or Not

<table>
<thead>
<tr>
<th>Year</th>
<th>Any top-bracket owner</th>
<th>All top-bracket owners</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>2005-2012</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2013</td>
<td>0.9463</td>
<td>0.9377</td>
</tr>
<tr>
<td>2014</td>
<td>0.9084</td>
<td>0.9089</td>
</tr>
<tr>
<td>2015</td>
<td>0.8765</td>
<td>0.8708</td>
</tr>
</tbody>
</table>

**Notes:** Table A.1 shows the attrition rates of firms which fit the sample criteria from 2005-2012 by whether they have top-bracket owners in 2012 or not. The sample criteria are having at least 5 employees and some business activity in each year. Each row shows the share of firms that fit the sample criteria that remain in the sample in that year. The first column presents shares for firms with at least one top-bracket owner in 2012; column 2 for firms with no top-bracket owners in 2012; column 3 for firms with all owners in the top bracket in 2012; column 4 for firms with not all top-bracket owners. For example, the second row of the first column shows that 94.63% of firms with at least one top-bracket owner in 2012 that fit the sample criteria in each year from 2005-2012 also fit these criteria in 2013. The next row shows that 90.84% of firms fitting the criteria from 2005-2012 also fit the criteria in 2014.
<table>
<thead>
<tr>
<th>NAICS (2 digit)</th>
<th>All N</th>
<th>Top-bracket owner N</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>11: Agriculture, Forestry, Fishing and Hunting</td>
<td>1,569</td>
<td>295</td>
<td>19%</td>
</tr>
<tr>
<td>21: Mining, Quarrying, and Oil and Gas Extraction</td>
<td>308</td>
<td>131</td>
<td>43%</td>
</tr>
<tr>
<td>22: Utilities</td>
<td>78</td>
<td>18</td>
<td>23%</td>
</tr>
<tr>
<td>23: Construction</td>
<td>11,227</td>
<td>1,742</td>
<td>16%</td>
</tr>
<tr>
<td>31-33: Manufacturing</td>
<td>7,567</td>
<td>2,515</td>
<td>33%</td>
</tr>
<tr>
<td>42: Wholesale Trade</td>
<td>4,521</td>
<td>1,670</td>
<td>37%</td>
</tr>
<tr>
<td>44-45: Retail Trade</td>
<td>12,490</td>
<td>2,579</td>
<td>21%</td>
</tr>
<tr>
<td>48-49: Transportation and Warehousing</td>
<td>2,014</td>
<td>438</td>
<td>22%</td>
</tr>
<tr>
<td>51: Information</td>
<td>794</td>
<td>209</td>
<td>31%</td>
</tr>
<tr>
<td>52: Finance and Insurance</td>
<td>1,920</td>
<td>641</td>
<td>33%</td>
</tr>
<tr>
<td>53: Real Estate and Rental and Leasing</td>
<td>1,896</td>
<td>636</td>
<td>34%</td>
</tr>
<tr>
<td>54: Professional, Scientific, and Technical Services</td>
<td>8,897</td>
<td>2,162</td>
<td>24%</td>
</tr>
<tr>
<td>55: Management of Companies and Enterprises</td>
<td>85</td>
<td>51</td>
<td>60%</td>
</tr>
<tr>
<td>56: Administrative and Support and Waste Management</td>
<td>3,109</td>
<td>563</td>
<td>18%</td>
</tr>
<tr>
<td>61: Educational Services</td>
<td>590</td>
<td>104</td>
<td>18%</td>
</tr>
<tr>
<td>62: Health Care and Social Assistance</td>
<td>10,288</td>
<td>2,771</td>
<td>27%</td>
</tr>
<tr>
<td>71: Arts, Entertainment, and Recreation</td>
<td>1,320</td>
<td>262</td>
<td>20%</td>
</tr>
<tr>
<td>72: Accommodation and Food Services</td>
<td>8,930</td>
<td>1,520</td>
<td>17%</td>
</tr>
<tr>
<td>81: Other Services (except Public Administration)</td>
<td>6,170</td>
<td>564</td>
<td>9%</td>
</tr>
</tbody>
</table>

**Notes:** Table A.2 shows summary statistics for firms in the sample by their reported 2-digit NAICS industry in 2012. The first column shows the number of firms in the sample in each industry. The second column shows the number of firms with at least one top-bracket owner in 2012 in each industry. The third column shows the share of firms in a given industry that have a top-bracket owner in 2012.
<table>
<thead>
<tr>
<th>State</th>
<th>All N</th>
<th>Top-bracket owner N</th>
<th>State</th>
<th>All N</th>
<th>Top-bracket owner N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK</td>
<td>244</td>
<td>63</td>
<td>NC</td>
<td>2,533</td>
<td>448</td>
</tr>
<tr>
<td>AL</td>
<td>1,169</td>
<td>292</td>
<td>ND</td>
<td>328</td>
<td>95</td>
</tr>
<tr>
<td>AR</td>
<td>712</td>
<td>115</td>
<td>NE</td>
<td>724</td>
<td>143</td>
</tr>
<tr>
<td>AZ</td>
<td>1,135</td>
<td>216</td>
<td>NH</td>
<td>366</td>
<td>76</td>
</tr>
<tr>
<td>CA</td>
<td>7,864</td>
<td>1,954</td>
<td>NJ</td>
<td>2,902</td>
<td>732</td>
</tr>
<tr>
<td>CO</td>
<td>1,706</td>
<td>293</td>
<td>NM</td>
<td>432</td>
<td>95</td>
</tr>
<tr>
<td>CT</td>
<td>878</td>
<td>238</td>
<td>NV</td>
<td>496</td>
<td>115</td>
</tr>
<tr>
<td>DC</td>
<td>122</td>
<td>37</td>
<td>NY</td>
<td>5,959</td>
<td>1,498</td>
</tr>
<tr>
<td>DE</td>
<td>279</td>
<td>70</td>
<td>OH</td>
<td>3,218</td>
<td>747</td>
</tr>
<tr>
<td>FL</td>
<td>5,199</td>
<td>1,139</td>
<td>OK</td>
<td>920</td>
<td>221</td>
</tr>
<tr>
<td>GA</td>
<td>2,290</td>
<td>461</td>
<td>OR</td>
<td>1,391</td>
<td>225</td>
</tr>
<tr>
<td>HI</td>
<td>229</td>
<td>47</td>
<td>PA</td>
<td>4,459</td>
<td>966</td>
</tr>
<tr>
<td>IA</td>
<td>1,075</td>
<td>236</td>
<td>RI</td>
<td>539</td>
<td>121</td>
</tr>
<tr>
<td>ID</td>
<td>614</td>
<td>80</td>
<td>SC</td>
<td>1,118</td>
<td>219</td>
</tr>
<tr>
<td>IL</td>
<td>3,975</td>
<td>985</td>
<td>SD</td>
<td>424</td>
<td>88</td>
</tr>
<tr>
<td>IN</td>
<td>2,431</td>
<td>484</td>
<td>TN</td>
<td>829</td>
<td>230</td>
</tr>
<tr>
<td>KS</td>
<td>808</td>
<td>179</td>
<td>TX</td>
<td>3,962</td>
<td>1,173</td>
</tr>
<tr>
<td>KY</td>
<td>1,190</td>
<td>217</td>
<td>UT</td>
<td>833</td>
<td>122</td>
</tr>
<tr>
<td>LA</td>
<td>1,092</td>
<td>318</td>
<td>VA</td>
<td>2,223</td>
<td>497</td>
</tr>
<tr>
<td>MA</td>
<td>2,528</td>
<td>568</td>
<td>VT</td>
<td>368</td>
<td>58</td>
</tr>
<tr>
<td>MD</td>
<td>1,610</td>
<td>299</td>
<td>WA</td>
<td>2,008</td>
<td>383</td>
</tr>
<tr>
<td>ME</td>
<td>665</td>
<td>95</td>
<td>WI</td>
<td>2,066</td>
<td>445</td>
</tr>
<tr>
<td>MI</td>
<td>2,695</td>
<td>609</td>
<td>WV</td>
<td>335</td>
<td>76</td>
</tr>
<tr>
<td>MN</td>
<td>2,297</td>
<td>468</td>
<td>WI</td>
<td>2,066</td>
<td>445</td>
</tr>
<tr>
<td>MO</td>
<td>1,682</td>
<td>375</td>
<td>WV</td>
<td>335</td>
<td>76</td>
</tr>
<tr>
<td>MS</td>
<td>585</td>
<td>133</td>
<td>WY</td>
<td>279</td>
<td>62</td>
</tr>
<tr>
<td>MT</td>
<td>469</td>
<td>55</td>
<td>WY</td>
<td>279</td>
<td>62</td>
</tr>
</tbody>
</table>

