Corporate Income Tax, Legal Form of Organization, and Employment

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A dynamic stochastic occupational choice model with heterogeneous agents is developed to evaluate the impact of a corporate income tax reduction on employment. In this framework, the key margin is the endogenous entrepreneurial choice of legal form of organization. A reduction in the corporate income tax burden encourages adoption of the C corporation legal form, which reduces capital constraints on firms. Improved capital re-allocation increases overall productive efficiency in the economy and therefore expands the labor market. Relative to the benchmark economy, a corporate income tax cut can reduce the non-employment rate by up to 7 percent.

Since the inception of the corporate income tax in 1909, the appropriateness of this tax as a government revenue instrument has been debated in both the policy and academic arenas. Economists have invested considerable efforts in understanding the incidence of a corporate income tax as well as its impact on firm decisions. Over the last few years, concerns with the corporate income tax have been focused on its potential negative effects on employment. Politicians have suggested that a cut

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in the corporate income tax rate could be an engine for job creation. This paper addresses the question: Will a decline in the corporate income tax generate jobs?

Much of the literature focuses on the corporate income tax as a tax on capital that distorts the capital-labor input factor ratio. As a result, this distortionary effect can have employment implications.[1] However, Stiglitz (1976) argues the corporate income tax becomes non-distortionary when the costs associated with corporate capital financing, such as interest payments on debts, are corporate income tax deductible. In this paper, we show that a reduction in the corporate income tax can result in job growth, even when this tax is treated as a tax on pure corporate profit (i.e., all labor and capital costs are tax deductible).

To evaluate the potential employment effect from a change in the corporate income tax rate, this paper develops a dynamic stochastic occupational choice model with heterogeneous agents. Model dynamics are introduced in a manner similar to Hopenhayn and Rogerson (1993). Occupational choice is modeled akin to Lucas (1978), and agents in the economy are able to choose between being non-employed, a worker, or an entrepreneur. Our model framework shares similarities to other papers in the literature. For example, Buera, Kaboski and Shin (2011) adopt an occupational choice model with financial constraints to evaluate the distortion of financial frictions on the allocation of capital and entrepreneurial talent across production units and its adverse effect on productivity.[2] This paper builds upon the aforementioned literature by introducing a firm's choice of legal forms of organization (LFO).

In the United States, a firm chooses to be either a pass-through business or a C

[1]The economic literature on the corporate income tax is voluminous. See Auerbach (2006) for a comprehensive overview of this literature. The literature has pointed out that a capital tax can affect per capita hours worked in the economy. For example, taking a comprehensive view, McGrattan (2012) includes all types of capital taxes paid by businesses. She finds that changes in tax rates on dividend income and undistributed profits had a particularly large effect on investment and, consequently, hours worked during the Great Depression.

[2]There are many papers using the Lucas (1978) style occupational choice model to study productivity misallocation. For example, Erosa (2001) shows financial costs of raising capital affects entrepreneurial occupational choice and causes misallocation of financial assets. Guner, Ventura and Xu (2008) use a version of the Lucas (1978) model to study size-dependent policies and misallocation. Many other papers document the implications of credit market imperfection and productivity — for example, Amaral and Quintin (2010) and Caselli and Gennaioli (2013). See Restuccia and Rogerson (2013) for a more detailed overview.

corporation. In 2011, 75 percent of firms were of the pass-through legal form, and they hired nearly half of all workers. Pass-through firms include sole proprietorships, partnerships, limited liability firms, and S corporations. Although many legal differences exist between the pass-through and the C corporation legal forms, our model focuses on the essential trade-off a firm must face when choosing an LFO. A disadvantage of a firm filing as a C corporation is that the firm is subject to double taxation. A C corporation must pay the corporate income tax on its corporate profits. If remaining profits are distributed to shareholders, these profits are subject to the personal income tax. On the other hand, if a firm files as a pass-through entity, all profits are passed through to the business owners, who are subject only to the personal income tax. The LFO choice also has implications for the access to capital. Pass-through entities are subject to legal restrictions on access to capital. Legally, a pass-through entity can have no more than 100 shareholders and no foreign, institutional, or corporate shareholders. This type of firm cannot issue preferred stock, which limits its ability to attract "deep-pocket" investors such as venture capitalists. Given these restrictions, pass-through businesses are more likely to be capital constrained compared with C corporations. In the paper, data are examined across industry sectors and firm-size classes to provide evidence that capital constraints indeed differ by LFO.

The corporate income tax can distort firm LFO choice. A distortion in LFO choice can impact the allocation of capital among firms in the economy. Ideally, marginal products of capital should be equalized across all firms in the economy. The corporate income tax can cause inefficiency by leaving some high marginal-return-to-capital firms without sufficient access to capital. The higher the corporate income tax rate, the more severe such capital misallocation would become. In our model, entrepreneurs finance their operations either by using personal wealth or by accessing the external capital market. More-productive entrepreneurs, with small individual personal wealth, are more likely to be capital constrained without external capital. If these firms were to choose the pass-through legal form to avoid double taxation, their access to the external capital market would be restricted. The resulting capital

misallocation would in turn impact overall employment in the economy. A reduction in the corporate income tax rate could encourage a pass-through firm to become a C corporation. As a result of the change in LFO, this firm would have additional access to capital, allowing expansion of operations and hiring of additional workers.[3]

To understand the importance of endogenizing the choice of LFO, consider a representative firm faced with fixed input factor prices in a static perfectly competitive environment. If the firm is a pass-through entity and not subject to the corporate income tax, a change in the corporate income tax rate would not impact the firm's hiring decisions. If the firm is organized as a C corporation and all capital and labor costs are tax deductible, a change in the corporate income tax rate would not distort the relative input prices of capital and labor. In this situation, the firm's output level and employment decisions would not be affected in the static environment. In either case of fixed LFO, a change in the corporate income tax policy would have little effect on employment.

