

Taxes, Private Equity, and Evolution of Income Inequality in the US*

Sebastian Dyrda

Benjamin Pugsley

University of Toronto

University of Notre Dame

sebastian.dyrda@utoronto.ca

bpugsley@nd.edu

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Abstract

From 1980 to 2012 the share of U.S. business organized as pass-through entities (for example LLCs and S-corporations) rather than C-corporations more than doubles. We show the shift in business organization has significant implications for real economic activity. First, using firm-level administrative data on flows between legal forms, we show that reorganizations surge during a sequence of tax-reforms that reduce the effective tax rate on pass-through business income. Next, using a decomposition of changes in the income distribution, we show that the rise of pass through entities explains roughly 40 percent of the increase in the share of *pre-tax* income for top 1 percent households. Finally, to understand the economic mechanism linking tax reform and changes in real activity, we provide an equilibrium model with heterogeneous households and entrepreneurs with an endogenous choice of legal form. We use the model to quantify the contribution of TRA86 tax reform through the business reorganization channel to the evolution of household income, wealth and consumption inequality. Looking forward, we study the predicted effects of the TCJA 2017 through the lens of the model.

Keywords: Income inequality; Business Taxation; TRA 1986; TCJA 2017

JEL Codes: E60; H32; K2; L2

*Dyrda: University of Toronto, Max Gluskin House, 150 St. George Street, Toronto, ON M5S 3G7, Canada, sebastian.dyrda@utoronto.ca. Pugsley: University of Notre Dame, 3029 Jenkins Nanovic Hall, Notre Dame, IN 46556, USA. We thank the participants of the seminars at the NBER Summer Institute Income Distribution and Macroeconomics, Entrepreneurship and Macro Public Finance, SED Annual Meeting in Edinburgh, Junior Macro Conference at the Arizona State University, Autonomous University of Barcelona, Philadelphia FED, North American Meeting of the Econometric Society in Philadelphia, Heterogeneity in Macroeconomics a Decade after the Crisis at the University of Cambridge. Any opinions and conclusions expressed herein are those of the author(s) and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed.

1 Introduction

Top income shares grew substantially in the United States since 1980. From 1980 to 2012, according to U.S. tax returns, the *pre-tax* market income share of the top 1 percent of U.S. households grew from 8.2 percent to 18.2 percent¹. The same pattern is observed for other top income groups. Recently a large number of papers have studied the policy implications, theoretical foundations and statistical decomposition of this phenomenon². With a recent exception of [Smith, Yagan, Zidar, and Zwick \(2019\)](#), what is less studied is the shift in the *composition* of income for these top income groups. The share of entrepreneurial income (from sole proprietors, partnerships and S corporations) within the top 1 percent income group almost tripled from 13.3 percent to 30.0 percent in this period. These secular shifts in the income distribution have been accompanied by the rise in the number of pass-through entities, which grew in terms of share of business receipts from 13.1 percent to 36.9 percent in 2012.³ In this paper we argue that the two phenomena are tightly related and that the rise of pass-through entities is an important, *non-mechanical*, contributor to the surge in pre-tax income inequality. A series of tax reforms and regulations introduced since 1980 made pass-through legal forms more attractive choice for a large class of businesses. Importantly, the change in the composition of legal forms is more than a change in taxation of profits and a shift from corporate to pass-through accounts. The shift from C corporations towards pass-through entities induced a behavioral change of firms and their owners. Smaller fractions of profits were retained within the pass-through businesses, which led to higher pre-tax income of their owners, driving largely the change in composition at the top of income distribution and rise of the top income shares.

This paper makes three contributions. First, we provide new evidence on the flows between the legal forms of organization of firms in the United States since 1980 from the US Census Bureau Longitudinal Business Database (LBD) and linked Business Register (BR). This has two advantages over previous evidence based on the composition of tax returns released by the Internal Revenue Service: (1) we analyze transitions of actual U.S. employ-

¹In a recent note [Guvenen and Kaplan \(2017\)](#) compare the patterns of top income shares between the IRS and U.S. Social Security Administration (SSA) data sets. They conclude that the divergence between the two series is mainly due to the presence of income accrued to pass-through entities in the IRS data. This type of income is precisely the focus of this paper so we use the numbers from the IRS data as a motivation.

²See for example [Atkinson et al. \(2011\)](#), [Piketty and Saez \(2013\)](#), [Alvaredo et al. \(2013\)](#), [Bricker et al. \(2016\)](#), [Piketty et al. \(2016\)](#) among many others.

³Pass-through entities are businesses whose income is passed entirely to the owner and taxed based on the personal income tax code. The legal forms which are pass-through entities are: sole proprietorships, general partnerships, limited partnerships, limited liability companies and S corporations. In Section 3.1 of the paper we provide a detailed discussion on differences between various legal forms of organization.

ers, whereas IRS tax returns contain both employers and other shell companies with no employees or even expenses, and (2) we are able to measure the changes in legal forms at the business entity level. Exploiting the panel dimension of the data, we decompose the flows into the intensive margin (switching) and extensive margin (entry and exit). We show that the majority of the flows were at the intensive margin. Having documented the significant firm-level reorganizations around the tax reforms (3) we show that choice of legal form has significant effects on firms choice of real quantities—a reorganization is not simply a change in accounting: among the set of firms that elect a pass through conversion, those that convert after the tax reform tend to shrink relative to those who converted outside of the tax reform periods.

Second, we establish the empirical link between trend in the distribution of legal forms of organization and income inequality dynamics using the data from the Survey Consumer Finances (SCF). Exploiting the information about business owners in the SCF data and about the legal forms of organization of their businesses we construct a time series of counterfactual top income shares, which allows us to quantify the impact of legal forms’ distribution for income distribution over time. Importantly, SCF allows us to separate the mechanical channel associated with shifting income from corporate to personal accounts from the behavioral responses of the business owners (economic channel). Focusing on the economic channel we apply decomposition introduced by [Juhn et al. \(1993\)](#) and we find that the rise of pass-through businesses accounts for 38.8 percent of the overall increase in the top 1 percent income share. Thus, our counterfactual top income shares imply that more than half of the income inequality increase post 1988 was due to the business owners changing the legal form of organization and furthermore drawing larger pre-tax income from their businesses. The counterfactual exercise is suggestive and useful to understand the link between distribution of legal forms or organization and income distribution dynamics. However, it is silent on the sources of the shift in the distribution of legal forms as well as on the economic mechanisms translating them into the changes in income distribution. Hence, one needs a structural macroeconomic model to address these issues.

The third contribution of the paper is to develop heterogeneous agent model with workers and entrepreneurs, in which the choice of the legal form of business organization is endogenous, which we then apply into the quantitative analysis. The model captures stylized trade-off entrepreneurs face between running the C corporation versus pass-through entity. Profits of the pass-through businesses are entirely channeled to the owners and taxed according to the personal income tax code. Capital of the pass-through entities is financed only

through owners' equity and thus owners are subject to undiversified investment risk due to idiosyncratic productivity shocks. In contrast, profits of the C corporation are taxed first at the entity level based on the corporate income tax code and further, whenever the dividends are paid out, the owners pay the dividend income tax. Unlike the pass-through owners, the owners of the C corporations are able to fully diversify the investment risk. Apart from double taxation of profits another downside of running C corporation is the overhead fixed cost. These features introduce trade-off for entrepreneurs between double taxation of profits and overhead costs but no investment risk while running a C corporation versus single taxation of profits and no fixed costs but being subject to the uninsurable investment risk while running a pass-through entity.

This trade-off between legal forms is central for the economic mechanism translating changes in the tax codes to the endogenous changes in the distribution of legal forms which further affect pre-tax income distribution. To illustrate it consider a reduction of the personal income taxes, which provides more incentives to run a pass-through business rather than C corporation. First, as entrepreneur switches to pass-through entity, pre-tax income increases due to the removal of the overhead costs. Second, there is a change in the capital allocation. The cost of organizing as a pass through is less access to outside equity. With some limitations on borrowing, the entrepreneur must now use her own equity to finance the business's capital stock, so that she saves more than she would with exclusively precautionary motives. Her income now fluctuates both from the variability in her managerial factor and the uncertain return on her business equity. Moreover, the undiversifiable private equity risk commands a risk premium. With decreasing returns, to generate a higher expected return on equity, the pass-through entrepreneur reduces the capital invested in business, hence the product of the larger savings and higher expected return determines the impact on the pre-tax income. Finally, the after tax risk free rate falls as a result of the tax reduction and the composition of income and substitution effects determines the response of workers labor supply. All these behavioral responses and general equilibrium effects associated with them lead to the changes in income distribution in the economy with the first two forces contributing to the higher pre-tax income of those entrepreneurs which switched to the pass-through form.

In the quantitative analysis we look through the lens of the model at the two major tax reforms in the recent US history: Tax Reform Act of 1986 (TRA86) and Tax Cuts and Jobs Act of 2017 (TCJA 2017). We first discipline the parameters of the model by targeting the set of macro statistics and cross-sectional moments from the pre-reform period. Next we compute the steady state associated with the pre-reform period and the steady state following the tax

reform. The only difference between model inputs across steady states are the levels of the fiscal instruments (personal income tax schedule, dividend income tax and corporate income tax). Using our model as a measurement device we find that as a result of TRA86, which reduced sharply the personal income taxes at the top of the income distribution, the fraction of pass-throughs increased by 11.9 percentage points (16.3 percentage points in the data). As a consequence of the reform the aggregate employment falls by 0.81 and the aggregate output falls by 1.54 percent. The rational behind negative effects on the aggregates is as follows. The favorable tax treatment of pass-throughs pushed the existing C corporations towards inferior form of business organization (pass-through), which reduced the average firm size and led to significant increase in the misallocation of factors of production. This dampens the employment and output. Our analysis suggest that the income inequality rose significantly and uniformly across different measures as a consequence of the reform. For example the share of the top 10 percent increased by 1.1 percentage points and the coefficient of variation of income went up by 13.0 percent. Qualitatively the effects of the TCJA 2017 operate in the opposite direction. By reducing the relative taxation of the income of C corporations it pushes the firms to be organized in the more efficient way and hence improves the aggregate efficiency. The quantitative results analyzing the impact of TCJA 2017 are pending.

2 Related literature

This paper is related to several strands of literature. First, it corresponds to the empirical literature on firm dynamics in the US. Recently, there has been a large interest on the dynamics of businesses and number of papers have exploited microeconomic data to document various interesting facts on this topic. These papers look at issues such as dynamics of small and large firms over the business cycle - [Chari et al. \(2008\)](#), [Moscarini and Postel-Vinay \(2012\)](#) and [Kudlyak and Sanchez \(2017\)](#); cyclical reallocation of workers across employers depending on the firm size - [Haltiwanger et al. \(2013\)](#), job creation by firms of different size and age - [Haltiwanger et al. \(2015\)](#); the implications of gradual shift towards older firms in the population of US businesses due to start-up deficit - [Pugsley and Sahin \(2015\)](#); or finally the role of start-ups in the structural transformation of the US economy - [Dent et al. \(2016\)](#). In contrast, this paper sheds new light on the dynamics of the legal forms of businesses organization in the US since 1980, which has not been yet explored with the use of the micro data. Second, this paper contributes to the vast literature on income inequality dynamics.

A number of papers have documented income inequality dynamics in the United States - [Piketty and Saez \(2003\)](#), [Atkinson et al. \(2011\)](#), [Piketty and Saez \(2013\)](#), [Alvaredo et al.](#)

(2013), [Bricker et al. \(2016\)](#), [Piketty et al. \(2016\)](#). There is no consensus in the literature about the sources of the recent income inequality increase. Some argue that executive compensations grew above the actual productivity growth in the financial services sector, leading to disproportional increase of the top executives' salaries - [Piketty and Saez \(2003\)](#). Other papers point at the skill-biased technological change as the main driving force of the recent changes in income distribution - [Krusell et al. \(2000\)](#), [Violante \(2001\)](#). There has been some interest in the role entrepreneurial income plays for the distribution of income in the society, but the analysis so far is restricted to the countries other than the US (see [Alstadsæter et al. \(2016\)](#)).

Our analysis complements and reinforces the recent work by [Smith, Yagan, Zidar, and Zwick \(2019\)](#) who show that pass-through income of top earners more closely reflects returns to high human capital embodied in individuals than returns to capital. They attribute a significant fraction of the rise in top incomes to these pass-through business owners. We provide a new decomposition of the change in the distribution of income using a different data source and attribute 40 percent of the growth in top income shares to the rise in pass through businesses. However, rather than the composition of businesses, our decomposition reveals this rise is primarily due to an increase in the concentration of pass-through business income. Building on their findings that business profits are tied to an entrepreneur's human capital, we provide a mechanism that helps quantitatively explain the increasing concentration of pass through business owner income.

The paper also contributes to the growing literature on macroeconomic implications of entrepreneurship and its role for shaping wealth and income inequality (see [Buera et al. \(2015b\)](#) for an excellent survey). As illustrated in the seminal papers by [Quadrini \(2000\)](#) and [Cagetti and Nardi \(2006\)](#) modeling of entrepreneurship is very important for generating the high concentration we observe at the very top of the wealth and income distribution. Given the success of models of entrepreneurship and financial frictions in producing reasonable wealth and income distributions vis-à-vis the data, these models have been used to analyze the impacts of tax policy ([Cagetti and Nardi \(2009\)](#); [Kitao \(2008\)](#); [Lee \(2012\)](#); [Meh \(2005\)](#); [Scheuer \(2014\)](#)). They have also been used to analyze business cycle fluctuations, particularly in the aftermath of the 2008 financial crisis ([Buera et al. \(2015a\)](#); [Buera and Moll \(2015\)](#); [Bassetto et al. \(2015\)](#); [Kiyotaki and Moore \(2012\)](#); [Shourideh and Zetlin-Jones \(2014\)](#)), where private entrepreneurs play a special role because of the interaction of consumption, saving, and risk that is linked with investment. There is also a literature that focuses on the consumption smoothing and self-insurance behavior of entrepreneurs ([Angeletos \(2007\)](#); [Buera and Shin \(2011\)](#); [Karaivanov and Townsend \(2014\)](#); [Moskowitz and Vissing-Jørgensen](#)

(2002)). Albeit these papers make important contributions and cover a wide range of topics they abstract from modelling the choice of the legal forms of organization of entrepreneurs, which is the focus of this paper. There are two related papers, which model explicitly legal forms of organization. [Short and Glover \(2011\)](#) focus on the incorporation decision of entrepreneurs and quantify the role of the limited liability, which is the dimension of heterogeneity among entrepreneurs we abstract from in the paper. [Chen et al. \(2014\)](#) evaluate the effects of corporate tax cuts on the employment in a model, where the choice of legal form is endogenous. They abstract from the accumulation of capital by entrepreneurs and risk premium, the features which are central to our analysis and relevant for the economic mechanism we propose. Recently, [Bhandari and McGrattan \(2018\)](#) develop a theory of pass-through businesses and estimate an aggregate sweat equity value of 0.65 times GDP, with little cross-sectional dispersion in valuations when compared to business net incomes and large cross-sectional dispersion in rates of return.