**Notes:** Table A.3 shows summary statistics for firms in the sample by their state as reported on Form 1120S in 2012. The first column shows the number of firms in the sample in each state. The second column shows the number of firms with at least one top-bracket owner in 2012 in each state. The third column shows the share of firms in a given state that have a top-bracket owner in 2012.
### Table A.4: Robustness to Functions of Net Income Controls

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_{2006-2009}$</td>
<td>-0.00163</td>
<td>-0.00086</td>
<td>0.00034</td>
<td>0.00060</td>
<td>-0.00077</td>
<td>0.00071</td>
<td>-0.00036</td>
<td>-0.00047</td>
</tr>
<tr>
<td></td>
<td>(0.00305)</td>
<td>(0.00301)</td>
<td>(0.00304)</td>
<td>(0.00303)</td>
<td>(0.00306)</td>
<td>(0.00304)</td>
<td>(0.00302)</td>
<td>(0.00297)</td>
</tr>
<tr>
<td>$\beta_{2009-2012}$</td>
<td>-0.00258</td>
<td>-0.00226</td>
<td>-0.00250</td>
<td>-0.00316</td>
<td>-0.00293</td>
<td>-0.00280</td>
<td>-0.00220</td>
<td>-0.00307</td>
</tr>
<tr>
<td></td>
<td>(0.00327)</td>
<td>(0.00317)</td>
<td>(0.00327)</td>
<td>(0.00318)</td>
<td>(0.00327)</td>
<td>(0.00319)</td>
<td>(0.00325)</td>
<td>(0.00313)</td>
</tr>
<tr>
<td>$\beta_{2012-2015}$</td>
<td>-0.01241***</td>
<td>-0.01065***</td>
<td>-0.01532***</td>
<td>-0.01262***</td>
<td>-0.01402***</td>
<td>-0.01202***</td>
<td>-0.01759***</td>
<td>-0.01480***</td>
</tr>
<tr>
<td></td>
<td>(0.00307)</td>
<td>(0.00301)</td>
<td>(0.00304)</td>
<td>(0.00301)</td>
<td>(0.00305)</td>
<td>(0.00302)</td>
<td>(0.00300)</td>
<td>(0.00298)</td>
</tr>
</tbody>
</table>

Controls for net income: netinc deciles, netinc deciles, netinc splines, netinc splines, netinc splines, netinc splines, netinc splines, netinc splines.

Observations: 244,035, 244,035, 244,035, 244,035, 244,035, 244,035, 244,035, 244,035.

Notes: Table A.4 shows first-difference estimates for treatment effect of “exposure” to the tax reform on the average earnings of employees based on regression specification (1.8). The exposure measure is defined as having at least one top-bracket owner and the outcome in each column is change in log average earnings. Each column controls for a different function of baseline firm net business income. The first column uses both 2011 and 2012 deciles of net business income; column 2 uses deciles of the average net income over 2011 and 2012; column 3 linear splines of 2012 income with 10 knots; column 4 uses linear splines of the average of 2011 and 2012 income with 10 knots. Columns 5 and 6 repeat 3 and 4 but with 20 knots. Columns 7 and 8 use cubic splines with 5 knots. Each specification also controls for log value-added per worker, 2-digit NAICS and state. Standard errors are clustered at the firm level.
Table A.5: Pass-Through of Business Tax Liability on Employee Earnings - K1 Income only

<table>
<thead>
<tr>
<th></th>
<th>All Employees</th>
<th>Stayers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>$\beta_{2012-2015}$</td>
<td>-0.1006***</td>
<td>-0.1685***</td>
</tr>
<tr>
<td></td>
<td>(0.0212)</td>
<td>(0.0352)</td>
</tr>
<tr>
<td>Pass-Through ($)</td>
<td>-0.2813***</td>
<td>-0.2750***</td>
</tr>
<tr>
<td></td>
<td>(0.0592)</td>
<td>(0.0574)</td>
</tr>
<tr>
<td>Mean $\Delta$Liability ($)</td>
<td>31,139</td>
<td>31,139</td>
</tr>
<tr>
<td>Implied $\Delta$Wage Bill ($)</td>
<td>8,759</td>
<td>8,563</td>
</tr>
<tr>
<td>Controls</td>
<td>Full</td>
<td>Full</td>
</tr>
<tr>
<td>Observations</td>
<td>81,780</td>
<td>81,780</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