The model is calibrated to match key economic statistics such as the rate of non-employment, the wealth distribution, and measures relating to the size distribution of firms and firm dynamics. Using the calibrated model, this paper quantitatively evaluates the impact that a decline in the corporate income tax rate would have on firm LFO choice, and aggregate implications for output, consumption, and capital utilization, as well as employment. A series of revenue-neutral policy experiments are conducted with respect to the corporate income tax rate. With a lower corporate income tax rate, the C corporation sector expands significantly. With the corporate income tax eliminated, the fraction of C corporations increases by more than 20 percentage points compared with the benchmark economy. In addition, C corporations hire about 94 percent of all workers in the economy. The economy experiences an increase in output, consumption, and capital formation, similar to

[3]A firm's ability to change LFO is an empirically important margin. For example, the State of Kansas enacted a tax cut package that eliminated the state income tax on pass-through entities in 2012. From 2012 to 2014, 393,814 entities took advantage of this tax policy change. As a result, the total pass-through income reported by those entities had increased by 11 percent. This indicates that LFO decisions are responsive to income tax rate changes. (See "Testimony: Reexamining Kansas' Pass-through Carve-out," Tax Foundation, January 19, 2017.)

the findings in Fehr et al. (2013). A reduction in the corporate income tax rate leads to moderate job growth. If the corporate income tax were to be eliminated, the model predicts the non-employed population would decrease from 34.1 percent to 31.7 percent, about a 7 percent fall in the relative non-employment rate.

This paper furthers the understanding of the impact of corporate tax policy on productivity misallocation. There is a large set of papers studying the economic impacts of productivity misallocation, such as Hopenhayn and Rogerson (1993), Restuccia and Rogerson (2008), Hsieh and Klenow (2009), and Midrigan and Xu (2014). Our paper is similar to Midrigan and Xu (2014) in that it incorporates two channels through which aggregate productivity can be affected by capital market imperfections. The corporate income tax both creates barriers to firm entry and generates dispersion in marginal returns to capital across firms with different tightness of capital constraints. A reduction in the corporate income tax rate encourages firms to adopt the C corporation legal form. As a result, aggregate productivity increases with the loosening of firm capital constraints and more efficient capital allocation. However, lowering the burden of double taxation induces entry by low-productivity firms, causing average managerial quality and labor productivity to fall. Because of these two counterbalancing forces, the effect of a corporate income tax reduction on overall economic efficiency is non-monotonic. The elimination of the corporate income tax has a relatively small overall effect on aggregate productivity — an increase of only about 0.9 percent.

By introducing the firm's choice of LFO, this paper adds an additional dimension needed to understand how firm incorporation decisions respond to corporate income tax policy. Following Gravelle and Kotlikoff (1989), papers such as Gordon and MacKie-Mason (1994), Mackie-Mason and Gordon (1997), Gordon and Slemrod (2000), and Kotlikoff and Miao (2010) explicitly allow incorporation decisions in their models. In Kotlikoff and Miao (2010), the corporate income tax impacts entrepreneurs' incorporation decisions by affecting business risk sharing, while in Gordon and MacKie-Mason (1994) and Mackie-Mason and Gordon (1997), firms' incorporation decisions hinge upon income tax progressivity. In this paper,

firms choose to incorporate to gain access to external capital. Empirically, Gordon and MacKie-Mason (1994), Goolsbee (1998), and Mackie-Mason and Gordon (1997) have generally found no major shifts between organizational forms in response to tax changes. One reason is that historical variation in federal corporate tax rates had been almost negligible. The notable exception is Goolsbee (2004), who uses cross-sectional variation in state corporate tax rates to measure the organizational response. The predicted LFO changes in response to changes in the corporate income tax rate in this paper are in line with the findings in Goolsbee (2004).[4]

The remainder of the paper is organized as follows. Section I presents the model in detail. Section II lends empirical support to the modeling of capital constraints. Section III details the calibration procedure and analyzes the calibration results of the benchmark model. Section IV considers policy experiments, discusses the implications on employment and productivity, analyzes the importance of LFO choice, and provides welfare analyses. Section V concludes.

I. The Model

In this paper, a dynamic stochastic occupational choice model is developed. Time is discrete and infinite, indexed by $t = 0, 1, 2, ...$[5] The economy consists of a unit measure of heterogeneous agents, a financial intermediary, and a government. The paper focuses on a steady-state analysis of the model. Next, the decisions of each type of agent in the model are described, and then the stationary equilibrium is defined.

[4]Employing the Gruber and Saez (2002) bunching approach to examine the elasticity of the corporate tax income in the United Kingdom, Devereux, Liu and Loretz (2014) examine the decision on whether to declare firm income as either corporate profit or personal income in response to the corporate income tax rate change. They find the elasticity of the share of income recorded as corporate profits is small and positive with respect to the difference between personal and corporate income tax rates. This is indirect evidence of an organizational response due to a change in the corporate income tax rate.

[5]For notational convenience, we suppress the time subscript t in the following model description.

A. Agents

Agents are heterogeneous in their productive talents and asset holdings. They can choose between being non-employed, a worker, or an entrepreneur. An entrepreneur can decide whether to operate the firm as a pass-through business or as a C corporation.

Each agent is endowed with 1 unit of time that can be allocated between work n and leisure $l = 1 - n$. The work-leisure decision is discrete. Either an agent works full time $n = \overline{n}$ or spends all the time in leisure $n = 0$. Agents discount the future at rate $\beta \in [0, 1]$.

Agent heterogeneity is reflected through the agent's state variables, which include the agent's productivity z and asset level a. Productivity evolves according to an exogenous first-order Markov process that is independent across agents, where $\rho(z'|z)$ denotes the probability of receiving productivity z' tomorrow conditional on today's productivity being z.

While productivity evolves exogenously, agents make asset-holding decisions endogenously. Each period, after observing current productivity z and asset level a, an agent decides on the asset holding next period a'. There is a non-borrowing constraint such that a' must be non-negative. The interest rate for asset savings is r.

Agent occupational choice decision χ is defined over a set of choices. An agent can alternatively choose to be non-employed, in which case $\chi = N$, become an employed worker, in which case $\chi = E$, or be an entrepreneur. The entrepreneurship decision, depending on both agent productivity z and asset level a, is modeled similar to Cagetti and De Nardi (2006) and Quadrini (2000). In addition, this model allows for LFO choice. An entrepreneur can organize a firm as a pass-through entity, in which case $\chi = P$, or as a C corporation, in which case $\chi = C$. At the beginning of a period, agents make occupational decisions after observing their current-period state variables z and a.

An agent's occupational choice also determines labor supply n. If an agent de-

cides to be non-employed, $\chi = N$, then all time is allocated to leisure and $n = 0$. Otherwise, for $\chi \in \{E, P, C\}$, an agent is assumed to work full time, or $n = \bar{n}$.