Finally, the paper is linked to the quantitative macro public finance literature. There is a vast literature studying the effects and designs of the tax systems in heterogeneous agents models with idiosyncratic labor income risk—see [Domeij and Heathcote \(2004\)](#), [Conesa et al. \(2009\)](#), [Krueger and Ludwig \(2013\)](#) or [Poschke et al. \(2012\)](#) among many others. At the same time there is also a large body of the literature inspecting the effects of the capital income taxes in the presence of the uninsurable investment risk - see [Panousi \(2008\)](#), [Meh and Terajima \(2009\)](#), [Panousi and Reis \(2012\)](#), [Evans \(2014\)](#). A number of interesting lessons emerge from these studies on the effects of capital income taxation in an environment with idiosyncratic and uninsurable shocks (be it investment or labor income shocks). Nonetheless, existing papers abstract from business legal forms of organization and the possibility of reorganization, which directly influence whether the same business activity is taxed as labor, capital or both. We show that incorporating an endogenous choice of business legal form is important to understand the full effects of both business and personal income tax reforms in a quantitative framework.

3 Dynamics of business legal forms of organization

Since the 1980s the most significant shift in business legal forms of organization is a secular increase in limited liability pass through entities and decline in the traditional corporation. In this section we evaluate the actual dynamics of business legal forms in the United States. We find that the prominent increase in pass through limited liability companies follows entirely from two sources: first is a secular increase in the share of *new* businesses formed as pass

through limited liability companies, offsetting nearly perfectly a decline in the share formed as traditional corporations; second an increase in the share of corporations converting to pass through entities, with notable bursts of conversions near tax-reform episodes. Interestingly, there was no change from differences in business survival. The characteristics of alternative legal forms of organization are significant, not just for their tax consequences. We first provide a brief summary of the important trade-offs between legal forms in the U.S., and then with these definitions in hand, we measure the dynamics of legal forms of actual U.S. businesses using confidential firm level Census data.

3.1 Overview of the legal forms of organization in the U.S.

Business owners in the United States may organize their enterprises in a variety of ways, subject to the applicable laws of their state. The choice would usually reflect their needs for capital, as for flexibility, and to limit their personal liability for any business debts by their business equity. The choice of the organizational form also determines how a business will be taxed at the federal level. An early and fundamental decision the owner must make is whether to incorporate. Corporations may have an unrestricted number and type of owners, and the typically have four characteristics: (i) limited liability (ii) centralized management (iii) free transferability of interest (iv) continuity of life. Limited liability implies that each owner's liability for the debts of the firm is limited to the amount of his or her investment. The centralized management means that the decision making belongs to the board of directors and not directly to the general owners. Free transferability of interest implies that each owner may sell his or her interest without the permission of the other owners. The continuity of life ensures that the firm does not automatically dissolve upon the death, bankruptcy, or withdrawal of the owner. These capabilities of an incorporated business are desirable, if not essential, for a growing business with significant need for outside equity. However, for a smaller scale business the flexibility of a corporate organizational form may be unnecessary.

The decision about incorporation affects how a business is taxed, but it is not the only one. All the unincorporated businesses are taxed in the same way but not all the corporations are taxed identically. The main legal forms of organization in the United States are: (i) sole proprietorship (ii) general partnership (iii) limited partnership (iv) limited liability company (v) S corporation (vi) C corporation. Their main characteristics are illustrated in Table 1. In terms of limited liability the owners of sole proprietorship and general partnership are not protected from the debts of the firm, whereas other unincorporated businesses (limited partnership, LLCs) offer some or full protection. In terms of the taxation, C corporation

pay the corporate income tax on their profits at the entity level. Then, whenever the after-tax profits are distributed to the shareholders in forms of the dividends, shareholders pay dividend income tax. Also, shareholders pay tax on any capital gains they realize when they sell shares of stock in the corporation. The profits of an S corporation "pass through" to its owners income taxes according to each owners equity stake in the business. The cost of this simplicity is rigid rules on the type and number of S corporation shareholders.⁴ S corporations, along with the other unincorporated legal forms do not pay corporate income tax on profits. Instead, all profits pass through to their owners, who pay individual income tax on them, independently on whether the profits were actually distributed or not. Hence, the common names for these businesses - "pass-through" entities.

Table 1: Main Characteristics of Different Organizational Forms for Businesses

	Number of Owners	Liability Protection	Taxation of Profits
Sole Proprietorship	1	No	Pass-through
General Partnership	More than 1	No	Pass-through
Limited Partnership	1+	No for partners Yes for limited part.	Pass-through
LLC*	1+	Yes	Pass-through
S Corporation	1 – 100	Yes	Pass-through
C Corporation	1+	Yes	Entity level

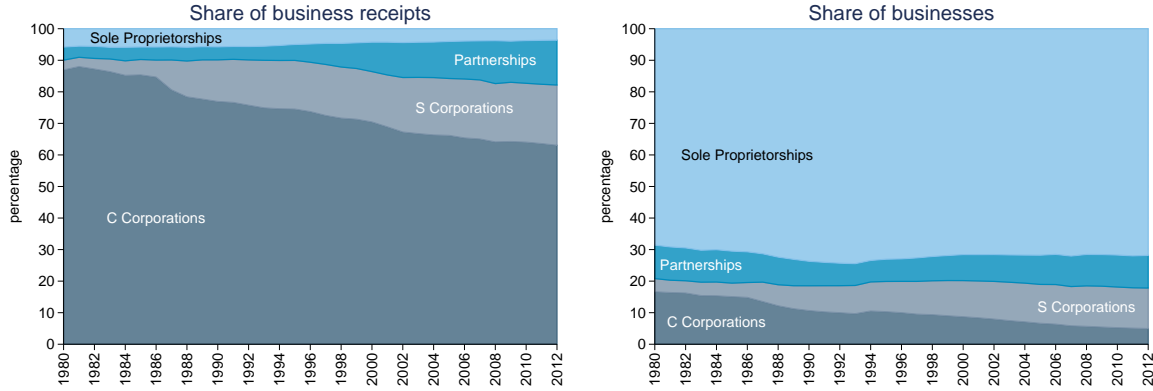
*LLC - Limited Liability Company.

There has been a secular shift in the distribution of the legal forms of organization in the United States since 1980, which is illustrated in Figure 1. The share of business receipts of pass-through entities (S corporations, partnerships and sole proprietorships) in the total business receipts in the US increased from 13.1 percent in 1980 to 36.9 percent in 2012. In

⁴S corporations must be a domestic corporation with at most 100 individual share holders (an S corp cannot be a subsidiary of another corporation or partnership) with only one class of stock. Certain types of businesses such as those in financial services are also ineligible. See <https://www.irs.gov/businesses/small-businesses-self-employed/s-corporation>

terms of the share of businesses, the share of C corporations in total entities dropped from 16.6 percent in 1980 to 4.9 percent in 2012. In what follows we provide a decomposition of stock dynamics into the flows between C corporations, Partnerships, Sole Proprietors, S corporations and entry/exit state.

Figure 1: Distribution of organizational forms in the US, 1980-2012



Notes: Business receipts are the revenues businesses receive from their sales of goods and services. Source: IRS Integrated Business Data

3.2 Organizational forms and the real economy

The IRS data does not provide a complete picture of the dynamics of business legal forms. We are only able to measure the stock of each legal form, and we are unable to differentiate actual businesses with employees from other pass through activity with no associated payroll such as shell companies. Using confidential firm level Census data, we can overcome these two shortcomings.

We measure both the stock and flows across the legal forms of employer businesses using Census data. To do this we merge the Longitudinal Business Database (LBD), which provides a complete enumeration of nearly all U.S. private sector establishments, with additional raw data from the Business Register. The Census Bureau compiles the LBD from business tax filings in the Business Register, with an extensive cleaning procedure to link establishments across years.⁵ Since corporations can elect to be taxed as a pass through entity (see above) the actual legal form of organization available in the LBD is not enough to identify limited liability pass through organizations. We merge in excluded raw data from the Business Register to

⁵See [Jarmin and Miranda \(2002\)](#) for details on the construction of the LBD.

determine which version of IRS form 1120 was filed and thus whether the business is actually a S-corporation.

Table 2: U.S. Employers by Legal Form of Organization

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2009
<i>Share of employers (percent)</i>						
C corporations	55.59	50.05	39.52	34.83	29.27	24.15
S corporations	9.27	15.77	26.35	33.35	39.80	45.44
Partnerships	7.78	7.90	6.70	6.91	9.61	12.64
Sole proprietors	27.36	26.27	27.42	24.91	21.32	17.78
<i>Average size (employees)</i>						
C corporations	23.12	18.25	19.62	19.68	19.83	19.06
S corporations	10.67	13.94	13.91	13.17	12.63	11.99
Partnerships	8.44	9.33	11.34	12.53	17.14	18.35
Sole proprietors	3.94	4.07	4.14	4.37	4.89	5.46
<i>Exit rate (percent)</i>						
C corporations	11.11	9.97	8.68	8.56	9.03	9.27
S corporations	14.51	10.83	8.71	8.67	8.57	9.42
Partnerships	22.20	19.67	16.18	15.99	14.35	14.23
Sole proprietors	20.22	17.26	15.55	16.35	16.10	17.44

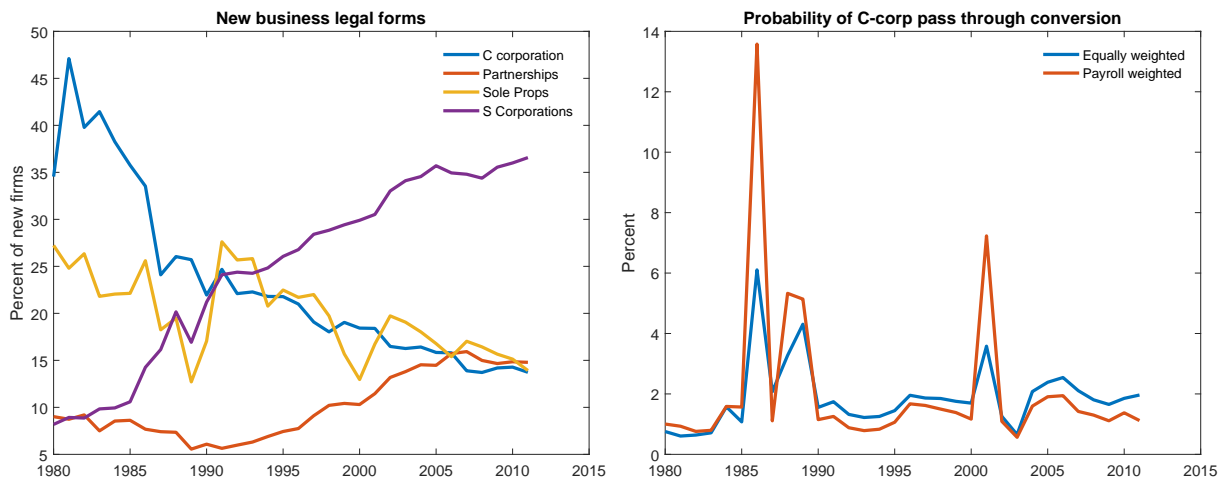
Using this LFO enhanced version of the LBD, we construct matrices to measure transitions across legal forms for each year from 1980 to 2012. We define the following states: C corporations, Partnerships, Sole Proprietors, S Corporations and other.⁶ For each year, we match every establishment to its corresponding observation the following year.⁷ We use an entry and exit state in the reference and future year for establishments that are new entrants or exit. Then we estimate a transition matrix by averaging these transitions across all possible transitions across states. We do this both equally weighting across establishments and weighting by each establishments payroll. The latter "activity" weighted measure assigns more weight to large establishments. We plot these transitions in Figure 2. The left panel plots the share of entrants choosing each legal form. The right panel plots the share of current C corporations who convert to an S corporation.

Consistent with the change in the stocks measured by the IRS data, the share of employer businesses organized as pass through entities also increases. This stems from two

⁶Other encompasses all other types of legal forms such as non profits, trusts, etc...

⁷Firms that operate multiple establishments (locations), will be counted once for each operating establishments. Because longitudinal linkages are more reliable at the establishment-level, we compute all transitions at the establishment level. While this does not affect the payroll weighted measures, corporations or pass throughs operating multiple locations will be over-weighted in the equally weighted measures.

Figure 2: U.S. Employer Transitions across Legal Form of Organizations, 1980-2012



Source: Census LBD and Business Register

different sources. First the share of new entrants choosing to organize as a pass through increases sharply beginning in the mid 1980s. Second, starting in 1986, the share of C corporations converting to pass through entities also jumps. There is a surge in conversions during significant tax reforms: Tax Act Reform of 1986 and Economic Growth and Tax Relief Reconciliation Act of 2001 (see Figures A5 and A4 for the illustration of evolution of the top statutory tax rates and the average marginal tax rates on personal income). Interestingly, there is almost no change in survival of C corporations (see appendix.). The right panel in Figure 2 shows that the surge in business conversions was concentrated in larger firms, because the share of conversions when weighted by payroll is actually larger.

3.3 The effects of reorganization on firm dynamics

The surge in pass through conversions evident in figure 2 also affected firm behavior of the firms who elected to convert legal forms. One might have expected the shift in legal forms to tax-advantaged pass through organizations to only change the taxation of profits, but otherwise leave firm dynamics unchanged, except perhaps through increases in free cash flow from reducing owed tax. This turns out not to be the case: firms induced to shift legal forms by tax reforms actually shrink.

We provide indirect evidence on the shift in firm investment dynamics by examining the response of a firm's employment growth to the pass through conversion using the same firm-

level administrative data.⁸ To this this, for every firm, we measure its employment growth, as well as its legal form. We construct a panel of firms that are C-corporations in 1984, and who over the next 10 years will either remain C corporations or convert to a for-profit pass through entity (either a partnership or S corporation). With this panel we estimate the following model:

$$\Delta \log E_{it} = \alpha_i + \sum_{\tau \neq 1985} \lambda_{\tau} D_{it}^{\tau} + \beta D_{it}^P + \sum_{\tau \geq 1986} \gamma_{\tau} D_{it}^P \times D_{it}^{\tau} + \varepsilon_{it} \quad (3.1)$$

where for business i , E_{it} is the employment in year t , α_i is a fixed effect, D_{it}^{τ} is a time dummy for year τ , D_{it}^P is a dummy variable indicating whether or not the firm is organized as a pass in current year t , and $E[\varepsilon_{it}|\alpha_i, t, D_{it}^P] = 0$. The omitted year is 1985, which is just prior to the TRA 1986. γ_{1984} would be zero by construction because all firms are C corporations in 1984. We specify the model in terms of employment growth rates $\Delta \log E_{it}$ to allow for unobserved heterogeneity in both levels and trend employment growth.

We can interpret the reduced form elasticities β as the elasticity of employment growth to a pass through conversion in 1985 and $\beta + \gamma_{\tau}$ as that elasticity in some year $\tau \geq 1986$ following the TRA 1986. More precisely, one can interpret the pre-TRA 1986 elasticity β as the average within-firm change in employment growth for a corporation that elects a pass through conversion in 1985 relative to the average within-firm change in employment growth for firms that remain C corporations. Similarly, the elasticity $\beta + \gamma_{1986}$ captures the average within-firm change in employment growth for a firm that elects to convert in 1986 relative to the average within-firm change in employment growth for firms that did not:

$$\begin{aligned} \beta + \gamma_{1986} &= E[\Delta \log E_{it}|i, D_{it}^P = 1, t = 1986] - E[\Delta \log E_{it}|i, D_{it}^P = 0, t = 1985] \\ &\quad - (E[\Delta \log E_{it}|i', D_{it}^P = 0, t = 1986] - E[\Delta \log E_{it}|i', D_{it}^P = 0, t = 1985]) . \end{aligned}$$

The reduced form elasticity γ_{τ} is simple the difference if any between the pre- and post-TRA 1986 responses.

