

Macroeconomic Perspective on the Rise of Pass-through Businesses*

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Abstract

From 1980 to 2012 the share of U.S. business receipts from businesses organized as pass-through entities (for example LLCs and S-corporations) rather than traditional C-corporations nearly triples. This paper investigates the origins of the secular rise of pass-throughs and evaluates its macroeconomic consequences. We exploit the panel dimension of the administrative data from the Longitudinal Business Dynamics dataset to document a number of facts characterizing the pass-throughs and C-corporations and to estimate the transition matrices between the legal forms. We show that the entry margin and switching margin account for the most of the rise of pass-throughs. Further, using the Statistics of the U.S. Businesses we argue that the shift in the distribution of organizational forms is related to the structural transformation of the U.S. economy and to some other economic forces, such as rise in the dispersion of productivities, which account for within-sector increase of pass-throughs role. We quantify the impact of different economic forces using the structural macroeconomic model, in which entrepreneurs in both sectors choose endogenously the legal form of organization. We proceed to evaluate the macroeconomic consequences of growing importance of pass-through businesses for the U.S. economy with particular focus on the role of microeconomic heterogeneity for macroeconomic outcomes, propagation of aggregate shocks, misallocation and finally welfare.

Keywords: Firm heterogeneity; Structural Transformation; Pass-through businesses

JEL Codes: E60; H32; K2; L2

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1 Introduction

From 1980 to 2012 the share of U.S. business receipts from businesses organized as pass-through entities (for example LLCs and S-corporations) rather than traditional C-corporations triples up to 37 percent. In this paper we inspect this phenomena from the macroeconomic standpoint. Specifically, we address the following questions:

1. What are the origins driving the secular rise of the pass-through businesses?
2. What are the macroeconomic consequences of changes in the way U.S. businesses are organized?

We start by documenting, using the administrative data from Longitudinal Business Dynamics (LBD) dataset, the basic characteristics of the pass-through firms and C corporations and evolution of the distribution of legal forms over time. We show, that the pass-through businesses started to gain their importance at the beginning of 1980s and the trend continues until now. We compute the transition matrices between the legal forms and argue that the entry margin and switching margin are the most important ones, while exit margin does not contribute to the trend. We further argue that the rise of closely held, pass-through businesses is driven by two main forces: (i) major tax reforms (ii) secular economic forces. In a companion paper, [Dyrda and Pugsley \(2019\)](#), we show that major tax reforms in 1986 and 2001 contributed to the shift in distribution of organizational forms and that changing the legal form of organization has important, economic implications for firm dynamics. In this paper we focus on the secular forces contributing to the changes in the distribution of legal forms. Using the Statistics of the U.S. Businesses (SUSB) we show that the increase in the number of pass-through businesses is tightly related to the structural transformation of the U.S. economy. The pass-through businesses account for larger share of firms and employment in services than in the manufacturing. Thus, as economy switches from manufacturing towards services the importance of the pass-through businesses increases through the composition effect. This force is however only partially responsible for the secular decline in importance of the traditional C corporations. Even looking within the sectors the pass-throughs are gaining their importance, perhaps surprisingly, faster among manufacturing businesses.

To investigate further the sources of the rise of pass-throughs we turn into the macroeconomic theory. The model we propose captures stylized trade-off entrepreneurs face between running the C corporation versus pass-through entity in manufacturing and services sector.

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.

With the use of the model we conduct a series of experiments. First, through the lens of the quantitative model we test various sources of the rise of pass-through entities such as structural transformation or the increase in entrepreneurial productivity risk. Second, we use the model to inspect macroeconomic implications of converting from economy with dominant role of C corporations to the economy where pass-through businesses play major role. In particular, we are investigate the role of microeconomic heterogeneity for macroeconomic outcomes, the propagation of the aggregate shocks, the misallocation and finally in the welfare analysis. The results are still pending.

2 Related literature

TO BE ADDED

3 Facts

3.1 Rise of the pass-throughs

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.¹ 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 determine which version of IRS form 1120 was filed and thus whether the business is actually a S-corporation.