Notes: This table displays first-difference estimates of intent-to-treat effect of log change in business income tax liability on average earnings. Business income is defined as the firm’s reported net business income. In column (1) the outcome is the average earnings of all full-time employees; in column (2) the outcome is the average earnings of firm “stayers,” employees incumbent with the firm at the time of the tax change that remain with the firm through 2015. The first row shows the elasticity estimated using Eq. (1.8). The second row contains estimates of the dollar-for-dollar pass-through attributable to the change in liability, which are estimated as $\beta_{2012-2015} \times (W/L)$, where $W/L$ is the ratio of the wage bill to tax liability calculated at the sample mean. Each regression is weighted by firm size and standard errors are clustered at the firm level. Standard errors for the pass-through estimate are calculated using the delta method.
A.1.3 Labor Market Models

Set-Up: Firm Owners’ Problem

I begin by presenting a general version of the firm problem that includes taxation of business income using a simple model where firms have a general firm-specific production function which may include a firm-specific product price. The firm maximizes firm-specific after-tax profits $\pi_j$,

$$\pi_j = Q_j(L^e(s), L^o, K) - \sum_s w_j(s)L^e(s) - \alpha \rho K - T(Q_j(L^e(s), L^o, K) - \sum_s w_j(s)L^e - (1 - \alpha)\rho K),$$

where $Q_j(\cdot)$ is the firm $j$ specific production function with the arguments $L^e(s)$ representing the vector of labor inputs for each skill level $s$ and $K$ representing capital. The firm-specific wage paid to employees of skill level $s$ is $w_j(s)$, $\rho$ is the opportunity cost of capital invested by the owner(s), and $\alpha$ is a parameter governing how capital income returns are subject to the business tax rate. If capital returns are fully deductible from the tax base, $\alpha = 0$, but if they are less than fully deductible (e.g. capital is funded by equity of the business owners) and the outside option capital investment of the owners does not face the same tax rate as the business income (e.g. dividend or capital gain returns), then $\alpha < 1$. Net profits are taxed according to a general non-linear income tax function $T(\cdot)$, which I treat as a graduated progressive income tax as is the case with the U.S. personal income tax.

Wage Bargaining

Workers have one discrete unit of labor they can supply to firm $j$; workers of a given skill-level decide whether to supply labor or not and receive earnings $w_j$. Earnings are set according to the Nash bargain

$$w_j^* = \arg\max_w [\theta \ln(w_j - b) + (1 - \theta)\ln P_j],$$

where $P_j$ is the share of firm profits $\pi_j$ in Eq. (1.1) attributable the hiring or retention of the employee. Formally, $P_j = q_j - w_j - \alpha \rho k - T(q_j - w_j - (1 - \alpha)\rho k)$ where $q_j$ is the marginal revenue product of hiring employee $j$, and $k$ is the capital investment necessary to equip employee $j$, or the average capital per worker of worker $j$’s skill type $K(s)/L^e(s)$, and $T(\cdot)$ is the average tax liability associated with the profits generated by workers of that skill type. The exogenous bargaining parameter is $\theta$, representing the bargaining power of the
worker, and $b$ is the worker's reservation wage. Differentiating with respect to earnings we have:

$$\frac{\partial}{\partial w_j} = \frac{\theta}{w_j - b} - \frac{(1 - \theta)(1 - \tau)}{(q_j - w_j - (1 - \alpha)\rho k)(1 - t) - \alpha pk},$$

where $t$ is the average tax rate and $\tau$ is the marginal tax rate, or $T'(\cdot)$. Setting this equal to 0 and rearranging gives the equilibrium wage:

$$w^* = \frac{(1 - \theta)(1 - \tau)b + \theta((1 - t)(q_j - (1 - \alpha)\rho k) - \alpha pk)}{(1 - \theta)(1 - \tau) + \theta(1 - t)}.$$  \hspace{1cm} (A.2)

The numerator is a weighted combination of the reservation wage, $b$, and the after-tax product of the employee's labor $(1 - t)(q_j - (1 - \alpha)\rho k) - \alpha pk$, weighted by the relative bargaining power of the firm and workers. The denominator is a bargaining power weighted function of the net marginal and average tax rates. Eq. (A.2) shows that, in general, the equilibrium wage is a function of both the average and marginal tax rates.

In the general case with a non-linear tax rate and where $0 < \theta < 1$, the size and direction of the earnings response to an increase in the top marginal tax rate will depend on the parameters of the model. Taking the derivative of $w^*$ given in Eq. (A.2) with respect to the marginal tax rate gives:

$$\frac{\partial w^*}{\partial \tau} = -\frac{((1 - \theta)b + \theta q_j \frac{\partial \tau}{\partial \tau}) ((1 - \theta)(1 - \tau) + \theta(1 - t))}{(1 - \theta)(1 - \tau) + \theta(1 - t))^2} + \frac{(1 - \theta + \theta \frac{\partial \tau}{\partial \tau}) ((1 - \theta)(1 - \tau)b + \theta((1 - t)(q_j - (1 - \alpha)\rho k) - \alpha pk)}{(1 - \theta)(1 - \tau) + \theta(1 - t))^2}$$

$$= \frac{-(1 - \theta)b + \theta q_j \frac{\partial \tau}{\partial \tau} + (1 - \theta + \theta \frac{\partial \tau}{\partial \tau})w^*}{(1 - \theta)(1 - \tau) + \theta(1 - t)} - \frac{(1 - \theta)(w^* - b) - \theta(q_j - w^*) \frac{\partial \tau}{\partial \tau}}{(1 - \theta)(1 - \tau) + \theta(1 - t)}$$

where moving from the first formulation to the second is done by substituting the equilibrium wage, $w^*(\theta, b, t, \tau, \alpha, \rho k)$, given in Eq. (A.2).

**Wage Posting**

Starting from the assumptions on the wage posting model described in the main text, define the elasticity of labor supply with respect to wage be $\eta$ such that $L = w^\eta$. Let the production function be general, but with the property that capital and labor are complements. Then we can define capital as a function of the choice of labor, $K(L) = K(w^\eta)$. Substituting this into the firm owner’s problem given by Eq. (A.1) and taking the first
order condition with respect to the wage and setting to zero, we find

\[
\frac{\partial \pi_j}{\partial w} = (1 - \tau) \left[ Q_L \eta w^{\eta-1} + Q_K \frac{\partial K}{\partial L} \eta w^{\eta-1} - (\eta + 1)w^{\eta} \right] - \rho \frac{\partial K}{\partial L} \eta w^{\eta-1} = 0 \iff
\]

\[
= (1 - \tau) \left[ Q_L + Q_K \frac{\partial K}{\partial L} \frac{\eta + 1}{\eta} w - \rho \frac{\partial K}{\partial L} \right],
\]

where \(\tau\) is the marginal tax rate defined as \(T'(\cdot)\). Letting \(q_j\) represent the net marginal revenue product associated with the employment of the given worker, we have

\[
w^* = \frac{\eta}{1 + \eta} \left[ q_j - \frac{\rho k}{1 - \tau} \right]
\]

where \(k\) represents the capital required when employing the additional unit of labor that comes from the wage increase.