Estimating the model from equation (3.1) by OLS and WLS weighting by business employment, we find that whereas firms that convert to pass throughs prior to 1986 grow faster, the growth rate declines for firms who elect a pass through conversion following TRA 1986. Table A6 reports the estimated elasticities. Columns (1) and (3) report the estimate elasticities for on the sample of all 1984 C corporations. When equally weighted (column 1)

⁸Ideally, we could observe the firms investment along with its employment, but there are unfortunately no investment data with the same comprehensive coverage of the LBD.

Table 3: Estimated change in employment growth at pass through conversion

	$\Delta \log E_{it}$ (1)	$\Delta \log E_{it}$ (2)	$\Delta \log E_{it}$ (3)	$\Delta \log E_{it}$ (4)
β	0.00699* (0.0040)	0.00915** (0.0041)	0.0345*** (0.0084)	0.0286*** (0.0086)
γ_{1986}	-0.0186*** (0.0050)	-0.0367*** (0.0052)	-0.0183* (0.0101)	-0.0312*** (0.0107)
γ_{1987}	-0.00206 (0.0041)	-0.0198*** (0.0048)	-0.0165* (0.0089)	-0.0315*** (0.0103)
γ_{1988}	-0.0170*** (0.0041)	-0.0230*** (0.0050)	-0.0378*** (0.0087)	-0.0288*** (0.0108)
γ_{1989}	-0.0159*** (0.0041)	-0.00669 (0.0074)	-0.0389*** (0.0086)	-0.00185 (0.0306)
Observations	3000000	500000	3000000	500000
R-squared	0.149	0.125	0.302	0.275
Business FE	Yes	Yes	Yes	Yes
Years	1984-1989	1984-1989	1984-1989	1984-1989
Weight	Equal	Equal	Employment	Employment
Sample	All	Converters	All	Converters

Note: Census Bureau Longitudinal Business Database. *, **, *** indicate significant at the 10, 5 and 1 percent level, respectively. Standard errors clustered by business. Number of observations rounded to nearest 100,000 to protect confidentiality. All includes all C corporations in 1984. Converters restricts the sample to those firms that convert to a pass through (LLC, LLP, general partnership or S corporation) from 1984 to 1993

employment growth increases by 0.7 percentage points for a conversion in 1985 and decreases by 1.2 percentage points for a conversion in 1986. This compares conversions in those years against the change in growth rate for the firms that did not convert. The -1.86 percentage point difference between these estimates is significant at the 1 percent level. When weighted by employment (column 3), the conversion also significantly reduces growth rates relative to converting in 1985, but the growth rates remain positive.

These estimates are attenuated by including C corporations that never convert in the control group. If we restrict the sample by excluding these C corporations that never convert as in columns (2) and (4), we find an even larger difference in growth rates. Businesses converting post TRA1986 on average experiencing declines in growth rates, regardless of weighting. For the most part, this pattern is also present for firms that convert in 1987-1989. This sensitivity to the choice of control group implies that employment growth is higher at firms that have yet to convert versus firms that will remain C corporations. It confirms, as will be the case in our model, that pass through conversions are only executed for a selected sample of C corporations. Although the table is not yet available, as a placebo test, we estimate the same model instead on the set of businesses that are C corporations in 1990 instead of 1984, which is a period of relatively steady level of conversions as can be seen from figure 2. When estimated on this set of firms, we find no statistically significant difference in growth rates between conversions in different years.

The difference in elasticities on its own should not be interpreted as the effect of a pass through conversion. For various idiosyncratic reasons, pass through conversions are executed even without a change in tax rates, and in all cases, the decision to convert is endogenous. We cannot observe a firm for which the re-organization is exogenously assigned. Instead we observe that the effects of executing a conversion reverse when the pass through is timed during a favorable tax reform. We interpret this difference as reflecting both a change in the threshold that makes a conversion profitable and thus expanding the set of marginal businesses, as well as capturing the effects on employment of those firms following the conversion. In our reduced form exercise we cannot disentangle those two forces. What is important for us, is that among this shifting marginal group, their employment dynamics change as a result of the conversion.

Overall, we interpret the evidence on employment dynamics as supporting the larger claim that the shift in legal forms is not an innocuous change in accounting. In the absence of severe adjustment costs, we expect firms to change inputs together, so that apparent effects on employment would also be evident were we able to observe firm investment. We

later propose a mechanism tied to the difficulty of diversifying investment risk as a pass through entrepreneur consistent with these patterns in employment dynamics and increasing concentration of entrepreneurial income.

4 Legal forms and income distribution dynamics

It is well known that the top income shares grew substantially in the United States since 1980 (see for example [Atkinson et al. \(2011\)](#)). As illustrated in Figure A2 in the tax data the top 1 percent income share (excluding capital gains) grew from 8.2 percent in 1980 to 18.2 percent. The same pattern is observed for all other shares: top 10 percent, top 0.1 percent etc. However, recent work by [Smith et al. \(2017\)](#) has highlighted a change in the composition of income at the top of the income distribution. Total income can be divided into three categories: (1) Labor income (2) Entrepreneurial income and (3) Other income. Labor income consists of wages, salaries, pensions, stock options exercised and annuities. Entrepreneurial income consists of income from sole proprietorships, partnerships and S corporations. The other income category consists of dividends, interest and rents. The increase in income inequality since 1980 has been accompanied by the rapid growth of the share of entrepreneurial income, mainly at the cost of dividend and interest income. In the top 10 percent group entrepreneurial income share grew from 8.3 percent in 1980 to 17.1 percent in 2012. The growth of entrepreneurial income for top 1 percent and top 0.1 percent was even more prominent, respectively 13.3 to 30.0 percent and 8.4 to 35.4 percent. The secular increase in the top income shares and associated shift in it's composition coincide in time with the secular change in the distribution of legal forms of business organization documented in Section 3. The goal of this section is to establish an empirical link between the two phenomena.

How would changes in the legal form of organization of businesses documented in the previous section lead to changes in pre-tax income inequality over time? We distinguish two channels of impact: Mechanical and Economic. The mechanical channel is related to the differences in accounting rules associated with running a pass-through business and C corporation. Retained earnings from the C corporation are recognized as individual income of the owner only when distributed to shareholders either through dividends or capital gains. Income of the pass-through entities is immediately channeled to the owner according to the shared ownership, even when retained in the business. As a result, when C corporation converts to the pass-through entity the owner's income mechanically rises due to the income earned by the business. The economic channel is associated with the behavioral changes of the

business owner who switches from one legal form to another such as changes in the amount of retained earnings, endogenous changes in the firm’s investment or costs of operating a business. The ability to separate these two channel in the data is crucial in order to properly link dynamics of legal forms of organization and evolution of income inequality. In what follows we propose the method to construct the counterfactual top income shares that extracts the impact of the economic effect.

4.1 Data description

We use data from the Survey of Consumer Finances (SCF) waves from 1989 to 2016. The starting point of the analysis is year 1989 since this is the first wave asking questions about the legal forms of business organization. The focus of our analysis are active business owners (ABO). The unit of observation in the SCF is the household. We classify active business owners as those households, a member of which owns or shares ownership in any privately-held businesses or any other business investments that are not publicly traded and has an active management role in any of these businesses. SCF provides us the information about the number of actively managed businesses by the household. For the first two businesses it also provides the information about their legal form of organization, classifying them into the partnerships, sole-proprietorships, S corporations, other corporations (including C), foreign business type and limited partnerships combined with limited liability companies. We classify other corporations as C corporations and all the other forms as pass-through entities. We proceed to attach the legal form of organization to each ABO household. To do so we need to take a stand about how to treat households running more than one business, which on average are less than ten percent of all ABOs over the waves of SCF. For these households we attach the most senior legal form of organization from the all businesses actively manages by the household.⁹

In what follows we use the notion of market income and business income of the household to compute the counterfactual top income shares over time. We define in the SCF market income as the sum of: (i) wages and salaries (ii) income from non-taxable investments (iii) income from interest (iv) income from dividends (v) income from capital gains (vi) income from a sole proprietorship or a farm (vii) withdrawals from pension accounts (ix) business income (x) other income. Our definition of market income differs from the one used by [Piketty and Saez \(2003\)](#). Their market income includes income from businesses or investments, net

⁹For example, if a household manages both a C corp and an pass-through business we classify the household as a C corp business owner. In the Appendix we provide alternative approaches to this issue and make sure our results are not affected by this particular attachment rule.

rent, trusts, or royalties, pooling together income from different sources and not separating business income from the receipts the business owner receives after retaining part of profits in the company. Our definition uses the notion of business income (component (ix)) instead. Isolating the income ABOs households earn from their businesses is not straightforward in the SCF. We do so by using a question directly asking the respondents about how much of net earnings or other income, in addition to regular salary, they received from their business. We also include income received by the spouses from the businesses. This is what we call business income. Defining business income this way rather than using income from other businesses or investments, net rent, trusts, or royalties, allows us to disentangle in the SCF data the mechanical effect from the economic one. Variable used by [Piketty and Saez \(2003\)](#) in the SCF is a direct counterpart of line 17 in 1040 form, which includes income from partnerships and S corporations (including losses carried over from previous years), rental real estate, royalties and trusts. Thus a mechanical shift of firm’s income after conversion from C corporation to pass-through entity would directly show up in line 17 of 1040 and hence in the appropriate variable in SCF, however it would not affect our definition of business income unless there was a behavioral change of the ABO household affecting how much additional income it received after the switch.

4.2 Changes in legal forms among active business owners

Active Business Owners constituted 11.5 percent of the total US population in 1988 and as illustrated in [Figure A3](#) this number has been relatively stable over time with a slight decline to 10.8 percent in 2012. In terms of total income ABOs account for, there has been a slight increase from 25.8 percent in 1988 and to 29.7 percent in 2012. At the top of the income distribution the presence of the ABO is much more prominent. On average they constitute around 60 percent of the population as well as the total income of the top 1 percent income share. These numbers are in line with findings by [Quadrini \(2000\)](#), [Cagetti and Nardi \(2006\)](#) and many others - see the excellent survey by [De Nardi \(2016\)](#)- highlighting the role of entrepreneurs for wealth and income inequality.

The secular trend in the distribution of the legal forms of organization documented in [Section 3](#) has also been present in the SCF data. To illustrate that we split the ABOs in the SCF into the owners of the pass-through entities and owners of the C corporations according to the rule described above. The share of owners of C corporations among ABOs in the overall population fell from 13.0 percent in 1988 to 7.7 percent in 2012 and weighting by income from 22.1 percent to 8.1 percent. In the top 1 percent income group a shift towards

pass-through entities was even more salient. Share of C corporation owners among ABOs fell there from 26.5 percent in 1988 to 14.0 percent in 2012, and weighting by income from 37.9 percent to 13.5 percent.

Figure 3: Share of C corps among the active business owners

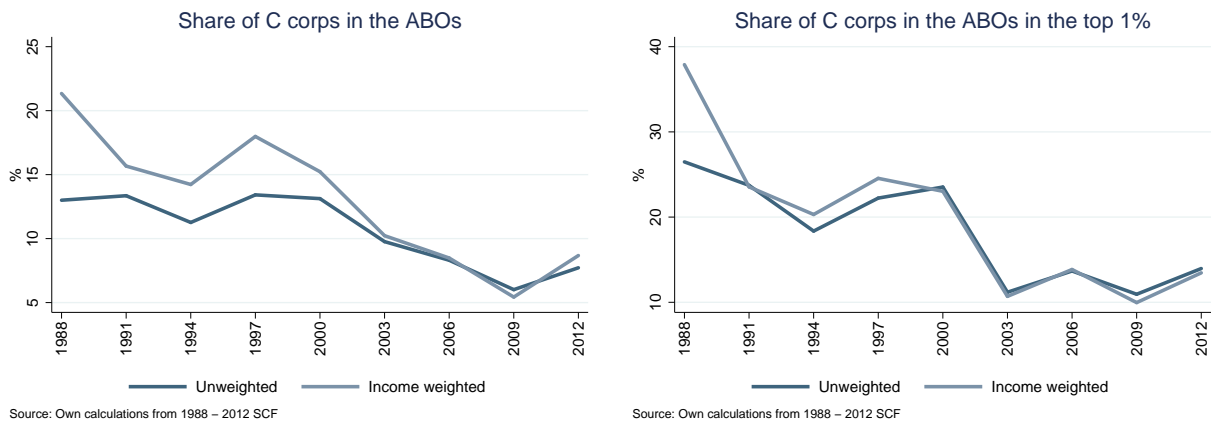
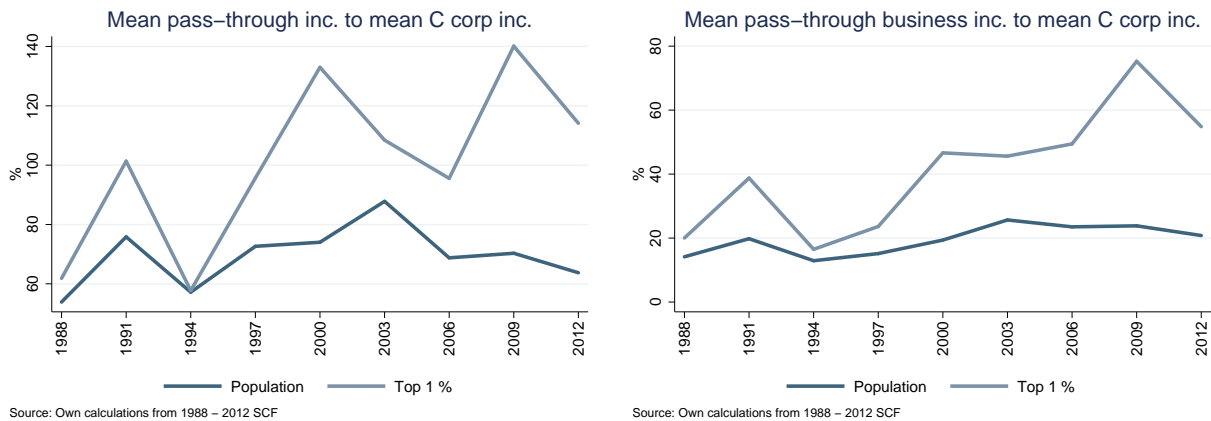


Figure 4: Relative income of pass-through and C corp owners



The shift in the composition of the legal form of organizations among ABOs has been associated with the striking shift of income between these two groups at the top of the income distribution as illustrated in Figure 4. In the top 1 percent the ratio of mean income (from all sources) of the pass-through owner to the mean income of the C corporation owner grew from 61.8 percent in 1988 to 114.1 percent in 2012 (growth of 84.6 percent), whereas in the overall population these numbers were respectively 53.9 percent and 63.7 percent. To get

more insight into this shift we decompose the overall income of the pass-through owners into the business components and non-business components in line with the definitions provided above. It turns out that the increase in the relative incomes is largely driven by the increase in the business component of pass-through owners income. In the top 1 percent the ratio of mean business income of the pass-through owner to the mean income of the C corporation from 20.0 percent to 54.8 percent. These secular changes in the composition of legal forms of organization and relative incomes across owners of firms with different legal forms suggest two forces at play. First, the business owners, who switched to pass-through entities were able to yield higher income from their businesses relative C corporation owners. Second, those who switched were owners of profitable (potentially large) businesses, which drove the dynamics of relative mean incomes.