Agent preference $u(c, n, \iota)$ depends on current consumption level c, working hours n, and entrepreneurial choice ι. In particular, we assume agents value consumption c, leisure $1 - n$, and the opportunity to be an entrepreneur. The utility function takes the form

$$u(c, n, \iota) = v(c, n) + \iota \cdot \eta.$$

The indicator ι shows whether or not an agent is an entrepreneur. If $\iota = 0$, the agent is either non-employed or a worker. If $\iota = 1$, the agent is operating either a pass-through entity or a C corporation. Entrepreneurship is accompanied by a constant increase in utility $\eta \geq 0$. Hurst and Pugsley (2011) refer to this additional utility as the agent's non-pecuniary benefits from owning a business. This aids in explaining the empirical pattern first documented by Hurst and Pugsley (2011) that a large number of small businesses never intend to grow larger. For the purpose of this paper, the magnitude of η is calibrated to match the size distribution of firms in the model economy.[6]

All agents, regardless of occupational types, are subject to a personal income tax. If m is taxable personal income, then the total tax is given by a personal income tax function $T^p(m)$. C corporate profits are subject to a corporate income tax. If π is the C corporate profit, then the total tax is given by a corporate income tax function $T^c(\pi)$.

We next describe the agent's problem under each occupation $\chi \in \{N, E, P, C\}$.

Non-employed Agent. — An agent, choosing to be non-employed, receives a lump-sum transfer b from the government each period. This transfer and any interest

[6]In an alternative specification, agents are allowed to have different non-pecuniary benefit (η) parameters. In particular, we normalize $\eta = 0$ for one group of the population and set $\eta > 0$ for another group. However, for the purpose of this paper, allowing such a possibility does not change much the results of the policy experiment. Most of the policy effect is caused by entrepreneurs' actions, either by switching LFO or entering the market. If two groups are allowed, the overwhelming majority of entrepreneurs under any corporate tax policy come from the group with $\eta > 0$. For the simplicity of the state space and computation, agents have the same non-pecuniary benefits $\eta > 0$ in the model.

income earned ra are subject to the personal income tax.

An agent's value function depends on productivity z and asset level a. If an agent is non-employed, the post-occupational-choice value function is denoted as $W^N(z,a)$, which is given by

$$\begin{aligned} W^N(z,a) &= \max_{c\geq 0, a'\geq 0} \; u(c,1,0) + \beta E_{z'|z} V(z',a') \\ \text{subject to:} &\quad c = (b+ra) - T^p(b+ra) + a - a'. \end{aligned} \tag{1}$$

Employed Worker. — If an agent decides to become an employed worker, he earns a wage w on effective labor $z\overline{n}$. Total income of this agent is comprised of earnings $wz\overline{n}$ and interest income ra. Both sources of income are subject to the personal income tax. The workers' value function, $W^E(z,a)$, is defined as

$$\begin{aligned} W^E(z,a) &= \max_{c\geq 0, a'\geq 0} \; u(c,1-\overline{n},0) + \beta E_{z'|z} V(z',a') \\ \text{subject to:} &\quad c = (wz\overline{n}+ra) - T^p(wz\overline{n}+ra) + a - a'. \end{aligned} \tag{2}$$

Entrepreneur. — The income of an entrepreneur depends on the firm's profit generated from production activities. All entrepreneurs have the same Cobb-Douglas production function $F(z,k,l) = zk^\gamma l^\theta$. Parameters γ and θ are the capital and labor intensity parameters, respectively. To ensure an interior solution, the production function is assumed to have decreasing returns to scale and $\gamma + \theta < 1$. Firms hire labor at wage rate w. Capital costs include both costs of depreciation and opportunity cost. Capital depreciates at rate δ. The opportunity cost of using 1 unit of capital is r, which is the return to saving 1 unit of assets. A firm's profit in a given period is defined as

$$\pi(z,k,l) = F(z,k,l) - (r+\delta)k - wl.$$

An entrepreneur can operate a firm either as a pass-through business or a C

corporation. The choice of LFO depends on two essential differences. First, the profits of C corporations are subject to both the corporate income tax and the personal income tax, while the profits of pass-through businesses are passed through to their owners and only subject to the personal income tax. Double taxation is a clear disadvantage of electing the C corporation legal form. On the other hand, C corporations face less restriction on accessing capital. Empirical evidence supporting this claim is presented in Section II.

An entrepreneur self-finances the capital input of the firm or receives external capital from an financial intermediary. Firms receive external financing offers in a probabilistic fashion. The advantage of being a C corporation is that the chance of a C corporation receiving external financing offers (φ^c) is higher than that of a pass-through business (φ^p). We assume, upon receiving an offer, an entrepreneur can raise as much external capital as the firm requires. A firm without an external financing offer must self-finance all the firm's capital input, so $k \leq a$.

This difference between external financing probabilities φ^c and φ^p is a key feature in our model. The difference in φ^c and φ^p is intended to capture the varying capital constraints faced by firms of different LFO. The value of φ is strictly between 0 and 1, which indicates that firms can access external financing but the access is not unlimited. In our framework, when the difference between φ^c and φ^p is large enough to overcome the disadvantage of double taxation, some entrepreneurs, especially those with high managerial talent z and limited personal wealth, would find it optimal to elect the C corporation legal form for their businesses.

Next, optimization problems for both the pass-through and the C corporation entrepreneurs are specified.

A pass-through entrepreneur is not subject to the corporate income tax. However, both entrepreneurial and interest incomes are subject to the personal income tax.

If a pass-through firm self-finances, the value of an entrepreneur is

$$
\begin{aligned}
(3) \qquad W^{P,self}(z,a) &= \max_{c\geq 0, a'\geq 0, k\geq 0, l\geq 0} \; u(c, 1-\overline{n}) + \beta E_{z'|z} V(z', a') \\
&\text{subject to:} \quad c = (\pi(z,k,l) + ra) - T^p(\pi(z,k,l) + ra) + a - a'; \\
&\qquad\qquad\quad k \leq a.
\end{aligned}
$$

On the other hand, if a pass-through firm receives external financing, the entrepreneur no longer faces the capital constraint $k \leq a$. The value of the entrepreneur is

$$
\begin{aligned}
(4) \qquad W^{P,ext}(z,a) &= \max_{c\geq 0, a'\geq 0, k\geq 0, l\geq 0} \; u(c, 1-\overline{n}) + \beta E_{z'|z} V(z', a') \\
&\text{subject to:} \quad c = (\pi(z,k,l) + ra) - T^p(\pi(z,k,l) + ra) + a - a'.
\end{aligned}
$$

The ex-ante value function of a pass-through business before knowing whether it is offered an external financing opportunity is

$$
(5) \qquad W^P(z,a) = (1-\varphi^p) W^{P,self}(z,a) + \varphi^p W^{P,ext}(z,a).
$$

A C corporation entrepreneur's corporate profits are subject to double taxation. Profits are taxed both at the corporate level and the personal level. In addition, any interest income earned ra is subject to the personal income tax.