Table 1: 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.² For each year, we match every establishment to its corresponding observation the following year.³ 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 1. The left panel

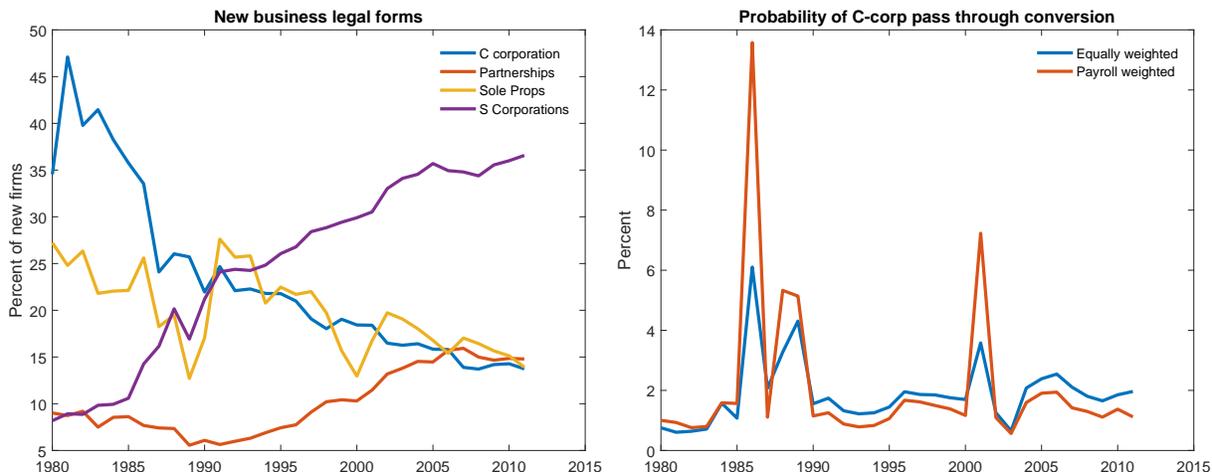
¹See [Jarmin and Miranda \(2002\)](#) for details on the construction of the LBD.

²Other encompasses all other types of legal forms such as non profits, trusts, etc...

³Firms 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.

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.

Figure 1: U.S. Employer Transitions across Legal Form of Organizations, 1980-2012



Source: Census LBD and Business Register

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 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. Interestingly, there is almost no change in survival of C corporations. The right panel in Figure 1 shows that the surge in business conversions was concentrated in larger firms, because the share of conversions when weighted by payroll is actually larger.

3.2 Pass-throughs across sectors

It is well known and documented that the US economy has experienced the structural transformation over the last decades - [Herrendorf, Rogerson, and Valentinyi \(2013\)](#). In this section we argue that the secular changes in the composition of the organizational forms of the US businesses are tightly related to the structural transformation. We exploit information from the Statistics of the U.S. Businesses (SUSB) dataset to document this relation. SUSB provide data from 2007 to 2015 on the composition of the US businesses in terms of both NAICS sectors and legal form of organization. Table 2 presents changes in the distribution of firms and employment across sectors and legal forms of organization. Manufacturing share of firms

has declined by 0.5 percentage points (8.7 percent) since 2007, whereas the share of its employment has fallen by 1.7 percentage point (14.4 percent). Unsurprisingly, these declines have been mirrored by the increase in the shares of services. At the same time, the composition of the legal forms of business organization experienced similar shift. The share of firms organized as pass-through businesses has risen by 5.1 percentage points (7.3 percent) since 2007, whereas in terms of share of employment they have risen by 2.4 percentage points (6.0 percent). This rise has been accompanied by the decline in the shares of the traditional C corporations, by 5.4 percentage points (24.3 percent) in terms of share of firms and 3.1 percentage points (6.5 percent) in terms of shares of employment. The asymmetry of changes between the shares of firms and shares of employment suggest that firms, which are smaller than average C corporations become pass-throughs.