The elasticity of labor supply, \(\eta\), is an endogenous reduced form parameter which is a function of the wage \(w^*\) as well as the elasticity of labor supply to the firm which reflects the heterogeneity in preferences over firm-specific workplace characteristics. Adapting the notation from Manning (2011), let \(\beta\) be the elasticity of labor supply to firm \(j\) and the labor supply curve of workers of quality \(s\) to firm \(j\) be

\[
L_j(s) = L(s)(w_j(s) - b_j(s))^\beta
\]

where \(w_j(s)\) is the wage offered to workers of quality \(s\), \(b_j(s)\) is the lowest reservation wage of the workers of quality \(s\) required to work for firm \(j\), and \(L(s)\) be the density of available workers of quality \(s\). Labor is supplied to firm \(j\) as a function of the net wage premium \(w_j(s) - b_j(s)\) with elasticity \(\beta\). From this firm-specific labor supply curve, we can calculate the elasticity of labor supply with respect to the offered wage, \(\eta = d\ln(L_j)/d\ln(w_j)\), is

\[
\eta = \beta \frac{w_j}{w_j - b_j}.
\]

Now, plugging the formula for the labor supply elasticity \(\eta\) into the equilibrium wage equation, we get

\[
w^* = (1 - \theta)b + \theta \left[ q_j - \frac{\rho k}{1 - \tau} \right],
\]

where \(\theta = \frac{\beta}{1+\beta}\).
Taking the derivative of the equilibrium wage with respect to the tax rate, we get

$$\frac{\partial w^*}{\partial \tau} = -\theta \frac{\rho k}{(1 - \tau)^2}$$

The derivative is negative, therefore the equilibrium wage is decreasing in the business tax rate. Also, we see that the derivative is increasing in $\theta$ and equals zero if $\theta = 0$. The parameter $\theta$ depends on the labor supply elasticity to the firm with respect to the wage surplus $(w_j - b_j)$. If market is perfectly competitive, the labor supply elasticity is perfectly elastic, the employees earn no surplus and the tax rate has no effect on earnings. If the firm faces an upward sloping supply curve, or if the elasticity is finite, then the firm's tax rate will affect employee earnings.
A.1.4 Welfare Analysis in a More General Framework

I assume that there are only two types of agents in the economy, business owners that are at the top of the income distribution and face tax rate $\tau$ and employees who are lower in the income distribution and face tax rate $t$, where $\tau > t$. Firm owners’ and employees’ utility functions are represented by the following:

$$
\text{Owners: } u^o(c, z(\pi, e)) = (1 - \tau)z_o(\pi, e) - \psi(\pi, e), \quad (A.3)
$$

$$
\text{Employees: } u^e(c, z(\omega, -e)) = (1 - t)z_e(\omega, -e) - \phi(\omega, -e). \quad (A.4)
$$

Agents receive positive utility from consumption, but negative utility from activities which pre-tax earnings $z$ such that $u_c > 0$ and $u_z < 0$. Earnings $z$ is increasing in its arguments. Owners and employees choose $\pi$ and $\omega$, respectively, and experience utility costs, $\psi$ and $\phi$, which are increasing and convex in net-of-surplus earnings $\pi$ and $\omega$. Optimization with respect to these arguments implies

$$
\text{Owners: } (1 - \tau)\frac{\partial z_o}{\partial \pi} = \frac{\partial \psi}{\partial \pi} \quad (A.5)
$$

$$
\text{Employees: } (1 - t)\frac{\partial z_e}{\partial \omega} = \frac{\partial \phi}{\partial \omega} \quad (A.6)
$$

Whether the agents choose the surplus share, $e$, and experience an associated utility cost, or whether it is as an exogenous parameter in their optimization problems depends on the labor market model. When $e$ is directly chosen by agents, the shape of the earnings and cost functions will depend on the underlying labor market model as well. Generally, I assume only that $z$ is increasing in its second argument and the cost functions are decreasing in their second arguments.

The government does not observe $\pi$ or $\omega$ directly, but only the total taxable income of owners and workers, $z$. I assume the government collects taxes and returns the money to everyone lump-sum, or analogously, that the social marginal value of public funds equals one. The welfare in the economy can be represented by:

$$
W = (1 - \tau)z_o(\pi, e) - \psi + (1 - t)z_e(\omega, -e) - \phi + \tau z_o(\pi, e) + tz_e(\omega, -e)
$$

$$
\text{owner welfare} \quad \text{employee welfare} \quad \text{government revenue} \quad (A.7)
$$

To assess the excess burden generated by a small change in the top marginal tax rate, I differentiate Eq. (A.7) with respect to the top marginal tax rate, $\tau$. A small increase in the tax rate produces a mechanical effect and a behavioral response, and also induces a
pre-tax transfer of surplus, \( de/d\tau \). The impact of these responses for owners employees and government revenue are summarized below.

\[
\frac{\partial W}{\partial \tau} = \frac{\partial z_o}{\partial \pi} \frac{d\pi}{d\tau} + t \frac{\partial z_e}{\partial \omega} \frac{d\omega}{d\tau} + \tau \frac{\partial z_o}{\partial e} \frac{de}{d\tau} - t \frac{\partial z_e}{\partial e} \frac{de}{d\tau} + \tau \frac{\partial z_o}{\partial e} \frac{de}{d\tau} - t \frac{\partial z_e}{\partial e} \frac{de}{d\tau} + \tau \frac{\partial z_o}{\partial e} \frac{de}{d\tau} - t \frac{\partial z_e}{\partial e} \frac{de}{d\tau} + \tau \frac{\partial z_o}{\partial e} \frac{de}{d\tau} - t \frac{\partial z_e}{\partial e} \frac{de}{d\tau} \]

\( \text{behavioral response} \quad \text{rev. externality from transfer} \quad \text{direct effect of transfer} \)

The mechanical effect holds behavior constant. An increase in the tax rate leaves the owner with less after-tax income and generates an equal amount of revenue for the government, and so produces no net change in welfare. The owners’ and employees’ choice of net-of-surplus earnings, \( \pi \) and \( \omega \) respectively, may respond to the rate change, but this behavioral response produces no first-order effect on the agents’ welfare because the earnings behavior was chosen optimally given \( \tau \). This is the standard application of the envelope theorem as implied by Eqs. (A.5) and (A.6). The behavioral response does have a first-order effect on revenue because the owner does not internalize the fiscal externality associated with the response.