Selection into the legal forms in the SCF. The Survey of Consumer Finances also shows consistent patterns of selection across legal forms by business owner net worth and measures of business productivity. We document selection across legal forms in the SCF by estimating the empirical distribution of log sales conditional on business owner net worth and her chosen legal form. We take the businesses log sales as a proxy for the unobserved entrepreneurial productivity that we model explicitly in Section 5. Importantly, and for this reason, log sales is for the entire business regardless of the business owner’s equity share in the firm. For each SCF year, we assign a wealth quintile given the distribution of net worth among both types of business owners. Net worth includes all financial and non financial assets (including business equity) less all household liabilities. Then for each net worth quintile (across all years) and type of legal form we compute the 10th, 25th, 50th, 75th and 90th percentiles of the distribution of log real sales. We pool across all years in order to increase precision, but to the extent that the selection rules and distributions are evolving over time we will not capture those differences. Both sales and wealth are measured in constant 2017 dollars. Table 4 presents these conditional distributions. Two facts are apparent: first, for nearly every percentile and across both pass throughs and C corporations, log sales are increasing in net worth. second, for every quintile of the wealth distribution, the distribution of C corporation sales stochastically dominates the distribution of pass through sales. Both features are present for other proxies of business productivity such as employment and profitability (see Appendix Table A2). These conditional distributions are consistent with a selection rule where the propensity to organize as a pass-through is increasing in wealth and decreasing in productivity, as will be the case in the model we present.

Table 4: Conditional distribution of log sales by net worth quintile

	Net worth quintiles				
	1	2	3	4	5
<i>Pass-through log sales (percentiles)</i>					
10th	7.00	7.31	7.60	8.01	9.21
25th	8.16	8.52	8.70	9.21	10.57
50th	9.39	9.74	10.04	10.60	11.98
75th	10.49	10.60	11.00	11.51	13.46
90th	11.29	11.16	11.74	12.43	14.91
<i>C corporation log sales (percentiles)</i>					
10th	10.13	10.00	9.31	9.21	10.67
25th	10.13	11.65	10.28	10.31	11.93
50th	11.11	12.43	11.16	11.70	13.46
75th	12.35	12.43	12.21	12.46	14.91
90th	12.61	12.61	13.76	13.59	16.12

4.3 Decomposing gains in top income shares

We quantify the impact of the shift in the distribution of legal forms of organization on income inequality using a [Juhn et al. \(1993\)](#), or JMP, -type decomposition. The purpose of this partial-equilibrium analysis is twofold. First, while remaining agnostic on the mechanism underlying any changes in behavior, the decomposition shows there is scope for changes in only the distribution of *pass-through* income to explain roughly half of the increase in *overall* top income shares. Second, it allows us to isolate the effects on overall income inequality explained by changes in the distribution of business owner income (both corporate and pass-through) where our proposed mechanism is operating, abstracting from the well-studied increase in income concentration among workers.¹⁰

First, we partition households into those classified as workers, w , versus those we identify as active business owners. Among active business owners, we distinguish between those operating a business organized as a "C-corporation", c , and those organized as a pass-through, p . For each type of household $l \in \{w, c, p\}$, we record the pre-tax income Y_i^l . Then conditional on type l , for each year t we decompose the conditional distribution of log income, $y_{it}^l \equiv \log Y_{it}^l$, into a mean and a distribution of mean zero residuals:

$$y_{it}^l = \mu_t^l + \varepsilon_{it}^l,$$

¹⁰Our mechanism has little effect on income concentration among workers except through general equilibrium channels on labor supply.

i.e., where $\varepsilon_{it}^l \equiv y_{it}^l - \mu_t^l$ and by construction, $E[\varepsilon_{it}^l|t, l] = 0$.¹¹ As in JMP, when ranked from smallest to largest the residuals ε_{it}^l through their CDF $F(\varepsilon|t, l)$ define an invertible map $F : \mathbb{R} \rightarrow [0, 1]$ from residual ε to quantile θ .

To construct counterfactual year $t \geq \tau$ income as if it were instead drawn from a year τ conditional distribution, we can convert year t residuals via quantile to year τ residuals using their respective CDFs. We define the counterfactual year τ income distribution of a type l household in year t by the random variable

$$\tilde{y}_{it}^{l\tau} \equiv \mu_\tau^l + \mu_t^w - \mu_\tau^w + F^{-1}(\theta_{it}^l|l, \tau),$$

where we lookup the year τ residual using the quantile of the actual residual in year t , $\theta_{it}^l = F(\varepsilon_{it}^l|l, t)$. We account for aggregate income growth between year τ and t by adjusting the mean for *all* types by the mean growth of worker income over the same time interval.¹² We can do this for each type of household and recover an entire counterfactual *unconditional* distribution of income captured by

$$\tilde{Y}_{it}^\tau = \exp(D_{it}^w \tilde{y}_{it}^{w\tau} + D_{it}^c \tilde{y}_{it}^{c\tau} + D_{it}^p \tilde{y}_{it}^{p\tau}), \quad (4.1)$$

where D_{it}^l is a dummy variable indicating whether household i was type l in year t .

We propose the following sequential decomposition of the distribution of income Y_{it} across households in year t using the identity

$$Y_{it} = \tilde{Y}_{it}^\tau + \tilde{Y}_{it}^{W\tau} - \tilde{Y}_{it}^\tau + \tilde{Y}_{it}^{WC\tau} - \tilde{Y}_{it}^{W\tau} + \tilde{Y}_{it}^{WCP\tau} - \tilde{Y}_{it}^{WC\tau} \quad (4.2)$$

The first term, computed using equation (4.1), captures the effects of compositional changes. It is the income we would have observed if only the allocation of households across types l had changed, because the income for each type is still drawn from the base year, τ , conditional distributions. The next difference $\tilde{Y}_{it}^{W\tau} - \tilde{Y}_{it}^\tau$ captures incremental contribution of the observed change in the distribution of income for worker households

$$\tilde{Y}_{it}^{W\tau} \equiv \exp(D_{it}^w y_{it}^w + D_{it}^c \tilde{y}_{it}^{c\tau} + D_{it}^p \tilde{y}_{it}^{p\tau}).$$

Here worker income is drawn from the current year, t , distribution but all active business

¹¹To work in logs for this decomposition, we drop all households with negative income, which are less than XXXX % of the sample on average.

¹²Because it scales income equally across households, the adjustment has no effect on top income shares.

owner income is still drawn from the base year, τ , distributions. Next, $Y_{it}^{WC\tau} - \tilde{Y}_{it}^{W\tau}$, captures the further contribution of the actual changes in the distribution of income among business owners organized as C corporations

$$\tilde{Y}_{it}^{WC\tau} \equiv \exp(D_{it}^w y_{it}^w + D_{it}^c y_{it}^c + D_{it}^p \tilde{y}_{it}^{p\tau}).$$

Finally, $\tilde{Y}_{it}^{WCP\tau} - \tilde{Y}_{it}^{WC\tau}$ captures the remaining contribution of the actual change in the distribution of income among pass through business owners

$$\tilde{Y}_{it}^{WCP\tau} \equiv \exp(D_{it}^w y_{it}^w + D_{it}^c y_{it}^c + D_{it}^p y_{it}^p).$$

To understand the decomposition, it helps to note that, by construction, $\tilde{Y}_{it}^{WCS\tau} = Y_{it}$ since $Y_{it}^{WCP\tau}$ is constructed using the actual year t income distributions for each type. So in the sequencing we propose, any contribution of the changes in the pass through income distribution is also the residual contribution.

At each stage of the decomposition, we can compute any summary statistic of the random variable's distribution. We are interested in the top 1 percent share, which for actual income Y_{it} is defined

$$s_t^{0.01} \equiv \frac{\sum_i Y_{it} D_{it}^{0.01}}{\sum_i Y_{it}},$$

where $D_{it}^{0.01}$ is a dummy variable that is 1 if household i is in the top 1 percent of the unconditional income distribution in year t . We define the share analogously for the top 1 percent of the counterfactual unconditional income distributions $Y_{it}^{W\tau}$, $Y_{it}^{WC\tau}$ and $Y_{it}^{WCP\tau}$, noting that by design $s_{it}^{0.01, WCP\tau} = s_{it}^{0.01}$.

This decomposition is straightforward to implement empirically. We use the actual distribution of income by type in each year, computing for each year and type the sample mean and residuals. We use the empirical distribution of income by type and year to form the estimate of c.d.f. $F(\epsilon, l, t)$, and construct each decomposition object using its sample counterpart.¹³

Applying this method, Table 5 shows the effects of increasing concentration of pass through income on the overall top 1 percent share. The table reports, for the calendar years 1988 and 2015 the actual and counterfactual share of total income earned by the top

¹³Unlike typical applications of JMP that first residualize income using a set of covariates, our simple model of conditional income is fully saturated, and our application requires no further assumptions to estimate the conditional cdf F . We can estimate it using its exact sample analog, the empirical c.d.f. of demeaned residuals $\hat{\epsilon}_{it}^l$.

1 percent of households. In the SCF, the top 1 percent of households accounted for 15 percent of aggregate SCF income in 1988 and by 2015 this share had climbed by more than 1/3 to 21.21 percent. If the distribution of income had not changed, but only the relative shares of worker households and pass through and corporate active business owner households, the share of income earned by the top 1 percent is virtually unchanged. If anything it declines very slightly so that the broad types with relatively increasing concentration became slightly smaller over the 27 year period. Allowing the distribution of income among worker households to evolve, but holding the distribution of pass through and corporate household earnings as they were in 1988, increases the top income share by 3.91 percent, a little less than 2/3 of the overall increase. The next column includes the effects of the evolution of the distribution of earnings among corporate active business owner households. Income actually becomes less concentrated for this corporate group, so that the overall top income share actually falls slightly. Finally, the change in the concentration of pass through income explains the remaining 40 or so percent of the increase in the top 1 percent share.

Table 5: Decomposition of change in top 1 percent income share

Year	Actual	Δ Composition	Δ Worker Distribution	$+\Delta$ C-corp Distribution	$+ \Delta$ Pass-thru Distribution.
1988	15.00	—	—	—	—
2015	21.21	14.93	18.84	18.80	21.21
Difference	6.21	-0.07	+3.91	-0.04	+2.41
Percent of	100	-1.1	63.0	-0.6	38.8

The increase in the concentration of pass through income is the focus of this paper. Although the prevalence of pass throughs increases significantly over since the mid 1980s, as shown by Table 5, the change the share of pass throughs had almost no effect on overall income inequality. It is the increase in the concentration of of income among pass through business owners that explains almost 40 percent of the overall change. This pattern is unchanged for alternative measures of income inequality. What explains the increase in the concentration of pass through income? We propose a straightforward explanation tied to the inherent difficulty diversifying investment in pass through businesses.

5 Model with endogenous choice of legal forms

The counterfactual exercise presented in Section 4 is suggestive and useful to understand the link between distribution of legal forms or organization and income distribution dynamics. However, it is silent on the sources of the shift in the distribution of legal forms as well as on the economic mechanisms translating them into the changes in income distribution. Hence, one needs a structural macroeconomic model to address these issues. In this section we develop a model with heterogeneous workers and entrepreneurs featuring endogenous choice of the legal form of organization for entrepreneurs. The model captures stylized trade-off between the legal forms. The income of the pass-through entities is taxed once according to the personal income tax code. Owners of the pass-through entities finance capital from their own equity and are subject to the undiversified investment risk. The income of the C corporation is subject double taxation, to the corporate income tax is levied on profits at the entity level and the dividend income tax is levied on the dividend payouts to the owners. Contrary to the pass-through entity, C corporations have access to the perfectly elastic supply of external equity and their owners can diversify completely an investment risk. On the top of that running the C corporation is associated with some overhead, fixed costs. These features introduce trade-off between fully diversified risk but double taxation of profits and fixed costs of operation and undiversified investment risk but single taxation of profits. We exploit this trade-off and illustrate how it changes as a result of the tax reforms and secular shifts in productivity and further how endogenous choice of the legal form of organization translates into the income distribution. In what follows we present the details of the model.

Demographics. There is a measure one of individuals in the economy. Each individual is one of the two types: worker or entrepreneur. The lifespan of both types is infinite. We denote the fraction of entrepreneurs in the model by μ . The fundamental difference between these two types is that entrepreneurs have access to the production technology and use it to run a firm, while workers do not and they supply their labor services in the market. Entrepreneurs can organize their businesses in two ways: as a pass-through entity or as C corporation. We denote the fraction of entrepreneurs organized as pass-through entities by p . Thus in every period we have $(1 - \mu)$ of workers, μp of pass-through entrepreneurs and $\mu(1 - p)$ of entrepreneurs with firms organized as C corporations in the model economy.

Preferences. Households in the economy have standard preferences over consumption c and leisure $1 - h$ ordered by

$$\mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t u(c_t, 1 - h_t) \right]$$

where $\beta \in (0, 1)$ is the discount factor, u satisfies standard conditions and expectation operator is with respect to the idiosyncratic shocks.

Technology. Every entrepreneur has an access to the decreasing returns to scale technology $f(z, k, n)$ transforming physical capital k and labor input n into the consumption good. Variable z represents the entrepreneur-specific productivity shock which follows the Markov process Γ_z . We impose the following functional form for the technology

$$f(z, k, n) = z^{1-\nu} (k^\alpha n^{1-\alpha})^\nu$$

where the presence of fixed factor z induces the decreasing returns to scale. Given the installed capital k and productivity z every firm generates the gross profits

$$\pi(k, z) = \max_n \{ z^{1-\nu} (k^\alpha n^{1-\alpha})^\nu - wn \}. \quad (5.1)$$

It will be convenient to express gross profits according the following lemma.

Lemma 1 *Given the homogeneity of the technology in z , k , and n and if labor markets are competitive where each unit of labor n is paid its marginal product, gross profits may be expressed as the sum of the return to capital and the return to the entrepreneur's productivity (Ricardian rent), i.e.,*

$$\pi(k, z) = f_k k + f_z z.$$

Proof. Given the technology is homogeneous of degree 1 in all factors, the result follows immediately from Euler's theorem noting with a competitive labor market, $f_n = w$. ■

Timing. The timing of the events within a period is as follows:

1. The entrepreneur makes a decision about the legal form of organization and about investment into a business.
2. Productivity shock z, ε are realized.
3. Labor supply and labor inputs are decided.

4. Production occurs. All agents receive their respective earnings.
5. The government levies taxes on personal, dividend and corporate income, then makes transfers and finances the exogenous government spending.
6. Consumption, saving decisions are made.