Table 2: Sectoral composition and legal forms of organization 2007-2015

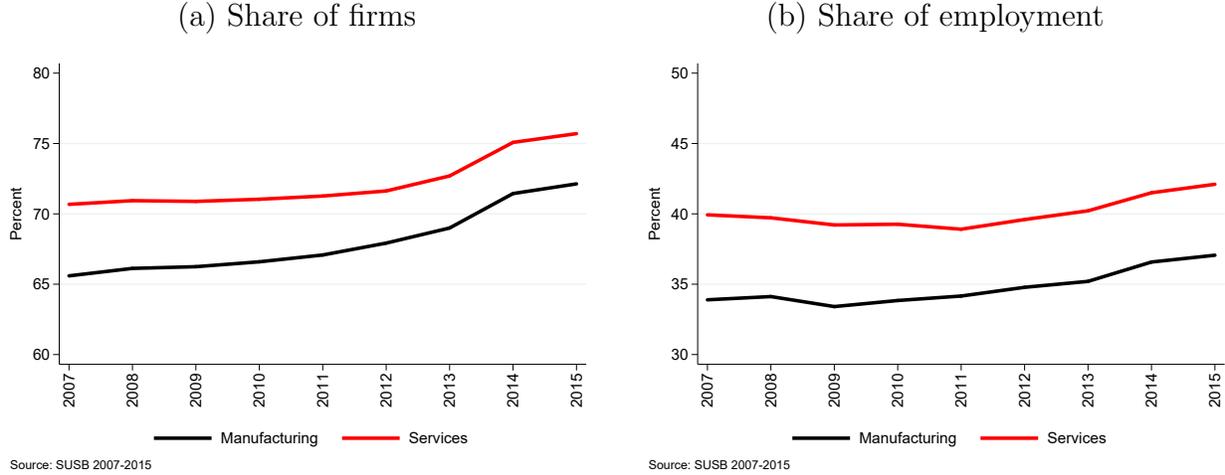
	Sector		Legal form of organization	
	Manufacturing	Services	Pass-throughs	C corporations
Share of firms				
2007	5.1	95.6	70.9	22.3
2015	4.6	96.1	76.0	16.9
Change	-0.5	0.5	5.1	-5.4
Share of employment				
2007	11.6	88.2	32.3	47.3
2015	9.9	89.9	41.6	44.2
Change	-1.7	1.7	2.4	-3.1

Source: Statistics of the U.S. Businesses (SUSB), 2007-2015.

To inspect further the relationship between structural transformation and the shifts in the composition of the US legal forms of organization we look into the role of pass-throughs conditional on the sector, in which they operate at. Figure illustrates the share of pass-throughs as a fraction of firms (left panel) and as a share of employment (right panel). Two patterns emerge. First, the fraction of businesses organized as pass-throughs is larger in services than in manufacturing, in 2007 the difference was 5 percentage points in terms of share of firms (6 percentage points in terms of share of employment). Second, both manufacturing and services have experienced substantial increase in the importance of pass-through businesses. Measured in terms of share of firms, pass-throughs rose by 6.5 percentage

points in manufacturing and by 5.0 percentage points in services, narrowing the initial gap. The rising importance of pass-through businesses, conditional on the sector, suggests that structural transformation is only partially, through the composition effect, responsible for the changes in the distribution of the legal forms of organization. There are some other forces operating similarly across all sectors of the economy.

Figure 2: Pass-throughs in manufacturing and services



4 Origins of the rise of pass-throughs

4.1 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 finite and individuals survive until next period with probability γ . We denote the fraction of entrepreneurs in the model by μ . Among entrepreneurs, a fraction ϕ runs manufacturing businesses, whereas the fraction $1 - \phi$ runs businesses operating in services. The sector attachments are fixed. Entrepreneurs in each sector choose the legal form of business organization between the pass-through business and C corporation. We denote the fraction of pass-through businesses in the economy by p . Thus in every period the economy consists of $1 - \mu$ of workers and μ entrepreneurs who are organized either as pass-throughs or C corporation and operate either in manufacturing or in services.

Technology. Every entrepreneur has an access to the decreasing returns to scale technology transforming physical $f^j(z, k, n)$ capital k and labor input n into the consumption good.