The tax change induces a transfer in pre-tax surplus away from employees and towards owners, \( de/d\tau > 0 \). There is a fiscal externality associated with the transfer as long as the money is shifted across groups facing different tax rates. The net effect depends on whether the surplus, \( e \), is a choice variable or an exogenous parameter in the agents’ optimization problems, which will determine whether the envelope theorem applies to the welfare effects of the transfer.

The three cases follow. In each case, in this general setting like in the main text, i) the owners’ taxable income response will not be a sufficient statistic for welfare analysis, and ii) when the taxable earnings response of the employees with respect to a top rate increase is negative, the owners’ taxable income response will understate the total welfare effect.

**Case 1: Transfer determined by the market** *(\( de/d\tau \) has first-order welfare effects for owners and employees)*

Agents do not choose \( e \), instead \( e \) is determined by the market and becomes a parameter in their optimization problems. Owners and employees solve:

** Owners:** \( \max_{c,\pi} u(c, z(\pi; e)) = (1 - \tau)z(\pi; e) - \psi(\pi) \)
Employees: \( \max_{c,w} u(c, z(\omega; -e)) = (1 - t)z(\omega; -e) - \phi(\omega) \)

which imply optimal choices \( \pi(\tau, e) \) and \( w(t, e) \) which are implicit function of the tax rates and the surplus share. The resulting net marginal welfare effect of a small increase in the top marginal tax rate is

\[
\frac{\partial W}{\partial \tau} = \tau \frac{\partial z_o}{\partial \pi} \frac{d\pi}{d\tau} - t \frac{\partial z_e}{\partial \omega} \frac{d\omega}{de} \frac{de}{d\tau} + \frac{\partial z_o}{\partial e} \frac{de}{d\tau} - \frac{\partial z_e}{\partial e} \frac{de}{d\tau}
\]

If the marginal change in earnings with respect to a small change in surplus is the same for owners and employees \( (\partial z_o/\partial e = \partial z_e/\partial e) \), as in the main text, then the transfer has no net welfare effect. This is the case when the transfer is zero-sum between owners and employees and utility is linear in earnings. The net welfare effect is then,

\[
\frac{\partial W}{\partial \tau} = \tau \left( \frac{\partial z_o}{\partial \pi} \frac{d\pi}{d\tau} + t \frac{\partial z_e}{\partial \omega} \frac{d\omega}{de} \frac{de}{d\tau} \right) + t \left( \frac{\partial z_e}{\partial \omega} \frac{d\omega}{de} \frac{de}{d\tau} - \frac{\partial z_o}{\partial e} \frac{de}{d\tau} \right) - (\tau - t) \frac{\partial z}{\partial e} \frac{de}{d\tau}
\]

where the third term in the second formulation comes from the zero-sum assumption. The first formulation in Eq. (A.9) shows that the welfare change is independent of the transfer and comes from fiscal externality from the change in economic decisions of the agents. Eq. (A.9) shows the primary results from the main text hold in the more general setting, i) the taxable income response of the owners is not a sufficient statistic for the marginal welfare loss, and ii) when the net earnings response of employees is negative, the taxable income response of the owners understates the total marginal welfare loss. In the more general setting the taxable income responses of the owners and employees to the top rate change are not sufficient statistics for welfare analysis; one also needs to be able to separately identify the transfer response from the total taxable income responses. But, the net revenue effect associated with the total taxable income responses understates the total marginal welfare loss by a constant - the transfer response weighted by the difference between owner and employee tax rates. When the taxable income response of employees is negative, the total revenue response from owners and employees will be a lower bound for the magnitude of the welfare loss, and will better approximate the welfare loss than the owner response alone.\(^1\)

\(^1\)This result is the same as in the main text. The main text presents a special case where the employees’ taxable income response is a sufficient statistic.
Case 2: Transfer determined by owner and employee optimization \((de/dτ \text{ has no first-order welfare effects for owners or employees})\)

When agents choose \(e\) as part of their optimization problem, owners and employees solve:

\[
\begin{align*}
\max_{c,\pi,e} u(c, z(\pi, e)) &= (1 - \tau)z(\pi, e) - \psi(\pi, e) \\
\max_{c,w,-e} u(c, z(w, e)) &= (1 - t)z(w, -e) - \phi(w, -e)
\end{align*}
\]

Owners jointly choose \((c, \pi, e)\) and employees jointly choose \((c, w, e)\), and the choice of \(e\) affects consumption, but also has a utility cost. The agents’ optimization problems with respect to \(e\) imply

\[
\begin{align*}
\text{Owners:} & \quad (1 - \tau)\frac{\partial z_o}{\partial e} = \frac{\partial \psi}{\partial e} \\
\text{Employees:} & \quad (1 - t)\frac{\partial z_e}{\partial e} = \frac{\partial \phi}{\partial e}
\end{align*}
\]

When the agents choose \(e\) optimally, at the margin a tax induced change in \(e\), \(de/dτ\), has no first-order on agents’ welfare. The envelope theorem applies to the direct effect of transfer and only the revenue externality remains, as seen in Eq (A.8). The resulting marginal welfare loss is given by:

\[
\frac{\partial W}{\partial \tau} = \tau \left( \frac{\partial z_o}{\partial \pi} \frac{d\pi}{d\tau} + \frac{\partial z_o}{\partial e} \frac{de}{d\tau} \right) + t \left( \frac{\partial z_e}{\partial \omega} \frac{d\omega}{d\tau} \frac{de}{d\tau} - \frac{\partial z_e}{\partial e} \frac{de}{d\tau} \right)
\]

The result is almost identical to that in the main text. The marginal welfare loss is equal to the total marginal revenue effect from all taxed induced behavioral responses from all sources. The main implications are also the same, i) the taxable income response of the owners is not a sufficient statistic, ii) the taxable income response of the owners will understate the total marginal welfare loss, and iii) in this case, the taxable income responses of the owners and employees are sufficient statistics for the marginal welfare loss.