If a C corporation self-finances, the value of the entrepreneur is

$$
\begin{aligned}
(6) \qquad W^{C,self}(z,a) &= \max_{c\geq 0, a'\geq 0, k\geq 0, l\geq 0} \; u(c, 1-\overline{n}) + \beta E_{z'|z} V(z', a') \\
&\text{subject to: } c = (\pi(z,k,l) - T^c(\pi(z,k,l)) + ra) - T^p(\pi(z,k,l) \\
&\qquad\qquad\qquad\qquad -T^c(\pi(z,k,l)) + ra) + a - a'; \\
&\qquad\qquad k \leq a.
\end{aligned}
$$

If a C corporation receives external financing, the value of the entrepreneur is

$$
\begin{aligned}
(7) \qquad W^{C,ext}(z,a) = & \max_{c\geq 0, a'\geq 0, k\geq 0, l\geq 0} \; u(c, 1-\overline{n}) + \beta E_{z'|z} V(z', a') \\
\text{subject to: } & c = (\pi(z,k,l) - T^c(\pi(z,k,l)) + ra) - T^p(\pi(z,k,l) \\
& -T^c(\pi(z,k,l)) + ra) + a - a'.
\end{aligned}
$$

Similarly, the ex-ante value function of a C corporation is

$$
(8) \qquad W^C(z,a) = (1-\varphi^c) W^{C,self}(z,a) + \varphi^c W^{C,ext}(z,a).
$$

Production occurs after entrepreneurial decisions are made and external financing shocks are realized. Therefore, entrepreneurs' optimal production input choices are static. In addition, both labor and capital input costs are assumed to be fully deductible in the corporate income tax.

The optimal input decisions can be fully derived analytically. When a firm is not capital constrained, either through external financing or by having enough personal wealth to self-finance, the optimal capital and labor choices depend only on the entrepreneur's productivity z and not on his asset level a. The optimal capital and labor choices are denoted as $k^*(z)$ and $l^*(z)$ respectively, and the optimal profits as $\pi^*(z)$. If a firm is capital constrained, or $a < k^*(z)$, a self-financing entrepreneur's asset holding a would affect the firm's optimal capital choice $k(z,a)$ and optimal labor choice $l(z,a)$, as well as its optimal profit $\pi(z,a)$. Analytical solutions are presented in on-line Appendix A. In the appendix, we show that $\pi(z,a) = \frac{(1-\theta)\kappa^{\frac{\gamma}{1-\theta}} - \gamma\kappa}{1-\theta-\gamma}\pi^*(z)$, where $\kappa = \min\{a/k^*(z), 1\}$ measures the tightness of a firm's capital constraint. Firms with relatively high z or relatively low a have relatively low κ and are more capital constrained. A low κ leads to lower profits, so this type of firm benefits more from having external financing and is more likely to choose the C corporation legal form.

VALUE FUNCTION. — In the beginning of a period, given productivity z and asset position a, an agent makes the occupational decision that maximizes the ex-ante value function over different choices of being non-employed, an employed worker, a pass-through entrepreneur, or a C corporation entrepreneur:

$$V(z,a) = \max\{W^N(z,a), W^E(z,a), W^P(z,a), W^C(z,a)\}. \tag{9}$$

Solving the problem determines the optimal occupational choice decisions, $\chi(z,a)$, consumption choices, $c(z,a)$, asset saving decisions, $a'(z,a)$, and labor supply decisions, $n(z,a)$.

DISTRIBUTION. — Let $\mu(z,a)$ denote the invariant cross-sectional distribution measure of agents with productivity z and asset a. The evolution of this distribution depends on the endogenous asset choice $a'(z,a)$ and the exogenous Markov process of productivity z. For any set of future asset levels $\mathcal{A}$ and any future productivity z', the following equation must be satisfied in the stationary equilibrium:

$$\mu(z', \mathcal{A}) = \int_{z,a} 1_{\{a'(z,a)\in\mathcal{A}\}} \rho(z'|z)\mu(dz, da). \tag{10}$$

B. Financial Intermediary

A financial intermediary behaves competitively and earns zero profit. The behavior of the financial intermediary is fairly mechanical in our model. It extends external financing offers in a random and probabilistic fashion based on a firm's declared LFO. A pass-through business has a φ^p chance of receiving an external financing offer, and a Corporation has a φ^c chance of receiving an offer. Then as long as a firm accepts the external financing offer, the financial intermediary raises all needed capital. The model abstracts away from any financing costs. In equilibrium, the interest rate on savings r adjusts until the capital market is cleared.

C. Government

The government collects revenue from a personal income tax and a corporate income tax. The personal income tax applies to all agents, including the non-employed, workers, and the two types of entrepreneurs. Labor, entrepreneurial, and interest incomes, as well as government transfers to the non-employed agents, are subject to the personal income tax, given by the tax function $T^p(y)$. The total personal income tax revenue is defined as

$$\begin{aligned} R^p \quad = \quad & \int_{z,a} [1_{\{\chi(z,a)=N\}} T^p(b + ra) + 1_{\{\chi(z,a)=E\}} T^p(wz\overline{n} + ra) \\ & + 1_{\{\chi(z,a)=P\}} [(1-\varphi^p) T^p(\pi(z,a) + ra) + \varphi^p T^p(\pi^*(z) + ra)] \\ & + 1_{\{\chi(z,a)=C\}} [(1-\varphi^c) T^p(\pi(z,a) - T^c(\pi(z,a)) + ra) \\ & + \varphi^c T^p(\pi^*(z) - T^c(\pi^*) + ra)]] \mu(dz, da). \end{aligned}$$

In the above equation, each indicator function $1_{\{\chi(z,a)\}}$ represents a particular occupational type $\chi(z,a)$ that is subject to either the personal or the corporate income tax. C corporate profits are subject to the corporate income tax $T^c(\pi)$, while profits from pass-through businesses are exempt. The total corporate income tax revenue is defined as

$$R^c = \int_{z,a} 1_{\{\chi(z,a)=C\}} ((1-\varphi^c) T^c(\pi(z,a)) + \varphi^c T^c(\pi^*(z))) \mu(dz, da).$$

The total revenue from the two sources is used to finance lump-sum transfers b to the non-employed. The aggregate transfers B is defined as

$$B = \int_{z,a} 1_{\{\chi(z,a)=N\}} b \mu(dz, da).$$

The government follows a balanced budget policy in equilibrium,

$$B = R^p + R^c. \tag{11}$$

D. Timing of Events

The timing of events within a period proceeds as follows:

1) An agent enters a period with productivity z and assets a.
2) The occupational decision χ is made.
3) The financial intermediary makes random external financing offers, and firms receive offers.
4) Production occurs. All agents receive their respective earnings.
5) The government levies taxes to finance transfers and exogenous government spending.
6) Consumption and saving decision are made.
7) Agents draw new productivity shocks, and the period ends.