Workers. The individual state of the worker is an asset position $a \in \mathcal{A}$ and idiosyncratic productivity shock $\varepsilon \in \mathcal{E}$, where ε follows the Markov process Γ_ε . Workers choose consumption c , labor supply h and next period asset position a' subject to the budget constraint and no borrowing constraint. Their income y consists of interest income ra and labor income $wh\varepsilon$. Thus the problem of the worker is

$$\begin{aligned}
V^W(a, \varepsilon) &= \max_{c, h, a'} u(c, 1 - h) + \beta \mathbb{E} [V^W(a', \varepsilon') | \varepsilon] \\
&\text{subject to} \\
c + a' &= a + y - T_d(ra) - T_i(wh\varepsilon) \\
y &= ra + wh\varepsilon \\
a' &\geq \underline{a}
\end{aligned} \tag{5.2}$$

where $T_i(\cdot)$ is the personal income tax schedule and $T_d(\cdot)$ is the dividend income tax schedule, which we specify later and T is a lump sum transfer.

Entrepreneurs: pass-through entity. The individual state of the pass-through entrepreneur is $a \in \mathcal{A}$ personal asset position, $e \in \mathcal{E}$ capital invested in the business and productivity shock $z \in \mathcal{Z}$, where z follows the Markov process Γ_z . Entrepreneur chooses consumption c and savings s , which further in the next stage are split into safe asset a' and next period capital invested into the business e' (the split depends on the choice of the legal form of organization). Her income y consists of the return on the individual asset ra and the profits from running a firm $\pi(e, z)$. Undepreciated value of the capital $(1 - \delta)e$ is added to her budget constraint. Income net of the value of depreciated capital is subject to the personal income tax levied according to the tax schedule $T_i(\cdot)$ specified later. An entrepreneur can finance the capital stock only through her own equity and is subject to exogenous borrowing

constraint. Hence, the dynamic programming program becomes

$$\begin{aligned}
V^P(a, e, z) &= \max_{s, c} u(c, 1 - \bar{h}) + \beta W^P(s, z) \\
&\text{subject to} \\
c + s &= y + a + (1 - \delta)e - T_i(\pi(e, z) - \delta e) - T_d(ra) \\
y &= ra + \pi(e, z) \\
s &\geq \underline{a}
\end{aligned} \tag{5.3}$$

where W^P is the continuation value that takes into account discrete decision about changing the legal form of organization, which is specified later on.

Entrepreneurs: C corporation. The individual state of the entrepreneur that enters the period as C corporation consists of personal $a \in \mathcal{A}$ personal asset position and productivity shock $z \in \mathcal{Z}$, where z follows the Markov process Γ_z . Entrepreneur chooses consumption c and savings s . Her income consists of the return on the individual assets ra and the Ricardian rents (dividend) from running the C corporation $D(z)$, which are net of the corporate income tax. The tax base for the corporate income tax is reduced by the fixed costs associated with running the C corporation, which are denoted by c_f . Income is subject to the dividend income tax levied on Ricardian rents and returns on assets according to the tax schedules $T_d(\cdot)$. Hence, the dynamic programming problem of the C corporation owner becomes

$$\begin{aligned}
V^C(a, z) &= \max_{s, c} u(c, 1 - \bar{h}) + \beta W^C(s, z) \\
&\text{subject to} \\
c + s &= y + a - T_d(ra + D(z)) \\
y &= ra + D(z) \\
D(z) &= (1 - \tau_c)(f_z(k^*)z - c_f) \\
s &\geq \underline{a}
\end{aligned} \tag{5.4}$$

where W^C is the continuation value that takes into account discrete decision about changing the legal form of organization, which is specified below.

Continuation values: converting decision. At the beginning of every period entrepreneur chooses the legal form of organization. The pass-through entrepreneur may continue to operate with current legal form or convert to a C corporation by selling its equity to the mutual

fund. The revenue from the transaction adds up to the personal assets. If she chooses to continue as pass-through entrepreneur she has to decide how much to invest into the business, i.e. ' e' '. Thus, the continuation value for pass-through entrepreneur is

$$W^P(s, z) = \max \left\{ \mathbb{E} [V^C(s, k^*(z), z') | z] + f_{PC}, \max_{e' \leq s - \bar{a}} \{ \mathbb{E} [V^P(s - e', e', z') | z] \} \right\}.$$

The owner of the C corporation can convert to the pass-through entity or continue to operate with the current legal form. If she converts, she has to decide how much to invest into the business, i.e. ' e' '. Therefore, the continuation value becomes

$$W^C(s, z) = \max \left\{ \mathbb{E} [V^C(s, k^*(z), z') | z], \max_{e' \leq s - \bar{a}} \{ \mathbb{E} [V^P(s - e', e', z') | z] + f_{CP} \} \right\}.$$

Denote the policy functions related to discrete decision about the legal form by $d_i \in \{0, 1\}$ for $i \in \{C, P\}$, where $d_i = 0$ denotes staying with the current legal form.

Mutual fund. The owners of the C corporations in the model have access to the infinitely elastic supply of outside equity, through the mutual fund, at the cost of $1 + r$. The mutual fund is an institution that makes investment decisions for the C corporations and aggregates the idiosyncratic risks faced by their owners and hence by the law of large number it is able to fully diversify it, so that it does not face any uncertainty with respect to the aggregate profits. Thus, the optimal capital stock $k^*(z)$ is determined by equalizing the expected marginal return on the capital net of depreciation and corporate income tax with the marginal opportunity cost of investing one more unit of physical capital, i.e.

$$\mathbb{E}[(1 - \tau_c)(\pi_k(k^*; z') - \delta) | z] + 1 = 1 + r \quad (5.5)$$

where τ_c is the corporate income tax.

Aggregation and Market Clearings. In every period there is a fixed fraction $1 - \mu$ of workers and μ of entrepreneurs in the economy. Let $a \in A = [a_{\min}, \infty]$ and $\varepsilon \in \epsilon$, where ϵ is the domain of the productivity shock and further let $(A \times \epsilon, \mathcal{B}(A) \times \mathcal{B}(\epsilon))$ be a measurable space of individual assets and workers productivities, where $\mathcal{B}(A)$ and $\mathcal{B}(\epsilon)$ denote the Borel sets. Let $\lambda_w : \mathcal{B}(A) \times \mathcal{B}(\epsilon) \rightarrow [0, 1]$ be the measure of over the space of individual assets and productivities for workers. It evolves according to

$$\lambda'_w(\mathcal{A}, \vartheta) = \int_{A \times \epsilon} \mathbb{I}\{a'(a, \varepsilon) \in \mathcal{A}\} \Gamma(\varepsilon' | \varepsilon) d\lambda_w(a, \varepsilon) \quad \forall \mathcal{A}, \vartheta \in \mathcal{B}(A) \times \mathcal{B}(\epsilon) \quad (5.6)$$

Let $e \in E = [0, \infty]$ and $z \in Z$ where Z is the domain of firm's productivity shocks. Let $(A \times Z, \mathcal{B}(A) \times \mathcal{B}(Z))$ be a measurable space of individual assets and firm's productivities of the C corporation owners and let $(A \times E \times Z, \mathcal{B}(A) \times \mathcal{B}(E) \times \mathcal{B}(Z))$ be a space of individual assets, capital invested in a firm and firm's productivities of the pass-through owners. Then define $\lambda_C : \mathcal{B}(A) \times \mathcal{B}(Z) \rightarrow [0, 1]$ as the measure of C corporation owners over the individual states and $\lambda_P : \mathcal{B}(A) \times \mathcal{B}(E) \times \mathcal{B}(Z) \rightarrow [0, 1]$ as the measure of pass-through owners over the individual states. They evolve according to the following law for all $\mathcal{A}, \mathcal{E}, \mathcal{Z} \in \mathcal{B}(A) \times \mathcal{B}(E) \times \mathcal{B}(Z)$:

$$\begin{aligned} \lambda'_P(\mathcal{A}, \mathcal{E}, \mathcal{Z}) &= \int_{A \times E \times Z} (1 - d_P) \mathbb{I}\{s - e' \in \mathcal{A}\} \mathbb{I}\{e' \in \mathcal{A}\} \Gamma(z'|z) d\lambda_P(a, e, z) \\ &+ \int_{A \times Z} d_C \mathbb{I}\{s - e' \in \mathcal{A}\} \mathbb{I}\{e' \in \mathcal{A}\} \Gamma(z'|z) d\lambda_C(a, z) \end{aligned} \quad (5.7)$$

where we skip the dependence of the policy functions on the individual states to economize on notation. The law of motion for the measure of C corporation owners is, for all $\mathcal{A}, \mathcal{Z} \in \mathcal{B}(A) \times \mathcal{B}(Z)$, given by

$$\begin{aligned} \lambda'_C(\mathcal{A}, \mathcal{Z}) &= \int_{A \times Z} (1 - d_C) \mathbb{I}\{s \in \mathcal{A}\} \Gamma(z'|z) d\lambda_C(a, z) \\ &+ \int_{A \times E \times Z} d_P \mathbb{I}\{s \in \mathcal{A}\} \Gamma(z'|z) d\lambda_P(a, e, z) \end{aligned} \quad (5.8)$$

where we again skip the dependence of the policy functions on the individual states to economize on notation. The number of pass-through owners p is endogenous in the model and determined by

$$p = \mu \left(\int_{A \times E \times Z} (1 - d_P(a, e, z)) d\lambda_P(a, e, z) + \int_{A \times Z} d_C(a, z) d\lambda_C(a, z) \right) \quad (5.9)$$

and then by construction the fraction of the C corporation owners is $(1 - \mu)(1 - p)$. Market clearing for labor requires

$$\begin{aligned} \int_{A \times \epsilon} h(a, \epsilon) d\lambda_w(a, \epsilon) &= \int_{A \times Z} n^*(z) d\lambda_C(a, z) \\ &+ \int_{A \times E \times Z} n(a, e, z) d\lambda_P(a, e, z) \end{aligned} \quad (5.10)$$

and market clearing for the capital stock requires

$$\begin{aligned} \int_{A \times Z} k^*(z) d\lambda_C(a, z) &= \int_{A \times \epsilon} a'(a, \epsilon) d\lambda_w(a, \epsilon) + \int_{A \times Z} a'(a, z) d\lambda_C(a, z) \quad (5.11) \\ &+ \int_{A \times E \times Z} a'(a, e, z) d\lambda_P(a, e, z) \end{aligned}$$

where $a' = s - e'$ for the pass-through entrepreneur and $a' = s$ for the C corporation owner.

Government. Government in our model has to finance an exogenous stream of expenditure G using the corporate income tax schedule $T_c(\cdot)$, dividend income tax schedule $T_d(\cdot)$ and personal income tax schedule $T_i(\cdot)$, government debt. It also has access to the lump sum transfer instrument which balances the budget. The revenues from the personal income tax, R_i , the dividend income tax, R_d , the corporate income tax, R_c are

$$\begin{aligned} R_i &= \int_{A \times \epsilon} T_i(wh\epsilon) d\lambda_w(a, \epsilon) + \int_{A \times E \times Z} T_i(\pi(e, z) - \delta e) d\lambda_P(a, e, z) \\ R_d &= \int_{A \times Z} T_d(D(z) + ra) d\lambda_C(a, z) + \int_{A \times E \times Z} T_d(ra) d\lambda_P(a, e, z) + \int_{A \times \epsilon} T_d(ra) d\lambda_w(a, \epsilon) \\ R_c &= \int_{A \times Z} \tau^c(\pi(k^*(z); z) - c_f) d\lambda_C(a, z) \end{aligned}$$

Hence the intertemporal government budget constraint becomes

$$G + (1 + r)B + T = B' + R_i + R_d + R_c \quad (5.12)$$

Equilibrium. The general equilibrium is defined as follows.

Definition 1 *Given government policy $\{G, T_i, T_d, T_c\}$, a **recursive competitive equilibrium** is a set of value functions $\{V^W, V^P, V^C\}$, allocations of workers $X_W = \{a', c, h\}$, allocations of pass-through entrepreneurs $X_P = \{a', e', c, d_P\}$, allocations of C corporation owners $X_C = \{a', c, d_C\}$, allocations of labor for pass-through firms and C corporations $\{n^*, n\}$, allocation of capital for C corporations $\{k^*\}$, prices $\{r, w\}$ and measures $\{\lambda_w, \lambda_P, \lambda_C\}$ such that*

1. *Given prices, allocations X_W, X_P, X_C and value functions $\{V^W, V^P, V^C\}$ solve respectively problems (5.2), (5.3), (5.4).*
2. *Given prices, allocations of labor $\{n^*, n\}$ and capital $\{k^*\}$, solve respectively (5.1) and (5.5).*

3. The probability measures $\{\lambda_w, \lambda_P, \lambda_C\}$ evolve according to (5.6), (5.7), (5.8).
4. Government budget constraint (5.12) is satisfied.
5. Market clearing conditions (5.10), (5.11) hold.

6 Qualitative properties of the model

6.1 The role of risk premium

Undiversified investment risk associated with running a pass-through entity induces there exists a risk premium, i.e. pass-through entrepreneurs demand higher return from running the business relative to the owners of the C corporation. The existence of the premium implies different allocation of capital across two legal forms of business organization. The following lemma illustrates that point.

Lemma 2 *Suppose T_i, T_d, T_c are set to zero and the borrowing constraint is slack. Then the allocations of capital for pass-through entities and C corporations are:*

$$e'(a, e, z) = \left[\left(\frac{\Delta}{r + \delta} \right) \left(\frac{\mathbb{E} \left[u_c(c(a', e', z')), \left(z'^{\frac{1-\nu}{1-(1-\alpha)\nu}} \right) | z \right]}{\mathbb{E} [u_c(c(a', e', z')) | z]} \right) \right]^{\frac{1-(1-\alpha)v}{1-v}}$$

$$k^*(z) = \left[\left(\frac{\Delta}{r + \delta} \right) \mathbb{E} \left[\left(z'^{\frac{1-\nu}{1-(1-\alpha)\nu}} \right) \right] \right]^{\frac{1-(1-\alpha)v}{1-v}}$$

where Δ is a constant depending on production function parameters. Moreover, for a given z we have $e' < k^*$ as long as $\text{Cov} \left(u_c(c(a', e', z')), \left(z'^{\frac{1-\nu}{1-(1-\alpha)\nu}} \right) \right) < 0$.

It's clear from the Lemma 2, that as long as the marginal utility of consumption is negatively correlated with the productivity shock then conditional on the current productivity level the amount of capital invested into the pass-through company will be lower than the amount of capital invested into the C corporation. Thus, it follows from the decreasing marginal products property of the production function that the return has to be higher. The inability to insure against productivity risk is crucial for the covariance to be negative. In the complete markets world the idiosyncratic shocks would be perfectly insured and consumption would be unaffected by them. As a result the risk premium would vanish. Following this argument, the lemma below offers a decomposition of the net-of-tax, expected return on private equity.

Lemma 3 *Suppose dividend income tax is linear. Then, the net-of-taxes expected return on equity can be decomposed as follows:*

$$\mathbb{E} \left[(1 - T'_y) (f_e - \delta) | z \right] = (1 - \tau_d) r - \frac{\text{Cov} [u_c, (1 - T'_y) f_e | z]}{\mathbb{E} [u_c | z]} + \frac{\zeta}{\beta \mathbb{E} [u_c | z]}$$

where ζ is the multiplier on the borrowing constraint of the pass-through entrepreneurs.