Case 3: Transfer determined by owner optimization \((de/dτ \text{ has a first-order welfare effect for employees only})\)

In the intermediate case where \(e\) is chosen directly by the owner, but not by the em-
ployees, the optimization problems of the agents are:

\[
\max_{c,\pi,e} u(c, z(\pi, e)) = (1 - \tau)z(\pi, e) - \psi(\pi, e)
\]

\[
\max_{c,w} u(c, z(w; -e)) = (1 - t)z(w; -e) - \phi(w)
\]

In this case the tax induced transfer will have no first-order effect on the welfare of the owners by the envelope condition, but there will be a first-order effect on the welfare of the employees. The marginal welfare effect is given by:

\[
\frac{\partial W}{\partial \tau} = \tau \left( \frac{\partial z_o}{\partial \pi} \frac{d\pi}{d\tau} + \frac{\partial z_o}{\partial e} \frac{de}{d\tau} \right) + t \left( \frac{\partial z_e}{\partial \omega} \frac{d\omega}{de} \frac{de}{d\tau} - \frac{\partial z_e}{\partial e} \frac{de}{d\tau} \right) \tag{A.11}
\]

\[
\frac{\partial W}{\partial \tau} = \tau \left( \frac{\partial z_o}{\partial \pi} \frac{d\pi}{d\tau} + \frac{\partial z_o}{\partial e} \frac{de}{d\tau} \right) + t \left( \frac{\partial z_e}{\partial \omega} \frac{d\omega}{de} \frac{de}{d\tau} - \frac{\partial z_e}{\partial e} \frac{de}{d\tau} \right) - (1 - t) \frac{\partial z_e}{\partial e} \frac{de}{d\tau}, \text{ or}
\]

\[
\frac{\partial W}{\partial \tau} = \tau \left( \frac{\partial z_o}{\partial \pi} \frac{d\pi}{d\tau} + \frac{\partial z_o}{\partial e} \frac{de}{d\tau} \right) + t \left( \frac{\partial z_e}{\partial \omega} \frac{d\omega}{de} \frac{de}{d\tau} - \frac{\partial z_e}{\partial e} \frac{de}{d\tau} \right) - (1 - t) \frac{\partial z_e}{\partial \omega} \frac{d\omega}{de} \frac{de}{d\tau}
\]

The main intuition remains: i) the taxable income response of the owners is not a sufficient statistics, and ii) using the owners’ taxable income response alone understates marginal welfare loss when the taxable income response of employees is negative. As in Case1, the taxable earnings responses of the owners and employees are not sufficient statistics for welfare analysis in the general case, one also needs to be able to differentiate the transfer response from the total taxable income responses. Also, the total marginal revenue effect from all taxed induced behavioral responses of owners and employees is a lower bound on the magnitude of the total marginal welfare loss, as seen in the second formulation of Eq. (A.11). Using owners’ and employees’ taxable income responses provides a better approximation of the total welfare loss. The appropriate weighting for the latter statistic to best approximate the welfare effect depends on whether a larger share of the employees’ earnings response is from the transfer or from changes in real economic behavior in response to the transfer, as seen by comparing the second and third formulation is Eq. (A.11).
APPENDIX B

Chapter II Supporting Material

B.1 Appendix

B.1.1 Figures

Figure B.1: First-time FBAR filers, amended vs. non-amended, 2005-2011

Notes: This figure plots aggregates on new disclosers of foreign accounts (those not filing FBAR in previous years, see text for details), by year and whether the new filer also filed late/amended FBARs for prior years. OVD participants and non-US address filers are excluded from the tabulations. The series are normalized by the 2008 level. The overall number of late/amended FBARs is small, but we observe an enormous increase in late/amended FBARs in relative terms in 2009. The 2008 levels are 1,092 for amending filers and 37,619 for non-amending filers.
Figure B.2: Event Study of Reported Income for OVD Participants

Panel A: Other Income Sources

![Graph showing coefficients on event-year dummies for various income sources.]

Panel B: Propensity to Report Positive Capital Income

![Graph showing propensity to report positive capital income.]

Notes: This figure plots the coefficients on event-year dummies in the event study regression for given income sources (Panel A) and a binary dependent variable indicating whether the individual reported any capital income (Panel B). Event-year 0 represents the tax year associated with the year of initial OVD participation. The 95% confidence interval is calculated from estimated standard errors clustered at the individual level. In Panel A, the outcome variable is an inverse hyperbolic sine transformation of a given income source.
Figure B.3: Event Study of Reported Income for First-Time FBAR Filers

Panel A: Other Income Sources

Notes: This figure plots the coefficients on event-year dummies in the event study regression for given income sources (Panel A) and a binary dependent variable indicating whether the individual reported any capital income (Panel B). Event-year 0 represents the tax year associated with the year of first-time FBAR filing. The 95% confidence interval is calculated from estimated standard errors clustered at the individual level. In Panel A, the outcome variable is an inverse hyperbolic sine transformation of a given income source.
Figure B.4: Decomposing Reported Income in Event Study of OVD Participants

Panel A: Interest

Panel B: Dividends

Notes: This figure repeats the exercise in Figures 2.9 and 2.10 for interest and dividend income, decomposing these types of income into income reported by domestic financial institutions (on Forms 1099-INT and 1099-DIV) and income reported by the taxpayer but not reported by domestic financial institutions. Event-year 0 represents the tax year associated with the year of initial OVD participation. The 95% confidence interval is calculated from estimated standard errors clustered at the individual level. The outcome variable is an inverse hyperbolic sine transformation of the given income source such that point estimates can be interpreted similarly to a log transformation.
Notes: This figure plots the regression coefficients on the event time dummies from a linear probability model where the outcome variable is an indicator for amending a 1040 from one of the previous four years in year $t$. The sample is identical to that of Figure 2.10. Confidence Intervals are derived from estimated standard errors which are clustered at the individual level. We observe a substantial spike in filing amended tax returns following the disclosure of a foreign account, which is strongly suggestive of a number of quiet disclosures.
Figure B.6: The Ratio of Account Value to Previously Reported Capital Income

Panel A: OVD Participants

Panel B: First-Time Filers

Notes: This figure shows quantiles of the ratio of total FBAR account value to capital income in the year before disclosure, by rank in the total capital income distribution. We rank individuals according to their rank among OVD participants or first-time filers rather than the entire population, for simplicity. To obtain total FBAR account value, we add across accounts if the individual reported multiple accounts. Results are very similar when using the maximum account value. Individuals with zero capital income in the prior year are excluded from the analysis.
B.1.2 Tables
Table B.1: Event Study of Reported Income for OVD Participants

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Standard errors clustered at the individual-level