E. Labor Market

The effective labor supply from an employed worker is his productivity z times the hours worked $\overline{n}$. We aggregate over all employed workers to obtain the total labor supply,

$$L^S = \int_{z,a} 1_{\{\chi(z,a)=E\}} z\overline{n}\mu(dz, da).$$

Both pass-through firms and C corporations demand labor. Aggregating labor demand across entrepreneur types gives the measure of total labor demand,

$$\begin{aligned} L^D &= \int_{z,a} [1_{\{\chi(z,a)=P\}}((1-\varphi^p)l(z,a) + \varphi^p l^*(z)) \\ &\quad +1_{\{\chi(z,a)=C\}}((1-\varphi^c)l(z,a) + \varphi^c l^*(z))]\mu(dz, da). \end{aligned}$$

In equilibrium, the wage w clears the labor market, so

$$L^S = L^D. \tag{12}$$

F. Capital Market

Capital supply in the market is the sum of all agents' assets, which is defined as

$$K^S = \int_{z,a} a'(z,a)\mu(dz,da).$$

Both pass-through firms and C corporations demand capital. Aggregating capital demand across entrepreneurs under different organizational forms gives the total capital demand,

$$\begin{aligned} K^D &= \int_{z,a} [1_{\{\chi(z,a)=P\}}((1-\varphi^p)k(z,a)+\varphi^p k^*(z)) \\ &\quad +1_{\{\chi(z,a)=C\}}((1-\varphi^c)k(z,a)+\varphi^c k^*(z))]\mu(dz,da). \end{aligned}$$

In equilibrium, the interest rate r clears the capital market, so

$$K^S = K^D. \tag{13}$$

Given the model specified above, a stationary equilibrium is defined in a standard way. On-line Appendix B outlines the algorithm for solving the model.

II. Empirical Evidence of Different Capital Constraints by LFO

In the model framework described in the previous section, the difference in capital constraints by LFO is a key margin in understanding why some entrepreneurs choose to operate C corporations. As previously mentioned, the legal codes of the United States have imposed restrictions on pass-through businesses' sources of capital. For example, they cannot have more than 100 shareholders; they cannot issue preferred stocks to attract venture capitals; and they are excluded from investment by corporate, partnership, or foreign investors. This section provides empirical support to show that, due to these restrictions, a pass-through business is more likely to be

capital constrained than a C corporation. Evidence is provided to show that the difference in capital constraints by LFO is robust across different industry sectors and firm-size classes.

A. Capital-to-Output Ratio by LFO

In the model, entrepreneurs make static profit maximization decisions.[7] When a firm is not capital constrained, its optimal choices of capital input $k^*(z)$ and optimal output $y^*(z)$ are only functions of the entrepreneur's productivity level z, holding other parameters fixed. In this setting, an unconstrained firm's capital-to-output ratio is determined by the output elasticity of capital γ and marginal cost of capital $r+\delta$,

$$\frac{k^*(z)}{y^*(z)} = \frac{\gamma}{r+\delta}.$$

When an entrepreneur faces capital constraints and $a < k^*(z)$, we can similarly derive

$$\frac{k(z,a)}{y(z,a)} = \frac{a}{y(z,a)} = \kappa(z,a)^{\frac{1-\gamma-\theta}{1-\theta}} \frac{\gamma}{r+\delta},$$

where $\kappa(z,a) = \min\{a/k^*(z), 1\}$ measures the tightness of a firm's capital constraint. As long as $\kappa < 1$, the capital-to-output ratio is $\frac{k(z,a)}{y(z,a)} < \frac{k^*(z)}{y^*(z)}$. Therefore, the tighter the capital constraint a firm faces, the lower its capital-to-output ratio. Because κ is increasing in asset holding a and decreasing in productivity shock z, a firm would have a lower capital-to-output ratio if its owner has relatively higher productivity and/or relatively lower personal wealth to finance the firm's operation.

In the model, a firm's capital constraint is removed once it receives external financing. On average, external financed firms should have higher capital-to-output ratios compared with self-financing firms. Because our model assumes that C corporations have a higher probability of receiving external financing ($\varphi^c > \varphi^p$), it predicts that C corporations have a higher average capital-to-output ratio than pass-through businesses. Empirically, the data is consistent with this prediction of our model.

Data available in the National Income and Product Accounts (NIPA) from the

[7] Appendix A provides a more detailed derivation of the analytical results shown in this subsection.

U.S. Bureau of Economic Analysis and the Corporation Complete Report from the Internal Revenue Service (IRS) are used to calculate the average capital-to-output ratios by LFO. Our model period is five years. Hence, the five-year average capital-to-output ratio is 0.306 for pass-through firms and 0.371 for C corporations. The procedure used to determine the capital-to-output ratios by LFO is similar to that of McGrattan and Prescott (2013).[8] The details are presented in on-line Appendix C.

Different industries have very different production technologies and hence very different capital-to-output ratios. It is possible that C corporations are disproportionately concentrated in industry sectors with relatively high-capital-intensity production technologies. In this case, a higher average C corporation capital-to-output ratio merely reflects the inter-industry technology differences, rather than differences in capital constraints across different LFO. For robustness, a proxy measure of the capital-to-output ratios by LFO across different industry sectors is examined. The estimated annual capital-to-output ratios across all major non-agricultural industry sectors is presented in on-line Appendix C.[9] As can be seen in Table C1 of the appendix, although this ratio clearly varies across industry, the capital-to-output ratios of C corporations are consistently higher than those of pass-through businesses in almost all industry sectors.[10] The only exceptions are the finance and insurance sector and the real estate sector, where capital-to-output ratios are larger in the pass-through sector. A possible explanation is that firms in these sectors handle tremendous amounts of loans and investment products (such as mortgages) for their clients, which are counted as part of their operating assets. Smaller pass-through businesses, such as small real estate partnerships, or limited liability insurance companies are disproportionately affected. The capital-to-output ratios are likely to be

[8] These numbers are lower than many other estimates of capital-to-output ratios in the literature, because household durables (such as residential housing) are excluded from the private fixed asset calculations.