The first term in the decomposition provided in Lemma 3 is equal to the net-of-tax return on the safe asset. The second term follows from the presence of the uninsurable, investment risk, which ties the marginal utility of consumption with the marginal product of capital for every realization of the individual productivity shock. Market incompleteness implies that the covariance term is negative, hence it pushes the rate of return on private equity above the rate of return on safe assets. Finally, the third term reflects the presence of the potentially binding borrowing constraints in the problem of pass-through entrepreneur. Whenever, the constraint is binding, then $\zeta > 0$, which increases the rate of return on private equity.

6.2 The role of taxes

The presence of distortionary taxes on the individual income, dividend income and corporate profits affects the allocation of physical capital and through this channel the distribution of income in the model economy. To illustrate their role the following lemma is useful.

Lemma 4 *Suppose tax schedules are linear, there is no idiosyncratic risk associated with productivity, i.e. z is fixed and borrowing constraint is slack. Then the allocations of capital for pass-through entities and C corporations are:*

$$e'(a, e, z) = \left[\left(\frac{\Delta}{r + \delta} \right) \left(z^{\frac{1-\nu}{1-(1-\alpha)\nu}} \right) \right]^{\frac{1-(1-\alpha)v}{1-v}}$$

$$k^*(z) = \left[\left(\frac{\Delta}{\frac{1}{(1-\tau_c)}r + \delta} \right) \left(z^{\frac{1-\nu}{1-(1-\alpha)\nu}} \right) \right]^{\frac{1-(1-\alpha)v}{1-v}}$$

where Δ is a constant depending on production function parameters. Moreover, for a given z we have $e' < k^*$ as long as $\tau_c > 0$.

Whenever the taxes are linear and there is no idiosyncratic uncertainty the allocation of the capital for the pass-through entrepreneur is unaffected and equal to the undistorted one. As for the capital allocation for the C corporations the presence of the corporate income tax

distorts the allocation. It is immediate to see that as long corporate income tax is positive the capital allocated into the C corporation is going to be lower than the one allocated by the pass-through business owner.

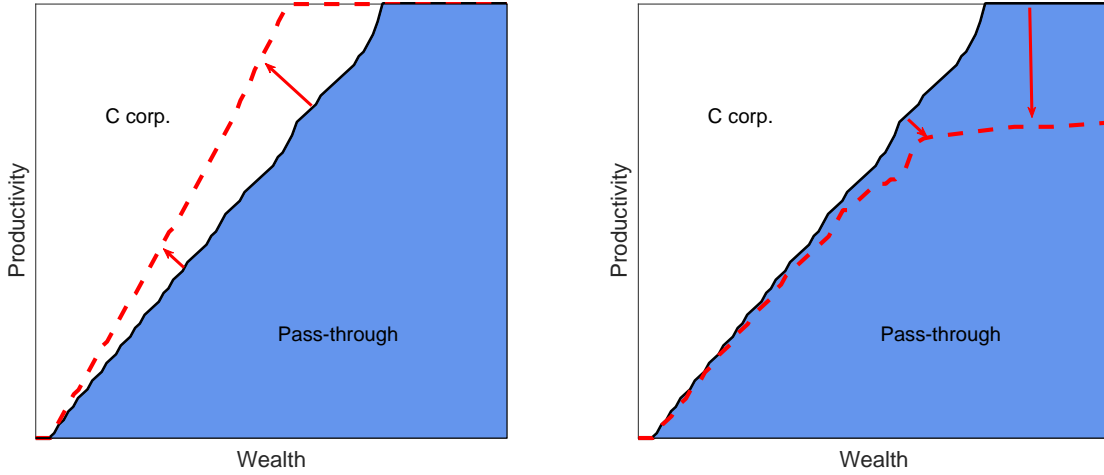
6.3 Selection into the legal forms

Figure 5 illustrates the endogenous selection mechanism in the model. On the horizontal axis there is wealth (cash-in-hand), whereas on the vertical axis there is productivity of the entrepreneur. The solid line is the indifference curve between the two legal forms of organization. Fraction of pass-through owners is increasing with wealth and decreasing with productivity. This shape of indifference curve is largely driven by the financial constraints faced by the pass-through owners. Investment in the business is made only with the use of private equity, therefore if entrepreneur has low wealth, but high productivity he would prefer to be a C corporation. On the other hand with high wealth and relatively low productivity an entrepreneur is able to finance the optimal scale of firm's operation with its own equity. The left panel of Figure 5 illustrates effects of the reduction in the personal income taxes for selection into the legal forms of organization. Lower personal income tax increases the after tax income profits from the pass-through business and therefore induces more entrepreneurs to choose this form of organization. Hence, the indifference curve shift to the left as a result of the reform. Importantly the effect is non-linear across wealth distribution. The incentives to switch to pass-through form are larger at the right end of the wealth distribution, among richer entrepreneurs. This force contributes to growing income inequality following the tax reform in the model. The right panel of Figure 5 presents the effects of the reduction in the corporate income tax rate for the selection into the legal forms. Lowering corporate income tax increases directly through condition 5.5 the capital stock invested into the C corporation and hence its size. As a result profits (before dividend taxes) increase, which implies that more entrepreneurs would prefer to run C corporation business. Similarly, to the personal income tax reduction, the effects are non-linear in wealth and incentives to change the legal form to C corporation are larger in the right tail of wealth distribution.

7 Quantitative analysis

In this section we conduct the quantitative analysis of the Tax Reform Act of 1986 and Tax Cuts and Jobs Act of 2017. We first take the model to the data and describe the logic behind disciplining the model parameters. Next, we present the model simulations of the two major

Figure 5: Selection into the legal forms of organization and tax reforms



Note: The left panel illustrates the equilibrium thresholds for high (black solid) and low (red dashed) personal income tax rate. The right panel illustrates the equilibrium thresholds for high (black solid) and low (red dashed) corporate income tax rate.

tax reforms. We start with model inputs, then we discuss the macroeconomic consequences and further discuss their effects on income inequality.

7.1 Model parametrization

In this section we describe the functional forms imposed on the model as well as the calibration strategy. The baseline parameter values and targeted moments are summarized in Table 6 and Table 7.

Preferences. We impose the following preferences for the workers

$$u(c, 1 - h) = \frac{c^{1-\sigma}}{1-\sigma} - \psi \frac{h^{1+\frac{1}{\theta}}}{1+\frac{1}{\theta}} \quad (7.1)$$

As for the entrepreneurs we abstract from the labor supply decision. We set the risk aversion parameter σ to 1.0. Frisch elasticity of labor supply, θ is set to 1.0, closely in line with estimates provided by Chetty et al. (2011). To discipline the discount factor β we match in the model the wealth to output ratio. For the 1986 tax reform simulation (pre-reform equilibrium) we take the mean from 1980 to 1985, which is 3.49. The parameter governing disutility of labor, ψ , is pinned down by targeting the average hours worked at the household level in the CPS data, where we normalize the total available hours (52 weeks

times 100 hours per week) to 1. Hence, we end up with the target value being 0.38.

Demographics and Technology. The fraction of workers in the model economy, μ is exogenous and we discipline it by averaging across waves the fractions of workers in the SCF data, which is 12.1 percent. We impose the following production technology for entrepreneurs

$$f(z, k, n) = z^{1-\nu} (k^\alpha n^{1-\alpha})^\nu$$

We set span of control parameter ν to 0.80, a number within the bounds used in the literature. The elasticity of the capital stock α is disciplined by the labor income share of 0.64. In line with the NIPA tables we set the depreciation rate δ to 0.05. To discipline the fixed cost of running C corporation we target the average fraction of the C corporations among businesses in LBD between 1980 and 1984, which is equal to 65.6 percent. In order to discipline the fixed costs associated with changing the legal form of business organization f_{PC} and f_{CP} we exploit the panel dimension of LBD data and our estimates of the transition matrices. We target the average 1980-1984 flow from pass-through to C corporations (1.3 percent) and from C corporations to pass-throughs (5.1 percent).

Productivity processes. We assume labor productivity for workers follows AR1 process given by

$$\log(\varepsilon_t) = \mu_\varepsilon + \rho_\varepsilon \log(\varepsilon_{t-1}) + \epsilon_w \quad (7.2)$$

where ϵ_w is i.i.d. with shock with mean zero and variance σ_w . For the entrepreneurs we also assume that productivity follows AR1 process. The annual persistence of the autoregressive process for labor income, i.e. ρ_ε , is set to 0.9 following [Domeij and Heathcote \(2004\)](#). We discipline σ_w using empirical target of the share of income held by top 1 percent between 1980 and 1984, which was 9.9 percent. We impose the following process for entrepreneurial productivity

$$\log(z_t) = \mu_z + \rho_z \log(z_{t-1}) + \epsilon_e \quad (7.3)$$

where ϵ_e is i.i.d. with shock with mean zero and variance σ_e . The annual persistence of the autoregressive process for entrepreneurial income ρ_z is also set to 0.9. To discipline the relative productivities of the workers and entrepreneurs we choose to match the fraction of ABOs income in the top 10 percent of the income distribution. Pinning down the standard deviation of entrepreneurial productivity is challenging due to limited estimates for the US. Hence, we choose to target the share of income held by top 10 percent in the IRS data.

Table 6: Parameters Imposed Exogenously on the Model

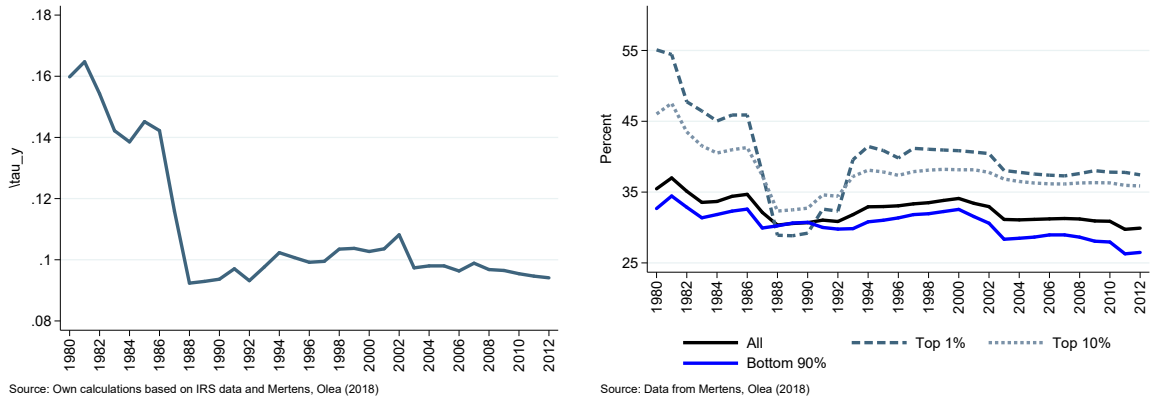
Parameter		Source	Value
Curvature of utility function	σ	-	1.0
Frisch elasticity of labor supply	ν	Chetty (2011) et. al.	1.0
Depreciation rate	δ	NIPA	0.05
Span of control	ν	-	0.80
Persistence of labor and ent prod.	ρ_ε, ρ_z	-	0.90
Elasticity of capital	α	Labor income share	0.20
Fraction of ABOs in population	μ	SCF data	0.87

Tax system. The tax system in the model consists of three instruments: the corporate income tax τ_c , the dividend income tax τ_d and the schedule for the personal income tax. We assume that both corporate and dividend income taxes are linear. As for the personal income tax schedule we apply the tax and transfer formula introduced into the class of models with heterogenous agents by [Benabou \(2002\)](#) and used also by [Heathcote et al. \(2017\)](#):

$$T(y) = y - \lambda_y y^{1-\tau_y}$$

The parameter τ_y determines the degree of progressivity of the tax system and the second parameter, λ_y , shifts the tax function and determines the average level of taxation in the economy.

Figure 6: Estimated progressivity parameter τ_y and average marginal tax rates, 1980-2012



In order to discipline the corporate income tax, we compute the time series of the average corporate income tax rate following the method proposed by [McGrattan and Prescott \(2005\)](#).

For the 1986 tax reform simulation (pre-reform equilibrium) we average the tax rate from 1983 to 1985 and set $\tau_c = 0.249$. We discipline the dividend income tax by the data on the average marginal dividend income tax computed using TAXSIM. For the 1986 tax reform simulation (pre-reform equilibrium) we take the mean of the averages from 1983 to 1985. To estimate the time series of the progressivity parameter τ_y we exploit the data on the average marginal income tax on wages, salaries and entrepreneurial income provided by [Mertens and Olea \(2018\)](#) as well as the data from the IRS. The estimated time series is presented together tax rates reported by [Mertens and Olea \(2018\)](#) in Figure 6. For the 1986 tax reform simulation (pre-reform equilibrium) we average the progressivity measure from 1983 to 1985 and set τ_y to 0.143. Finally, the λ_y , which controls the average level of personal income taxes, is pinned down by the average tax revenues to GDP in NIPA between 1983 and 1985, which amounts to 22.9 percent. The details of the estimation of the time series of corporate, dividend and personal income taxes are provided in Appendix B.

Table 7: Parameters Calibrated in Equilibrium for Tax Reform Act of 1986 Simulation

Parameter	Value	
Discount factor	β	0.933
Disutility of labor	ψ	11.53
Mean of labor prod.	μ_ϵ	1.277
Fixed cost for C corp.	c_f	0.029
Std. dev. of labor prod.	σ_ϵ	0.382
Std. dev. of entrepreneurial prod.	σ_z	0.315
Flow C \rightarrow P	f_{CP}	18.29
Flow P \rightarrow C	f_{PC}	17.74
Tax schedule shifter	λ_y	0.731
Government Expenditure	G	0.088

Target	Data	Model
Wealth/Output - NIPA	3.49	2.85
Average hours worked - CPS	0.38	0.38
% of ABOs in Top10 - IRS	20.3	19.4
% of C corp. - LBD	44.4	46.2
Top 1% income share (%) - IRS	9.9	10.2
Top 10% income share (%) - IRS	34.6	35.4
Flow P \rightarrow C (%) - LBD	4.3	3.8
Flow C \rightarrow P (%) - LBD	1.6	1.2
Revenues/GDP (%)	21.9	22.2
Federal Debt/GDP (%)	39.0	39.0

7.2 Model simulation: Tax Reform Act of 1986

In this section we look at the Tax Reform Act of 1986 through the lens of our model and evaluate it's consequences the macroeconomic aggregates as well as for the income inequality. To quantify the effects of the reform we compute two stationary equilibria of the model, one associated with pre-reform period and the other associated with the post-reform period. In terms of the model inputs the two equilibria differ with respect to the levels of fiscal instruments. The average marginal rate on dividend income fell from 30.9 to 27.0 percent. The average effective corporate income tax rate increased from 23.9 percent to 28.2 percent. The estimated progressivity parameter of the HSV tax/transfer scheduled went down from 0.149 to 0.098. In order to keep the ratio of total tax revenues to GDP constant we adjust the tax schedule shifter λ_i . The model inputs for the TRA 1986 simulation are summarized in Table 8.