*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports the regression coefficients plotted in Figure 2.9 and Figure B.2
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<th>(6)</th>
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</thead>
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<td>(0.019914)</td>
<td>(0.019104)</td>
<td>(0.019111)</td>
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<tr>
<td>Treat*Event time 4</td>
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<td>0.609308***</td>
<td>0.455921***</td>
<td>0.456233***</td>
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<td>455,201</td>
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<td>370,521</td>
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<tr>
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<td>0.847410</td>
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</tbody>
</table>

Standard errors clustered at the individual-level

*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports several alternative specifications of the estimation of equation (2.1) on the impact of disclosure on reported total financial capital income. Column (1) is identical column (4) of Table B.1. Column (2) drops zeros in event year -1, as these individuals are also excluded from the analysis in Table B.8. Column (3) drops all observations of zero financial capital income. Columns (4) is similar to column (3), but use a traditional logarithmic transform instead of an inverse hyperbolic sine transform. In columns (5) and (6) we estimate the regression on a balanced panel of taxpayers using the inverse hyperbolic sine transformation and natural log of the outcome, respectively.
### Table B.3: Event Study of Reported Income for First-Time FBAR Filers

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<tr>
<th>Variables</th>
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<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
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<td>For any Capital Income</td>
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<tr>
<td>For any Schedule C Income</td>
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<td>-0.032300*</td>
<td>-0.007597</td>
<td>0.000033</td>
<td>0.114827***</td>
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<td>For any Schedule E Income</td>
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<td>0.020076*</td>
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<td>For any Treatment time 0</td>
<td>0.319700***</td>
<td>0.112550***</td>
<td>0.026411*</td>
<td>0.282919***</td>
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<tr>
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<tr>
<td>For any Treatment time 2</td>
<td>0.599319***</td>
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<tr>
<td>For any Treatment time 4</td>
<td>0.549502***</td>
<td>0.231005***</td>
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<td>0.372131***</td>
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Standard errors clustered at the individual-level

*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports the regression coefficients plotted in Figure 2.10 and Figure B.3.
Table B.4: Decomposing Reported Income in Event Study of OVD Participants

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<th>Variables</th>
<th>(1) Non-1099 Interest</th>
<th>(2) 1099 Interest</th>
<th>(3) Total Interest</th>
<th>(4) Non-1099 Dividends</th>
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<td>Treat*Event time -4</td>
<td>0.031721</td>
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R-squared: 0.576671, 0.767779, 0.761839, 0.568226, 0.861470, 0.842375

Standard errors clustered at the individual-level
*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports the regression coefficients plotted in Figure B.4
Table B.5: Decomposing Reported Income in Event Study of First-Time FBAR Filers

<table>
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<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
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<td>Non-1099 Interest</td>
<td>1099 Interest</td>
<td>Total Interest</td>
<td>Non-1099 Dividends</td>
<td>1099 Dividends</td>
<td>Total Dividends</td>
</tr>
<tr>
<td>Treat*Event time -4</td>
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<td>-0.055918***</td>
<td>-0.213678***</td>
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<td>(0.014507)</td>
<td>(0.013662)</td>
<td>(0.032061)</td>
<td>(0.013382)</td>
<td>(0.014861)</td>
</tr>
<tr>
<td>Treat*Event time 0</td>
<td>0.749249***</td>
<td>0.049669***</td>
<td>0.319700***</td>
<td>0.269119***</td>
<td>-0.064529***</td>
<td>0.112550***</td>
</tr>
<tr>
<td></td>
<td>(0.031612)</td>
<td>(0.014572)</td>
<td>(0.014178)</td>
<td>(0.033294)</td>
<td>(0.013266)</td>
<td>(0.015046)</td>
</tr>
<tr>
<td>Treat*Event time 1</td>
<td>1.215824***</td>
<td>0.259789***</td>
<td>0.615175***</td>
<td>0.339037***</td>
<td>-0.003119</td>
<td>0.199839***</td>
</tr>
<tr>
<td></td>
<td>(0.037404)</td>
<td>(0.019562)</td>
<td>(0.017974)</td>
<td>(0.035280)</td>
<td>(0.018205)</td>
<td>(0.019377)</td>
</tr>
<tr>
<td>Treat*Event time 2</td>
<td>1.139670***</td>
<td>0.297143***</td>
<td>0.593199***</td>
<td>0.322458***</td>
<td>0.047191**</td>
<td>0.208778***</td>
</tr>
<tr>
<td></td>
<td>(0.038324)</td>
<td>(0.021409)</td>
<td>(0.019890)</td>
<td>(0.037248)</td>
<td>(0.021780)</td>
<td>(0.022310)</td>
</tr>
<tr>
<td>Treat*Event time 3</td>
<td>1.127410***</td>
<td>0.283152***</td>
<td>0.561062***</td>
<td>0.376952***</td>
<td>0.090953***</td>
<td>0.229531***</td>
</tr>
<tr>
<td></td>
<td>(0.040379)</td>
<td>(0.022850)</td>
<td>(0.021647)</td>
<td>(0.041276)</td>
<td>(0.023776)</td>
<td>(0.024515)</td>
</tr>
<tr>
<td>Treat*Event time 4</td>
<td>1.101122***</td>
<td>0.303910***</td>
<td>0.549502***</td>
<td>0.297557***</td>
<td>0.110638***</td>
<td>0.231005***</td>
</tr>
<tr>
<td></td>
<td>(0.041184)</td>
<td>(0.024423)</td>
<td>(0.022800)</td>
<td>(0.042471)</td>
<td>(0.025432)</td>
<td>(0.025752)</td>
</tr>
</tbody>
</table>

Observations: 829,532 829,532 829,533 829,531 829,533 829,533
R-squared: 0.607445 0.746965 0.768602 0.603660 0.851211 0.840233

Standard errors clustered at the individual-level
*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports the regression coefficients plotted in Figure 2.11.
Table B.6: Probability of Amending Returns Relative to First-Time Filing

<table>
<thead>
<tr>
<th>Variables</th>
<th>Amend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treat*Event time -4</td>
<td>-0.004717***</td>
</tr>
<tr>
<td></td>
<td>(0.001799)</td>
</tr>
<tr>
<td>Treat*Event time -3</td>
<td>-0.008348***</td>
</tr>
<tr>
<td></td>
<td>(0.001888)</td>
</tr>
<tr>
<td>Treat*Event time -2</td>
<td>-0.003798**</td>
</tr>
<tr>
<td></td>
<td>(0.001850)</td>
</tr>
<tr>
<td>Treat*Event time 0</td>
<td>0.033132***</td>
</tr>
<tr>
<td></td>
<td>(0.002020)</td>
</tr>
<tr>
<td>Treat*Event time 1</td>
<td>0.016392***</td>
</tr>
<tr>
<td></td>
<td>(0.001960)</td>
</tr>
<tr>
<td>Treat*Event time 2</td>
<td>0.005307***</td>
</tr>
<tr>
<td></td>
<td>(0.001892)</td>
</tr>
<tr>
<td>Treat*Event time 3</td>
<td>0.000590</td>
</tr>
<tr>
<td></td>
<td>(0.002070)</td>
</tr>
<tr>
<td>Treat*Event time 4</td>
<td>-0.002472</td>
</tr>
<tr>
<td></td>
<td>(0.001889)</td>
</tr>
</tbody>
</table>