[9] Data limitation has restricted us to use business asset-to-receipts ratios calculated from the 2011 IRS data to proxy for capital-to-output ratios. In addition, the IRS does not report assets for Sole Proprietors, so our calculation of pass-through businesses do not include them.

[10] C corporation capital-to-output ratios are also higher in almost all the sub-industry sectors. For example, this is true for all 20 sub-industry sectors in the manufacturing industry, from food manufacturing to petroleum product manufacturing.

distorted for these pass-through businesses.

C corporations have higher capital-to-output ratios not only when controlling for industry sector, but also when controlling for firm size. Firm size can be a concern, as it is well documented that firm size is positively correlated with the capital-to-output ratio. Adding to this concern is that large firms in the United States are almost exclusively C corporations. This suggests that the documented capital intensity difference between C corporations and pass-through businesses could simply reflect the difference in the efficiency scales of large corporate firms versus small pass-through businesses. To alleviate this concern, a proxy measure of the capital-to-output ratios by LFO across different firm-size categories is presented in on-line Appendix C.[11] As can be seen in Table C2 of the appendix, the C corporation sector is dominated by large corporations, as firms with $50 million or more in business receipts generate 90 percent of all sales. In contrast, firms with $50 million or more in business receipts generate only 38 percent of the sales in the pass-through sector. As expected, the capital-to-output ratio is higher for larger corporate firms. When the data are segmented into different size categories, C corporations consistently have higher capital-to-output ratios compared with pass-through businesses in every size category.

The empirical evidence confirms that C corporations have higher capital-to-output ratios than pass-through businesses after controlling for either industry sector or firm-size category. Hence, the capital-to-output data is consistent with the assumption that C corporations face less-severe constraints on capital than pass-through businesses.

B. Probability of Small Businesses Receiving External Equity by LFO

An alternative approach to provide support for the assumption concerning the relative probability of receiving external financing is to examine the sources of business

[11]The IRS does not report assets by both size of businesses and LFO. This data limitation has restricted us to using capital-income-to-business-receipts ratios calculated from the 2011 IRS data to proxy for the capital-to-output ratios. We provide a more detailed discussion of this in Appendix C.

financing. Most large firms in the United States are publicly traded C corporations, which receive a large amount of public equity. But this is not sufficient to show C corporations have more opportunity to receive external equity. The financing of small businesses needs to be examined as well. In particular, empirical evidence is presented in this section to show that (1) a sizable fraction of small businesses are capital constrained and require external financing and (2) among these small businesses, the probability of receiving external funding varies by LFO. In particular, C corporations are more likely to receive external investment.

The 2003 Survey of Small Business Finance data, collected by the Federal Reserve System, is used for this analysis. These survey data contain only businesses with 500 employees or fewer, thus exclude large corporate firms. The survey includes questions on the organizational type of the business, whether the business raised additional equity, and the sources of the additional equity raised. Additional information on these data is available in on-line Appendix D. For the following analysis, we restrict our attention to three major industry sectors: manufacturing, wholesale and retail trade, and services.

Capital constraints are one of the most important reasons for a business to raise additional equity. A total of 6.1 percent of all the firms surveyed reported raising additional equity. Among these, 7.4 percent of the C corporations and 5.7 percent of the pass-through businesses raised additional equity. Because firms can raise capital by other means (such as loans), and firms could have raised capital in non-survey years, these numbers should be considered as a lower-bound estimate of the fraction of firms who require additional capital.

The survey provides firms' sources of additional equity. By excluding sources of equity, such as equity from existing owners, employees, or family members, this analysis focuses on small businesses that raised equity from three external sources, namely, (1) venture capitalists, (2) public stock offerings, and (3) angel investors. Of these sources, pass-through firms are barred by law from receiving external funding from (1) and (2), so they can raise external equity only from angel investors, who are affluent private informal investors.

Summary statistics of the percentages of firms' external equity sources by both LFO and industries are presented in Table 1. In the survey data, among pass-through businesses, only S corporations raised external equity. In cases where an S corporation had additional equity, only 6.0 percent raised capital from an external source. In contrast, 14.2 percent of small C corporations raised additional equity from external sources. In the capital-intensive manufacturing industry, over one-third of the C corporations surveyed used external equity, while no S corporations used any external equity. One might suspect that few manufacturing firms use the S corporation legal form, but this is not the case. In manufacturing, the number of S corporations is about half that of C corporations. While significantly smaller than the C corporation sector, the S corporation sector is a significant part of the manufacturing industry. In contrast, almost no firms in the wholesale and retail trade industry use external financing. The only exception is the 2.4 percent of the S corporations that have private angel investors. This industry is the only one where S corporations can potentially use more external financing than C corporations. In services, a higher percentage of C corporations consistently use more external equity than S corporations. The percentage differential is smaller than what is observed in manufacturing.

Table 1—External Equity Sources by LFO

	Overall		Manufacturing		Wholesale & Retail Trade		Services	
	S	C	S	C	S	C	S	C
Venture Capital	0.0%	2.8%	0.0%	7.1%	0.0%	0.0%	0.0%	3.5%
Public	0.0%	1.2%	0.0%	3.9%	0.0%	0.0%	0.0%	1.0%
Angel	6.0%	11.2%	0.0%	25.9%	2.4%	0.0%	12.5%	13.7%
External Equity	6.0%	14.2%	0.0%	36.8%	2.4%	0.0%	12.5%	15.6%

Table D of the appendix presents results from three logit regression models. These models control for owner characteristics, firm credit risks, industry sector, geographic region, and firm size. Consistent with Table 1, the regression results indicate that C corporations have a higher chance of receiving external financing than pass-through businesses. These regression models indicate that C corporations are as

much as eight times more likely to receive external equity financing as pass-through firms. By assuming that C corporations are less capital constrained, our model can capture this empirical difference in external equity financing by LFO.

III. Calibration

This section details the calibration of the model, motivates the choices of calibration targets, and discusses the implications of the calibration results.