Table 8: Tax Reform Act of 1986 Simulation - Model Inputs

Instrument	Pre-reform 1983-1985	Post-reform 1986-1990	Comments
τ_d	0.309	0.270	TAXSIM Avg. Marginal Rate on Dividends
τ_c	0.239	0.282	NIPA Avg. Corporate Tax Rate
τ_y	0.149	0.098	Own calculations
Revenues/GDP	0.219	0.219	λ_i adjusts

Macro effects of the tax reform. To illustrate the effect of TRA 86 on macroeconomic aggregates we split the response of the economy into three stages - see Table 9. Following the personal tax reduction, the owners of the pass-through entities receive higher income from running their businesses. As a result the value of running the pass-through business increases, which moves the marginal entrepreneurs from the pool of C corporation owners the indifference threshold. On the top of that the threshold by itself moves in line with the logic discussed section describing qualitative properties of the model. Hence, some entrepreneurs, who pre-reform would were running C corporations now prefer to run pass-through business. These two channels lead to an increase in the fraction of ABOs running pass-through firms from 46.2 percent to 55.8 percent in a partial equilibrium (PE) set up and to 58.1 percent if the general equilibrium forces are taken into account. The economy experience the reallocation of labor and value added from C corporations towards pass-through entities. The employment of C corporations falls by 16.1 percent in PE exercise (19.0 in GE), whereas the value added

falls by 16.9 percent in PE exercise (19.2 in GE). Since on average the pass-through businesses are smaller and less productive than the C corporations the reallocation leads to the decline in the aggregate employment by 1.2 percent in PE exercise (0.81 percent in GE) and -1.54 percent decline in output in PE exercise (1.12 in GE). The GE effect comes from the falling wages, which benefits both types of businesses, as the labor input becomes cheaper. The rise of pass-throughs is 11.9 percentage points in the model whereas in the data the increase was 16.3 percentage points.

Table 9: Macro effects of the of the TRA86

	Baseline	Tax reform PE	% Change PE
Employment	0.610	0.603	-1.20
Output	0.470	0.463	-1.54
Employment C	0.485	0.407	-16.1
Employment P	0.123	0.197	60.4
Output C	0.385	0.319	-16.9
Output P	0.086	0.144	67.7
% of P ent. in ABOs	46.2	55.8	20.8
Avg Emp C/Avg Emp	1.48	1.53	3.3
Avg Emp P/Avg Emp	0.44	0.57	34.4
	Baseline	Tax reform GE	% Change GE
Employment	0.610	0.605	-0.81
Output	0.470	0.465	-1.12
Employment C	0.485	0.393	-19.0
Employment P	0.123	0.211	71.9
Output C	0.385	0.311	-19.2
Output P	0.086	0.154	79.5
% of P ent. in ABOs	46.2	58.1	25.8
Avg Emp C/Avg Emp	1.48	1.55	4.8
Avg Emp P/Avg Emp	0.44	0.60	37.8

Distributional effects of the tax reform. Table 10 illustrates the distributional effects of the TRA86. Following the reform all the inequality measures increase. This is a direct

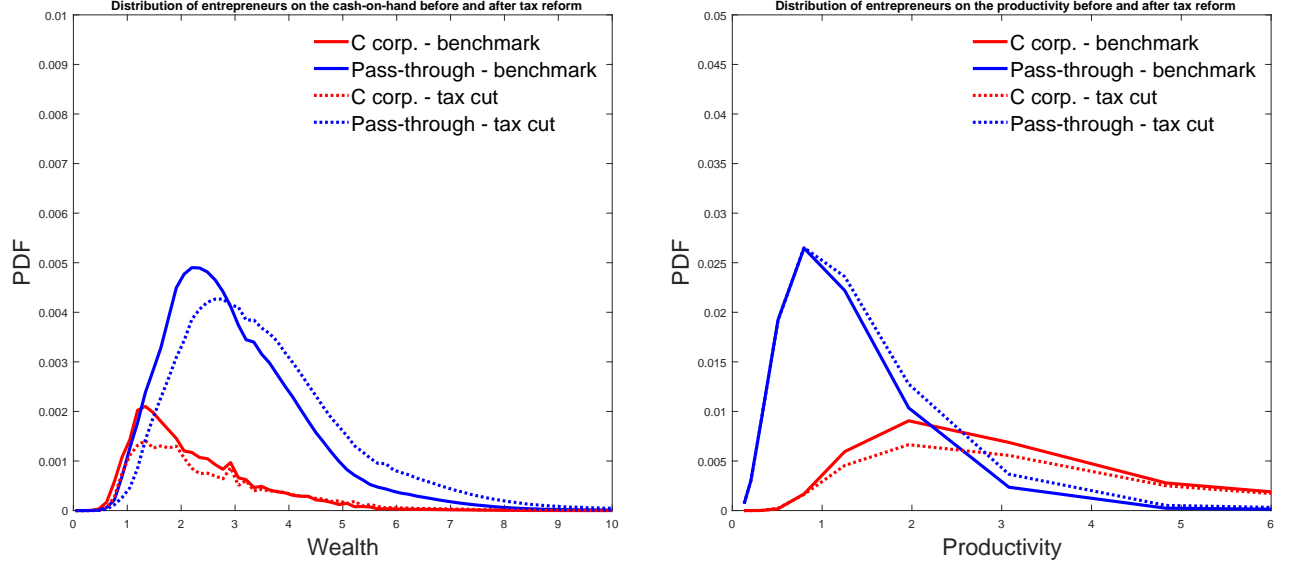
consequence of a larger fraction of pass-through businesses in the economy, which are concentrated at the top of the income distribution and whose income is more dispersed as a result of uninsurable risk. Following the top income share the coefficient of variation of income of pass-through entrepreneurs increases indicating more income dispersion in this group. The share of Top 1 percent of top incomes increases from by 1.1 percentage points. As we look at larger top shares (Top 5, Top 10) the TRA86 reform has larger impact. As for the data the Top 1 % income share rises in respective period by 3.5 percentage points and Top 10% rises by 4.2 percentage points, hence the model accounts for 30-50 percent of the observed rise of income inequality. As we illustrate in Figure 8 the increase in income dispersion is driven by larger dispersion of both capital income and managerial income among the pass-through business owners. Endogenous selection as well as the general equilibrium effects operate in the same direction as the direct impact on the decision rules.

Table 10: Distributional effects of the TRA86

	Baseline	Tax reform	Change
Top 1%	10.2	11.3	1.1
Top 5%	22.5	24.4	1.9
Top 10%	35.4	37.7	2.3
Coeff. Var Pop	0.92	1.04	0.12
Coeff. Var P	0.16	0.23	0.07
Coeff. Var C	0.10	0.05	-0.05
% of P ent. in ABOs	46.2	58.1	11.9

To illustrate the endogenous selection margin in Figure 7 we present the marginal distributions of agents over wealth and productivity conditional on the legal form of organization. First, notice that in line with the arguments in Section 6.3 more productive entrepreneurs are running C corporations, whereas wealthier one are choosing to run pass-through entities. Following the tax reform the distribution of pass-through entrepreneurs over wealth moves to the right, indicating the positive income effects and importantly the mass of pass-through business owners rises due to the switches from the pool of C corporations. At the same time the selection pattern is clear on the productivity margin. The fraction of pass-through increases especially among entrepreneurs with high productivity levels in line with the evidence from the LBD data, which suggest that larger than the average C corporations are switching.

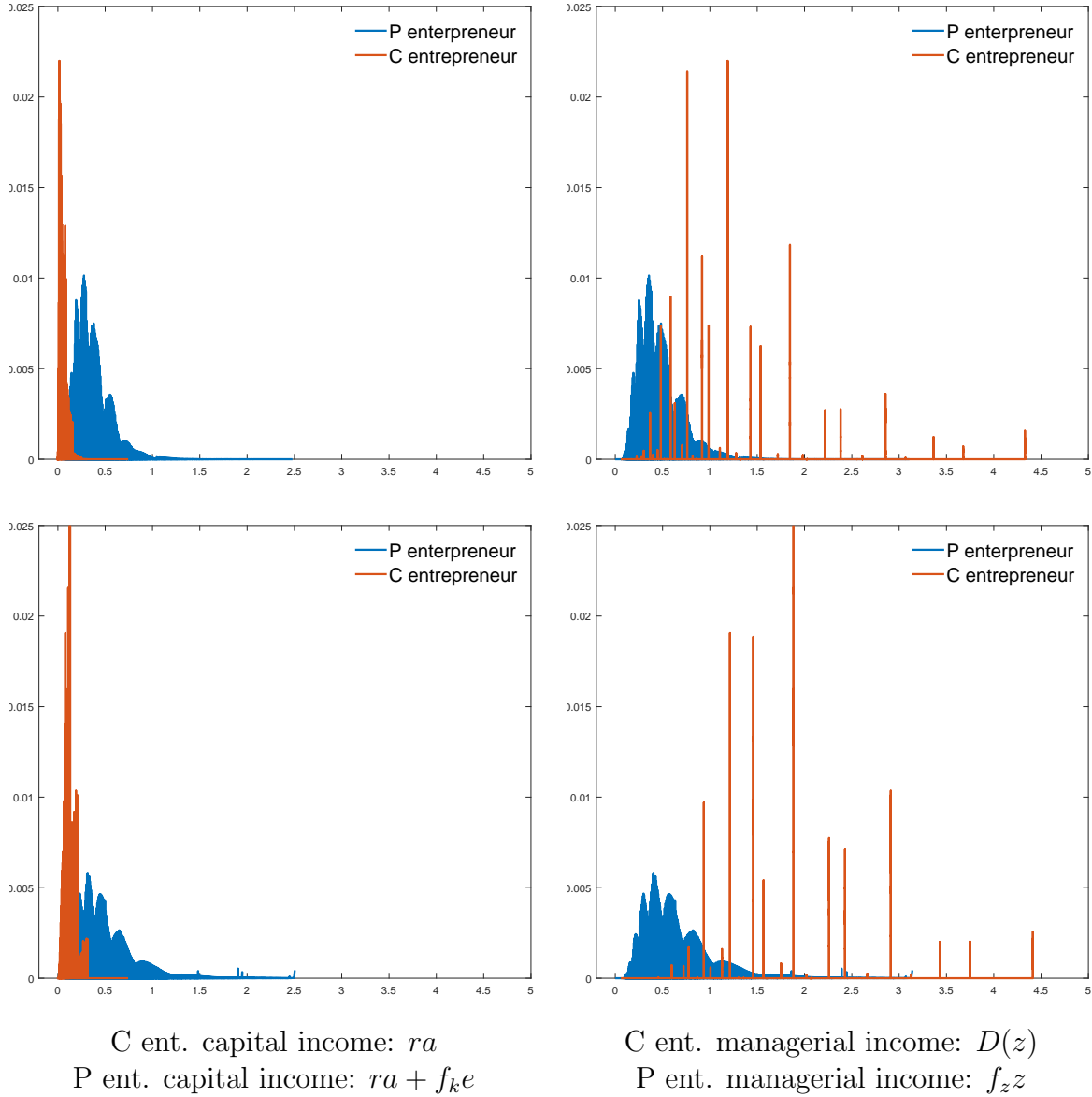
Figure 7: Marginal distributions over wealth and productivity



8 Conclusions

In this paper we argue that changes in income distribution over the last 35 years have been tightly related to the shift in the distribution of legal forms of organization of the US businesses. Tax reforms introduced since the beginning of 1980s together with relaxed regulations on pass-through entities implied running the pass-through business became much more attractive for the business owners in the United States. We use SCF data to illustrate the empirical link between the two secular trends. We also provide new evidence, using administrative data, on the flows between the legal forms and argue that switching from C corporation to pass-through entity has real effects on allocation of factors of production and leads to size reduction of the switchers. Finally, we propose a quantitative-theoretical framework to inspect economic mechanisms translating reduction in personal income taxes into changes in distribution of the legal forms of business organizations and through this channel to the income distribution and its dynamics.

Figure 8: Distribution of capital and managerial income in the benchmark economy (top panel) and post-tax reform economy (bottom panel)



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A Additional figures and tables

Figure A1: Business exit by legal form

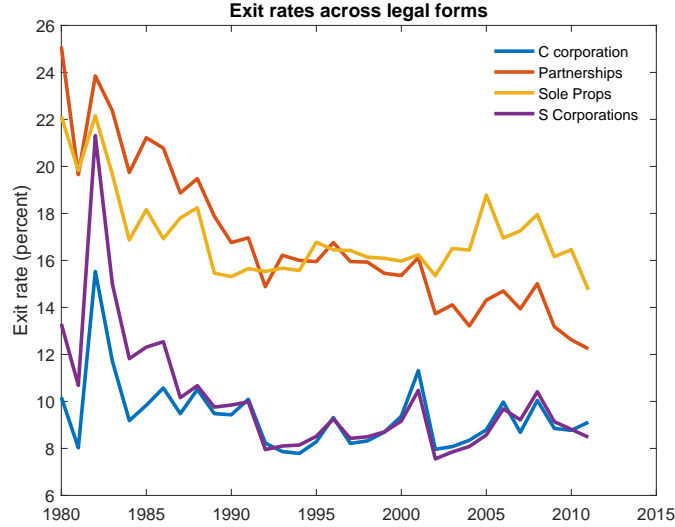


Table A1: Payroll-weighted LBD summary statistics

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2009
<i>Average size (employees)</i>						
C corporations	514.30	278.00	1062.00	1007.00	583.60	985.10
S corporations	71.85	144.00	121.50	148.80	103.20	223.40
Partnerships	199.70	193.50	552.50	539.80	801.60	606.00
Sole proprietors	107.10	19.93	49.88	407.20	200.70	607.70
<i>Exit rate (percent)</i>						
C corporations	4.28	4.50	3.11	3.61	8.46	3.95
S corporations	3.75	1.80	3.04	3.26	6.07	3.07
Partnerships	5.26	1.72	5.95	6.99	6.62	5.30
Sole proprietors	6.94	5.96	8.15	8.13	3.54	7.09
<i>Share of employers (percent)</i>						
C corporations	84.54	75.34	65.03	58.62	48.65	40.34
S corporations	6.02	15.07	25.69	30.64	38.03	36.65
Partnerships	6.89	7.47	5.19	6.50	7.44	18.07
Sole proprietors	2.56	2.12	4.09	4.24	5.88	4.94

Table A2: Distribution of log employment by business owner net worth and LFO

Table A3: Distribution of log real profits by business owner net worth and LFO

	Wealth Quintiles				
	1	2	3	4	5
pass-through	6.21	6.72	6.80	7.31	8.29
	7.60	8.01	8.16	8.52	9.62
	9.10	9.21	9.21	9.80	10.92
	9.90	10.13	10.24	10.71	12.14
	10.52	10.71	10.90	11.46	13.44
C corporation	10.13	8.29	7.65	7.82	9.08
	10.13	9.31	8.29	9.21	10.37
	10.82	10.13	9.21	10.37	11.48
	11.11	10.13	11.41	11.29	12.68
	11.11	10.84	12.01	12.21	14.08

Table A4: Income and savings relative to median worker

	1989	1992	1995	1998	2001	2004	2007	2010	2013	2016
Median net worth:										
pass-through	4.73	3.86	3.29	3.87	5.77	5.74	4.64	6.58	6.82	6.07
C corporation	20.26	16.59	9.91	12.34	13.54	13.06	13.57	27.93	17.36	16.51
Median market income:										
pass-through	2.26	2.59	2.34	2.62	2.54	2.50	2.64	2.27	2.79	2.57
C corporation	4.15	4.64	3.09	3.32	3.83	2.56	4.01	3.88	4.19	3.80
Median ratio of wealth to income:										
pass-through	6.89	4.85	4.65	4.95	6.23	6.42	6.08	5.83	5.20	5.48
C corporation	14.14	9.37	9.18	10.26	9.28	11.72	11.07	10.79	10.35	8.56
Share of net worth:										
pass-through	0.28	0.33	0.31	0.29	0.32	0.35	0.38	0.40	0.39	0.40
C corporation	0.14	0.12	0.10	0.12	0.10	0.08	0.08	0.06	0.07	0.05
Share of market income:										
pass-through	0.23	0.26	0.25	0.26	0.28	0.27	0.27	0.27	0.26	0.28
C corporation	0.07	0.07	0.05	0.07	0.07	0.04	0.05	0.03	0.03	0.03

Figure A2: Pre-tax top income shares in 1980-2012



Source: Own calculations. NBER Tax Model Files. Series exclude capital gains.