Indicator $j \in \{m, s\}$ denotes the sector in which the entrepreneur operates, where m stands for manufacturing and s stands for services. Variable z represents the entrepreneur-specific productivity drawn from distribution Γ_z . We impose the following functional form for the technology

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

where ν_j is sector specific share of the fixed factor, which together with the parameter α determines the labor share across sectors. Given the installed capital k and productivity z every firm generates the gross profits

$$\pi^j(k, z) = \max_n \{ z^{1-\nu_j} (k^\alpha n^{1-\alpha})^{\nu_j} - wn \}. \quad (4.1)$$

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, $f_n = w$. ■

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. The consumption c is given by the CES aggregator

$$c = \left[\omega_m^{\frac{1}{\theta}} c_m^{\frac{\theta-1}{\theta}} + \omega_s^{\frac{1}{\theta}} c_s^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$

where c_m denotes the consumption of the manufacturing good and c_s consumption of the services. The functional form is a parsimonious choice that allows us to capture two features on the demand side that are potentially important for understanding the reallocation of activity across these three sectors: how the demand of the household reacts to changes in income and in relative prices.

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

$$V^W = \max_{c,h,a'} u(c, 1-h) + \beta \mathbb{E} [V^W(a', \varepsilon') | \varepsilon] \quad (4.2)$$

subject to

$$c = \left[\omega_m^{\frac{1}{\theta}} c_m^{\frac{\theta-1}{\theta}} + \omega_s^{\frac{1}{\theta}} c_s^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$

$$c_m + p_s c_s + a' = a + y - T_d(ra) - T_i(wh\varepsilon)$$

$$y = ra + wh\varepsilon$$

$$a' \geq \underline{a}$$

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

$$V^P(a, e, z, j) = \max_{s, c} u(c, 1 - \bar{h}) + \beta W^P(s, z, j) \quad (4.3)$$

subject to

$$c = \left[\omega_m^{\frac{1}{\theta}} c_m^{\frac{\theta-1}{\theta}} + \omega_s^{\frac{1}{\theta}} c_s^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$

$$c_m + p_s c_s + s = y + a + (1 - \delta) e - T_i(\pi^j(e, z) - \delta e) - T_d(ra)$$

$$y = ra + \pi^j(e, z)$$

$$s \geq \underline{a}$$

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

$$V^C(a, z, j) = \max_{s, c} u(c, 1 - \bar{h}) + \beta W^P(s, z, j) \quad (4.4)$$

subject to

$$c = \left[\omega_m^{\frac{1}{\theta}} c_m^{\frac{\theta-1}{\theta}} + \omega_s^{\frac{1}{\theta}} c_s^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$

$$c_m + p_s c_s + s = y + a - T_d(ra + D(z))$$

$$y = ra + D(z)$$

$$D(z) = (1 - \tau_c)(f_z(k^*)z - c_f)$$

$$s \geq \underline{a}$$

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

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

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

$$W^C(s, z, j) = \max \left\{ \mathbb{E} [V^C(s, z', j)], \max_{e' \leq s-a} \left\{ \mathbb{E} [V^P(s - e', e', z', j)] \right\} \right\}.$$

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.

$$\mathbb{E}[(1 - \tau_c) (\pi_k^j(k^*; z') - \delta) | z] + 1 = 1 + r \quad (4.5)$$

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

$$\lambda'_w(\mathcal{A}, \vartheta) = \int_{A \times \epsilon} \mathbb{I}\{a'(a, \epsilon) \in \mathcal{A}\} \Gamma(\epsilon'|\epsilon) d\lambda_w(a, \epsilon) \quad \forall \mathcal{A}, \vartheta \in \mathcal{B}(A) \times \mathcal{B}(\epsilon) \quad (4.6)$$

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

$$\begin{aligned} \lambda'_P(\mathcal{A}, \mathcal{E}, \mathcal{Z}, j) &= \int_{A \times E \times Z} \sum_{j \in \{m, s\}} (1 - d_P) \mathbb{I}\{s - e' \in \mathcal{A}\} \mathbb{I}\{e' \in \mathcal{A}\} \Gamma(z'|z) d\lambda_P(a, e, z, j) \\ &+ \int_{A \times Z} \sum_{j \in \{m, s\}} d_C \mathbb{I}\{s - e' \in \mathcal{A}\} \mathbb{I}\{e' \in \mathcal{A}\} \Gamma(z'|z) d\lambda_C(a, z, j) \end{aligned} \quad (4.7)$$