A. Model Specification

The model period is five years. The reason for using a five-year model is twofold. First, changes to a firm's LFO status can occur over a few years. For instance, when a C corporation converts to an S corporation, the firm could still pay C corporation taxes on some of its income (i.e., by selling appreciated assets). The Small Business Jobs Act of 2010 stipulates that the recognition period of status conversion is five years. Therefore, using five-year periods in the model is appropriate, as the model abstracts from these complex tax treatments during the conversion period. In addition, individual agents in the model make occupational decisions based on their current-period asset position and productivity draw. The model abstracts away from direct intertemporal dependency of occupational status. Hence, to avoid high-frequency temporary occupational changes, it is preferable in our calibration to use a five-year model period.

The logarithm of productivity z follows an AR(1) process with autocorrelation ϱ_z and standard deviation σ_z, or $\log(z') = \varrho_z \log(z) + \varepsilon$, where $\varepsilon \sim N(0, \sigma_\varepsilon^2)$. Numerically, the method developed in Tauchen (1986) is used to construct a first-order Markov process approximation.

Agent per-period utility is specified as

$$u(c, n, \iota) = \alpha \log(c) + (1 - \alpha) \log(1 - n) + \iota \cdot \eta,$$

where the relative importance of consumption to leisure is given by the parameter α.[12]

To allow for progressivity, the personal income tax function proposed by Gouveia and Strauss (1994) is employed. Given any income m, the total personal income tax is

$$T^p(m) = a_0 \left(m - \left(m^{-a_1} + a_2 \right)^{-\frac{1}{a_1}} \right),$$

where (a_0, a_1, a_2) are parameters. Parameter a_0 is the limiting average tax rate when $m \to \infty$, and parameter a_1 captures progressivity. This functional form is adopted by recent papers on optimal taxation, such as Conesa and Krueger (2006) and Conesa, Kitao and Krueger (2009). Following the approach in these papers, we use parameter values of $a_0 = 0.258$ and $a_1 = 0.768$ from the original estimation of Gouveia and Strauss (1994). The parameter a_2 is chosen so that the government budget constraint is balanced in the equilibrium.

The corporate income tax obligation is assumed to be proportional to profits, or $T^c(\pi) = \tau^c \cdot \pi$. A corporate income tax function could be estimated to take into account the progressivity in the U.S. corporate tax code. However, the legislative corporate tax rates are not applicable because of the myriad of corporate tax loopholes. To avoid dealing with issues of legislative versus effective corporate tax rates, the proportional tax assumption seems appropriate. The average effective corporate income tax rate τ^c is estimated and assumed to be the same for all C corporations.

[12] This functional form is a special case of the following function

$$u(c, n, \iota) = \frac{(c^\alpha (1-n)^{1-\alpha})^{1-\xi} - 1}{1-\xi} + \iota \cdot \eta,$$

which is a constant-relative-risk-aversion (CRRA) transformation of the Cobb-Douglas utility function. This preference specification is consistent with balanced growth. One focus of this paper is the employment effect of the corporate income tax policy change. The employment effect is largely dependent upon agents' labor supply decisions, which is a function of real wages in the economy. In this preference specification, the relative share of working to leisure is constant with respect to wages, so the income effect of an increase in wages cancels out with the substitution effect. In the special case, the CRRA parameter ξ is set to be 1. Calibration exercise with this more general form of utility function yields a CRRA parameter ξ close to 1, and gives similar qualitative results.

B. *Independently Calibrated Parameters*

In the model, an agent is either non-employed with leisure being 1 or working full time with leisure being $1 - \overline{n}$. We set $\overline{n}$ by assuming that individuals have 98 hours a week of substitutable time not spent eating, sleeping, or engaged in other personal care. If an agent spends 40 hours a week working full time, $\overline{n}$ approximately equals 0.4. The calibration of $\overline{n}$ is similar to others' treatments in the literature, such as Hansen and Imrohoroglu (1992).

The corporate income tax rate τ^c is set to be the average effective tax rates from 2000-2010, which is calculated based on NIPA and the Corporation Complete Report from the IRS. Following similar definitions in Mertens and Ravn (2013), the average corporate income tax rate is the federal, state, and local taxes on corporate income (NIPA Table 3.1 line 5), excluding the tax on Federal Reserve Banks (NIPA Table 3.2 line 8), divided by the corporate income tax base; the corporate income tax base is the total income subject to tax from all active corporations, other than those filing forms 1120S, 1120-REIT, and 1120-RIC (IRS Complete Report Table 12 line 81). Based on our calculation, the average effective corporate income tax rate is 28.5 percent.

The depreciation rate δ is the total depreciation of private fixed assets by corporate firms, partnerships, and sole proprietorships (NIPA Fixed Asset Table 6.4 lines 2, 6, and 7) divided by the total private fixed assets of corporate firms, partnerships, and sole proprietorships (NIPA Fixed Asset Table 6.1 lines 2, 6, and 7). The estimated annual depreciation rate is 8.2 percent. Hence, the five-year capital depreciation rate is 35 percent. Table 2 summarizes the set of parameters that are independently calibrated.

Table 2—Parameters Calibrated Independently

Description	Parameter	Value	Source
Full-time Hours Worked	$\overline{n}$	0.40	data
Corporate Income Tax Rate	τ^c	0.285	data
Depreciation Rate on Capital (5 year)	δ	0.35	data
Limiting Avg. Personal Income Tax Rate	a_0	0.258	Gouveia and Strauss (1994)
Personal Income Tax Progressivity Parameter	a_1	0.768	Gouveia and Strauss (1994)

C. Calibration Results

The remaining parameters in the model are calibrated jointly in the benchmark stationary equilibrium. These parameters and their calibrated values are summarized in Table 3.

Table 3—Parameters Calibrated Jointly in Equilibrium

Description	Parameter	Value
Production Function Parameter on Capital	γ	0.241
Production Function Parameter on Labor	θ	0.643
Productivity Persistence	ϱ_z	0.821
Standard Deviation of Productivity	σ_z	0.245
Cobb-Douglas Utility Parameter on Consumption	α	0.501
Discount Rate (5 year)	β	0.770
Non-employment Lump Sum Transfer	b	0.238
Pass-Through Business External Financing Probability	φ^p	0.462
C Corporation External Financing Probability	φ^c	0.717
Entrepreneurial Non-pecuniary Benefit	η	0.305

A set of empirical moments are carefully chosen to help pin down these parameters. These data moments discipline the model so as to capture certain significant economic aspects central to our policy experiments. A comparison of the data and model moments is presented in Table 4.