Table A5: Shares of total income and income composition.

	Share	1980			Share	2012		
		Composition				Composition		
		Labor	Entr.	Other		Labor	Entr.	Other
Top 10%	32.9	78.1	8.3	13.6	47.8	74.3	17.1	8.6
Top 1%	8.2	60.5	13.3	26.2	18.9	54.9	30.0	15.2
Top 0.1%	2.2	49.1	8.4	40.5	8.4	41.6	35.4	23.0

Source: Own calculations. NBER Tax Model Files. Notes: Labor income = wages + salaries + pensions + stock-option exercised + annuities; Entrepreneurial income = sole proprietorships + partnerships + S corporations; Other: dividends + interest + rents.

Figure A3: Active Business Owners over time

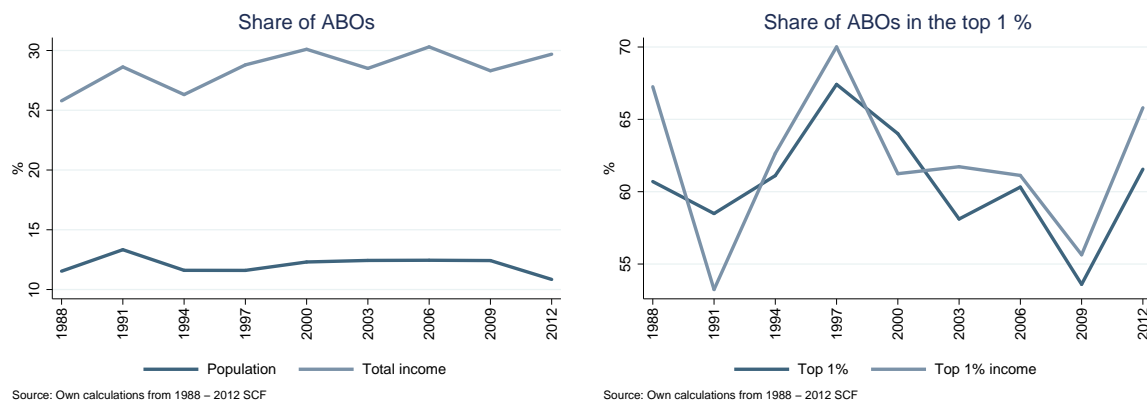


Figure A4: Marginal personal income tax rates in the US

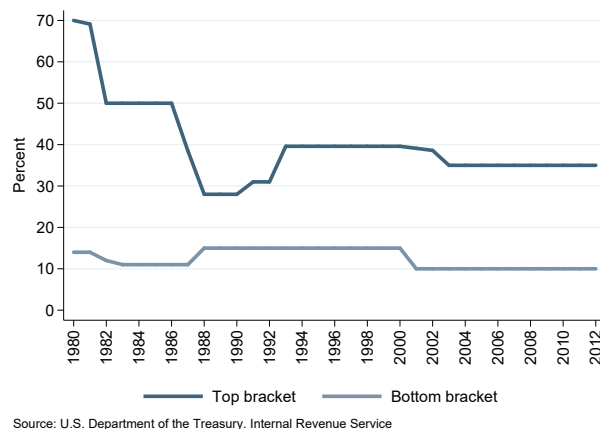


Figure A5: Average marginal personal income tax rates in the US

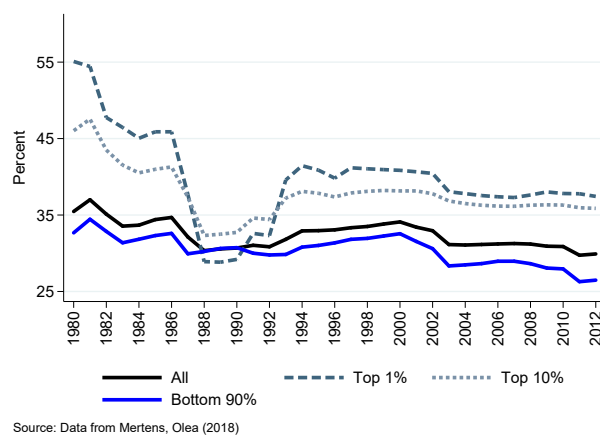


Table A6: Conversions and Tax Reform Act of 2001

	$\Delta \log E_{it}$ (1)	$\Delta \log E_{it}$ (2)	$\Delta \log E_{it}$ (3)	$\Delta \log E_{it}$ (4)
β	0.0257*** (0.0033)	0.0210*** (0.0036)	0.0230*** (0.0068)	0.0184** (0.0072)
γ_{2000}	-0.0207*** (0.0037)	-0.0160*** (0.0044)	-0.00926 (0.0071)	-0.00836 (0.0087)
γ_{2001}	-0.0301*** (0.0035)	-0.0264*** (0.0042)	-0.0340*** (0.0067)	-0.0385*** (0.0136)
γ_{2002}	-0.0315*** (0.0034)	-0.0215*** (0.0058)	-0.0226*** (0.0073)	-0.0127 (0.0199)
γ_{2003}	-0.0293*** (0.0034)	0.0134 (0.0133)	-0.0296*** (0.0080)	0.0167 (0.0250)
Observations	3900000	300000	3900000	300000
R-squared	0.134	0.119	0.25	0.234
Business FE	Yes	Yes	Yes	Yes
Years	1998-2003	1998-2003	1998-2003	1998-2003
Weight	Equal	Equal	Employment	Employment
Sample	All	Converters	All	Converters

B Time series of taxes

B.1 Average Corporate Tax Rate

Average tax rate on corporate income is derived using equation (B.1) based on the method discussed in the appendix of [McGrattan and Prescott \(2005\)](#).

$$\text{avg corporate income tax rate} = \frac{\text{corporate tax liabilities} - \text{FED profits}}{\text{corporate profits before tax} - \text{FED profits}} \quad (\text{B.1})$$

Data

- *corporate tax liabilities* (*cortax*), *corporate profits before tax* (*corprof*): [NIPA Table 1.16](#)
- *FED profits* (*FEDprof*): [NIPA Table 6.16](#)

B.2 Average Marginal Dividend Income Tax

The series for the average dividend income tax comes from the TAXSIM model simulations reported at the [NBER website](#) together with the [comments](#).

B.3 Personal Income Tax Schedule: Progressivity Parameter

C Numerical algorithm

To economize on the individual state variables we rewrite problems in terms of cash on hand. Let x to be cash on hand that entrepreneur has after the production took place and before consumption, savings and investment decisions have been made. Then, the continuation value depends on the legal form of organization and denote x'_C and x'_P to be respectively the continuation value in case entrepreneur chooses to run C corporation and continuation value in case entrepreneur chooses to run pass-through entity. Thus, we have for the C corporation

$$\begin{aligned} x'_C &= y'_C(z') + a' - T_i(ra') - T_d(f_z(k^*(z))z') + T - c_f & \forall z' \\ y'_C(z') &= ra' + f_z(k^*(z))z' & \forall z' \end{aligned}$$

and for the pass-through entrepreneurs we have

$$\begin{aligned} x'_P &= y'_P(z') + a' + (1 - \delta)e' - T_i(y'_P(z') - \delta e') + T & \forall z' \\ y'_P(z') &= ra' + \pi(e', z') & \forall z' \end{aligned}$$

With these continuation values at hand one can rewrite the problem of C corporation entrepreneur as

$$\begin{aligned} V(x, z, C) &= \max_{c, a', d_C} u(c) + \beta \mathbb{E} [d_C V(x'_C(z'), z', C) + (1 - d_C) \mathbf{1}_{\{a' \geq k^*(z)\}} V(x'_P(z'), z', P)] \\ &\text{subject to} \end{aligned} \tag{C.1}$$

$$\begin{aligned} x'_C &= y'_C(z') + a' - T_i(ra') - T_d(f_z(k^*(z))z') + T - c_f & \forall z' \\ x'_P &= y'_P(z') + a' + (1 - \delta)k^*(z) - T_i(y'_P(z') - \delta k^*(z)) + T & \forall z' \\ y'_C(z') &= ra' + f_z(k^*(z))z' & \forall z' \\ y'_P(z') &= ra' + \pi(k^*(z), z') & \forall z' \\ x &= a' + c \\ a' &\geq \underline{a} \end{aligned}$$

and the problem of the pass-through entrepreneur as

$$\begin{aligned} V(x, z, P) &= \max_{c, a', d_P} u(c) + \beta \mathbb{E} [d_P V(x'_P(z'), z', P) + (1 - d_P) V(x'_C(z'), z', C)] \\ &\text{subject to} \end{aligned} \tag{C.2}$$

$$\begin{aligned} x'_C &= y'_C(z') + a' + e' - T_i(r(a' + e')) - T_d(f_z(k^*(z))z') + T - c_f & \forall z' \\ x'_P &= y'_P(z') + a' + (1 - \delta)e' - T_i(y'_P(z') - \delta e') + T & \forall z' \\ y'_C(z') &= r(a' + e') + f_z(k^*(z))z' & \forall z' \\ y'_P(z') &= ra' + \pi(e', z') & \forall z' \\ x &= a' + e' + c \\ a' &\geq \underline{a} \end{aligned}$$

To present the numerical algorithm, it is useful to write the conditional value functions for the entrepreneurs. Problem of the entrepreneur running C corporation who does not change

the legal form becomes

$$\begin{aligned}
V(x, z, C | C) &= \max_{c, a'} u(c) + \beta \mathbb{E}[V(x', z', C) | z] & (C.3) \\
&\text{subject to} \\
x'_C &= y'_C(z') + a' - T_i(ra') - T_d(f_z(k^*(z))z') + T - c_f \quad \forall z' \\
y'_C(z') &= ra' + f_z(k^*(z))z' \quad \forall z' \\
x &= a' + c \\
a' &\geq \underline{a}
\end{aligned}$$

The problem of the entrepreneur running the C corporation who switches to running the pass-through business becomes

$$\begin{aligned}
V(x, z, C | P) &= \max_{c, a', e'} u(c) + \beta \mathbb{E}[V(x', z', P) | z] & (C.4) \\
&\text{subject to} \\
x'_P &= y'_P(z') + a' + (1 - \delta)k^*(z) - T_i(y'_P(z') - \delta k^*(z)) + T \quad \forall z' \\
y'_P(z') &= ra' + \pi(k^*(z), z') \quad \forall z' \\
x &= a' + c \\
a' &\geq k^*(z)
\end{aligned}$$

where the constraint on a' incorporates the restriction that entrepreneur can convert only if she has enough assets. The problem of the pass-through entrepreneur conditional on keeping her legal form of organization is

$$\begin{aligned}
V(x, z, P | P) &= \max_{c, a', e'} u(c) + \beta \mathbb{E}[V(x', z', P) | z] & (C.5) \\
&\text{subject to} \\
x'_P &= y'_P(z') + a' + (1 - \delta)e' - T_i(y'_P(z') - \delta e') + T \quad \forall z' \\
y'_P(z') &= ra' + \pi(e', z') \quad \forall z' \\
x &= a' + e' + c \\
a' &\geq \underline{a}
\end{aligned}$$

and conditional on switching to the C corporation the problem becomes

$$\begin{aligned}
V(x, z, P | C) &= \max_{c, a', e'} u(c) + \beta \mathbb{E}[V(x', z', C) | z] \\
&\text{subject to} \\
x'_C &= y'_C(z') + (a' + e') - T_i(r(a' + e')) - T_d(f_z(k^*(z))z') + T - c_f \quad \forall z' \\
y'_C(z') &= r(a' + e') + f_z(k^*(z))z' \quad \forall z' \\
x &= a' + e' + c \\
a' &\geq \underline{a}
\end{aligned} \tag{C.6}$$

Then the numerical algorithm to solve problems (C.1) and (C.2) is as follows.

Algorithm 5 *Create two grids, \mathcal{G}_v for the value function and \mathcal{G}_x for the policy functions and derivative of the value function. Let \mathcal{G}_z be the grid for the productivities. Pick the accuracy parameter ε . Proceed through the following steps.*

1. Guess $\tilde{V}^0(x, z, P)$ and $\tilde{V}^0(x, z, C)$ on the grid $\mathcal{G}_v \times \mathcal{G}_z$ where

$$\tilde{V}^0(x, z, i) = \beta \mathbb{E}[V(x', z', i) | z]$$

for $i \in \{P, C\}$.

2. Use linear splines to interpolate the $\tilde{V}^0(x, z, i)$ on the $\mathcal{G}_x \times \mathcal{G}_z$ grid and compute it's derivative with respect to the x . The existence of the derivative is guaranteed by the arguments in [Clausen and Strub \(2016\)](#).
3. Given the guess, solve on the grid $\mathcal{G}_x \times \mathcal{G}_z$ for the conditional policy functions solving problems (C.3), (C.4), (C.6) and (C.5). We develop and use the application of the envelope condition method for this step (see [Maliar and Maliar \(2013\)](#) for the simple exposition of the method).
4. Obtain the conditional value functions $V(x, z, C | C)$, $V(x, z, C | P)$, $V(x, z, P | P)$, $V(x, z, P | C)$ using conditional policy functions found in Step 3 and interpolate them back linearly on the grid $\mathcal{G}_v \times \mathcal{G}_z$.
5. Obtain the unconditional value functions

$$\begin{aligned}
V(x, z, C) &= \max_{i \in \{C, P\}} \{V(x, z, C | i)\} \\
V(x, z, P) &= \max_{i \in \{C, P\}} \{V(x, z, P | i)\}
\end{aligned}$$

and policy functions, i.e. the legal form of organization decision from

$$\begin{aligned} d(x, z, C) &= \arg \max_{i \in \{C, P\}} \{V(x, z, C \mid i)\} \\ d(x, z, P) &= \arg \max_{i \in \{C, P\}} \{V(x, z, P \mid i)\} \end{aligned}$$

and the consumption, savings and investment decision rules from

$$\begin{aligned} c(x, z, i) &= c(x, z, i \mid d(x, z, i)) \\ a'(x, z, i) &= a'(x, z, i \mid d(x, z, i)) \\ e'(x, z, P) &= e'(x, z, P \mid d(x, z, P)) \end{aligned}$$

6. Update the guess of the value function

$$\tilde{V}^1(x, z, i) = \beta \mathbb{E}[V(x', z', i) \mid z]$$

Check the condition

$$\left\| \tilde{V}^0(x, z, i) - \tilde{V}^1(x, z, i) \right\|_{\infty} \leq \varepsilon$$

if it holds stop, otherwise set $\tilde{V}^0(x, z, i) = \tilde{V}^1(x, z, i)$ and go to Step 2.