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 $\mathcal{A}, \mathcal{Z} \in \mathcal{B}(A) \times \mathcal{B}(Z)$ and for each $j \in \{m, s\}$, given by

$$\begin{aligned} \lambda'_C(\mathcal{A}, \mathcal{Z}, j) &= \int_{A \times Z} \sum_{j \in \{m, s\}} (1 - d_C) \mathbb{I}\{s \in \mathcal{A}\} \Gamma(z'|z) d\lambda_C(a, z, j) \\ &+ \int_{A \times E \times Z} \sum_{j \in \{m, s\}} d_P \mathbb{I}\{s \in \mathcal{A}\} \Gamma(z'|z) d\lambda_P(a, e, z, j) \end{aligned} \quad (4.8)$$

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

$$p = \mu \left(\int_{A \times E \times Z} \sum_{j \in \{m, s\}} (1 - d_P(a, e, z, j)) d\lambda_P(a, e, z, j) + \int_{A \times Z} \sum_{j \in \{m, s\}} d_C(a, z, j) d\lambda_C(a, z, j) \right) \quad (4.9)$$

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

$$\begin{aligned} \int_{A \times \epsilon} h(a, \epsilon) d\lambda_w(a, \epsilon) &= \int_{A \times Z} \sum_{j \in \{m, s\}} n^*(z) d\lambda_C(a, z, j) \\ &+ \int_{A \times E \times Z} \sum_{j \in \{m, s\}} n(a, e, z, j) d\lambda_P(a, e, z, j) \end{aligned} \quad (4.10)$$

and market clearing for the capital stock requires

$$\begin{aligned} \int_{A \times Z} k^*(z, j) d\lambda_C(a, z, j) &= \int_{A \times \epsilon} a'(a, \epsilon) d\lambda_w(a, \epsilon) + \int_{A \times Z} a'(a, z, j) d\lambda_C(a, z, j) \\ &+ \int_{A \times E \times Z} a'(a, e, z, j) d\lambda_P(a, e, z, j) \end{aligned} \quad (4.11)$$

where $a' = s - e'$ for the pass-through entrepreneur and $a' = s$ for the C corporation owner. Finally, to pin down the relative price of services p_s we require the market goods for services to clear, i.e. the total demand for the consumption of services equals the overall production of these goods in the economy.

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

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

Hence the intertemporal government budget constraint becomes

$$G + (1 + r)B + T = B' + R_i + R_d + R_c \quad (4.12)$$

Equilibrium. The general equilibrium is defined as follows.

Definition 1 *Given government policy $\{G, T_i, T_d, T_c\}$, a recursive competitive equilib-*

rium 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 (4.2), (4.3), (4.4).
2. Given prices, allocations of labor $\{n^*, n\}$ and capital $\{k^*\}$, solve respectively (4.1) and (4.5).
3. The probability measures $\{\lambda_w, \lambda_P, \lambda_C\}$ evolve according to (4.6), (4.7), (4.8).
4. Government budget constraint (4.12) is satisfied.
5. Market clearing conditions (4.10), (4.11) hold.

4.2 Structural transformation

TO BE ADDED

4.3 Rise of productivity risk

TO BE ADDED

5 Macroeconomic Implications

5.1 From micro heterogeneity to macro aggregates

TO BE ADDED

5.2 Propagation of the aggregate shocks

TO BE ADDED

5.3 Misallocation: effects on the aggregate productivity

TO BE ADDED

5.4 Welfare analysis

TO BE ADDED

6 Conclusions

TO BE ADDED

References

- DYRDA, S. AND B. PUGSLEY (2019): “Taxes, Private Equity, and Evolution of Income Inequality in the US,” Tech. rep.
- HERRENDORF, B., R. ROGERSON, AND K. VALENTINYI (2013): “Growth and Structural Transformation,” Working Paper 18996, National Bureau of Economic Research.
- JARMIN, R. S. AND J. MIRANDA (2002): “The Longitudinal Business Database,” Working Papers 02-17, Center for Economic Studies, U.S. Census Bureau.