Observations 829,533
R-squared 0.160275

Standard errors clustered at the individual-level
*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports the regression coefficients plotted in Figure B.5.
Table B.7: Estimates of the Total Effect of IRS Enforcement Initiatives (Direct Method)

<table>
<thead>
<tr>
<th>Coefficient (t+1)</th>
<th>Change in Total Reported Capital Income (millions)</th>
<th>Tax Rate (millions)</th>
<th>Revenue Estimate (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OVD Participants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>1.06</td>
<td>403</td>
<td>0.35</td>
</tr>
<tr>
<td>Dividends</td>
<td>0.49</td>
<td>218</td>
<td>0.15</td>
</tr>
<tr>
<td>Capital Gains</td>
<td>0.21</td>
<td>70</td>
<td>0.15</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>691</td>
<td>0.27</td>
</tr>
<tr>
<td><strong>First-time Filers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>0.62</td>
<td>2,573</td>
<td>0.35</td>
</tr>
<tr>
<td>Dividends</td>
<td>0.20</td>
<td>970</td>
<td>0.15</td>
</tr>
<tr>
<td>Capital Gains</td>
<td>0.10</td>
<td>37</td>
<td>0.15</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3,580</td>
<td>0.29</td>
</tr>
</tbody>
</table>

Notes: This table constructs the estimate of the total effect on reported capital income and tax revenues using the “direct method” described in the text, i.e. simply applying the event study estimates to each observation assuming a uniform effect of disclosure on income reporting. The first column reports the coefficient from the event study for each type of capital income. The second reports the total effect on capital income. The third column reports the tax rate we use to construct the revenue estimate. We assume for simplicity that realized capital gains and dividends are taxed at the preferred rate, which was 15 percent in the top tax bracket in the period we study. The last column multiplies the total change in reported income by the tax rate.
Table B.8: Estimate of the Total Effect (Indirect Method)

<table>
<thead>
<tr>
<th></th>
<th>Average Percent Change in E[$V_i/y_i$] (trimmed 95th ptile)</th>
<th>Total Reported Assets (millions)</th>
<th>Change in Total Reported Capital Income (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient (t+1)</td>
<td>E[$d_i * r_i$]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVD Participants</td>
<td>0.75</td>
<td>51.26</td>
<td>0.022</td>
</tr>
<tr>
<td>First-time Filers</td>
<td>0.49</td>
<td>46.17</td>
<td>0.014</td>
</tr>
</tbody>
</table>

Notes: This table constructs the estimate of the total effect on reported capital income and tax revenues using the “indirect method” described in the text. We first convert the coefficient from total financial capital income in the event studies to its implied percent change in income. We then use equation (2.4) to estimate E[$d_i * r_i$] from the reported statistics in the second and third column. We apply this via equation (2.2) to the total reported assets to estimate the total effect on reported income.
Table B.9: Estimated Rates of Return on Foreign Assets

<table>
<thead>
<tr>
<th>Change in Total</th>
<th>Total Reported Assets (millions)</th>
<th>Reported Capital Income (millions)</th>
<th>E[d_i * r_i]</th>
<th>E[r_i]</th>
<th>E[d_i]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OVD Participants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Method</td>
<td>20,700</td>
<td>691</td>
<td>0.033</td>
<td>0.033</td>
<td>1</td>
</tr>
<tr>
<td>Indirect Method</td>
<td>20,700</td>
<td>454</td>
<td>0.022</td>
<td>0.022</td>
<td>1</td>
</tr>
<tr>
<td><strong>First-time Filers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Method</td>
<td>114,467</td>
<td>3,580</td>
<td>0.031</td>
<td>0.033</td>
<td>0.94</td>
</tr>
<tr>
<td>Indirect Method</td>
<td>114,467</td>
<td>1,568</td>
<td>0.014</td>
<td>0.022</td>
<td>0.62</td>
</tr>
</tbody>
</table>

**Notes:** This table considers the implications of our results using the direct or indirect method (Tables 2.3, B.7 and B.8) for rates of return on foreign wealth. The first two columns report the total assets and total change in reported capital income. The third column estimates the compliance-adjusted rate of return. For the direct method, this is calculated by dividing the change in reported capital income by total reported assets; for the indirect method, it is calculated using equation (2.4). In the last two columns, we decompose the compliance adjusted rate of return into the actual rate of return for previously non-compliant account, and the fraction of accounts that are non-compliant, under the assumption that 1) all OVD participants were previously non-compliant, and 2) the rate of return was the same for OVD participants and first-time filers.
C.1 Appendix

C.1.1 Figures

Figure C.1: Number of Independent Contractors by State, 2001 and 2015

Notes: This figure shows the number of independent contractors by state in 2001 and 2015. ICs are defined using our preferred definition, 1099 recipients that report less than $10K in deductions on a Schedule C, excluding car and travel expenses.
Figure C.2: Percent change in Independent Contractors from 2001-2015, by Industry

Notes: This figure shows the percent change in the number of ICs by the industry from 2001 and 2015. ICs are defined according to our preferred definition, 1099 recipients that report less than $10K in deductions on a Schedule C, excluding car and travel expenses. Industries are defined as the two-digit NAICS categories as reported on the firm’s income tax return.
Figure C.3: Firm use of Independent Contractors, by Industry

Panel A: Percent of Firms with any IC (Extensive Margin)

Panel B: Worker Ratio (Intensive Margin)

Notes: These figures decompose the extensive and intensive margin measures of firm IC as presented in Figure 3.10 by 2 digit industry codes (NAICS). Only industries with over 1,000 observations per year are shown. Firms are categorized by their position in the distribution of firm median wages. Panel A shows the extensive margin; Panel B shows the intensive margin defined by the worker ratio. ICs correspond with our preferred IC definition, individual ICs with less than $10K in Schedule C deductions, excluding car and travel expenses.
BIBLIOGRAPHY


Labanca, Claudio, and Dario Pozzoli. 2017. “Coordination of Hours within the Firm.”