Table 4—Data and Model Moments

Targeted Moments			
Statistics	Data	Model	Difference
Non-Employment Fraction	0.334	0.341	2.1%
Average Workers per Firm	21.807	21.778	−0.1%
Fraction of C Corporations	0.228	0.226	−0.9%
Employment % of C Corporations	0.548	0.561	2.4%
Pass-Through Capital-Output Ratio (5 year)	0.306	0.313	2.3%
C corporation Capital-Output Ratio (5 year)	0.371	0.376	1.3%
Fraction of Entry Firms (5 year)	0.344	0.330	−4.1%
Emp. Fraction of Entry Firms (5 year)	0.113	0.118	4.4%
Fraction of Small Businesses ($<$ 20 Employees)	0.875	0.789	−9.8%
Employment Fraction of Small Businesses	0.184	0.184	0.0%
Wealth Gini Index	0.816	0.845	3.6%
Percentage of Wealth in Top 1%	0.340	0.424	24.7%
Percentage of Wealth in Top 10%	0.714	0.784	9.8%
Percentage of Wealth in Top 20%	0.834	0.886	6.2%
Percentage of Wealth in Top 40%	0.950	0.955	0.5%
Percentage of Wealth in Top 60%	0.990	0.979	−1.1%

The benchmark model fits the data well. In particular, almost all the model moments are within a 10 percent difference from the targeted data moments, the only exception is the percentage of wealth held by the most wealthy individuals. Next, the choices and fits of target moments are discussed as well as their relationship to the calibrated model parameters.

Importantly, the calibrated model is able to match a number of job market and LFO statistics. The average number of workers per firm in the data is 21.807, which is calculated from the 2011 National Business Employment Dynamics Data published by the U.S. Bureau of Labor Statistics. The 2011 County Business Patterns of the Statistics of U.S. Businesses published by the U.S. Census Bureau reports the number of firms and employment by both employment size and LFO. The same data source reports that 22.8 percent of all the businesses in the United States are C corporations, and they hire 54.8 percent of all employees. The calibrated model matches these targets closely. In the model, the average number of workers per firm is 21.8, the fraction of C corporations is 22.6 percent, and the employment fraction of C corporations is 56.1 percent.

The calibrated labor intensity parameter $\theta = 0.643$ is within the range of the values found in recent literature, such as Gomes (2001) and Gourio and Miao (2010). The calibrated capital intensity parameter $\gamma = 0.241$ is lower than those found in the literature (for example, $\gamma = 0.311$ in Gourio and Miao (2010)). This is because in obtaining target capital-to-output ratios, we exclude household durables (such as residential housing) from the private fixed-assets calculations. If we use $\gamma = 0.311$, the model predicts an annual capital-to-output ratio close to 3, which is the value typically employed in the literature.

To balance the government budget, the tax function parameter is calibrated to be $a_2 = 0.725$.

The persistence parameter ϱ_z of the productivity Markov process and the standard deviation σ_z of the productivity shock distribution are calibrated to match data moments of firm dynamics, specifically the fraction of entry firms and the employ-

ment fraction of entry firms.[13] Firm entry statistics are from the 2011 Longitudinal Business Database (LBD) from the U.S. Census Bureau. Because the model period is five years, all the firms aged less than or equal to five years are considered entry firms in our calculation. In 2011, 34.4 percent of all the firms were established in the previous five years, and these firms hire about 11.3 percent of all the workers over the five-year period. The calibrated value of the persistence parameter is $\varrho_z = 0.821$, and the standard deviation parameter is estimated to be $\sigma_z = 0.245$.[14]

The model is also calibrated to match two moments of small business statistics — the fraction of small businesses and the employment fraction of these businesses. These target moments are computed from the 2011 National Business Employment Dynamics Data, which is published by the U.S. Bureau of Labor Statistics. A "small business" is defined as a firm with 20 employees or fewer. This is the definition employed in Hurst and Pugsley (2011). In the U.S. economy, 87.5 percent of all firms are classified as small businesses, and they hire about 18.4 percent of all employees.[15] Our calibrate model matches these two moments reasonably well.

The utility parameter α and the discount rate β are related to agents' asset-saving decisions. These parameters are calibrated to match the Gini coefficient for wealth and the wealth distribution. The wealth Gini index of 0.816 and the wealth distribution listed in Table 4 are sourced from Diaz-Gimenez, Glover and Rios-Rull (2011). The calibrated value of the utility parameter is $\alpha = 0.501$, and the calibrated five-year discount rate is $\beta = 0.67$, which implies a discount rate of about 0.95 per annum. The model over-predicts the fraction of wealth held by the top 1 percent, suggesting that the wealthiest agents are accumulating assets faster than in the data. This result is due to the modeling assumption that a firm's access to external capital

[13]The firm entry and exit dynamics are governed by the productivity process, and only agents with relatively high productivity level z choose to operate firms in our model. In the stationary equilibrium, the fraction of entry firms is the same as the fraction of exiting firms.

[14]In comparison with recent papers, such as Gourio and Miao (2010), the standard deviation parameter is similar, but the persistence parameter is slightly higher. This is largely due to the five-year period assumption.

[15]Our model generates measures of workers, instead of numbers of workers, hired by firms. By calculating average worker per firm and measures of workers and firms in the model, we can construct a measure of worker average effective labor. Then, for each firm, we divide the measures of workers by the average effective labor to calculate the number of workers.

follows a random and transitory process. Faced with a significant chance of losing access to external capital, highly talented entrepreneurs may accumulate a large amount of assets today to avoid the possibility of facing stricter capital constraints tomorrow.

The non-employment lump-sum transfer payment $b = 0.238$ is calibrated to match the non-employed fraction of population in the United States. The non-employed population includes unemployed workers and those who are out of the labor force.[16] The model period of five years is longer than the average unemployment duration of six months. Because this paper is interested in long-term policy implications, the non-employment rate instead of unemployment rate is used in the calibration. The employed civilian labor force as a percentage of population (persons 16 to 65 years of age) in the year 2011 is 66.6 percent, as reported in the Labor Force Statistics of the Current Population Survey by the Bureau of Labor Statistics. Hence, the non-employed fraction of the population used in our calibration is 33.4 percent.

In reality, the government does not have a transfer program specifically designed for non-employed persons. To see if the calibrated parameter b makes sense, its calibrated value is compared with two closely related government benefit programs. A related program is unemployment insurance, which is available to workers who recently lost their jobs and are actively seeking employment. According to the U.S. Department of Labor guidelines and statistics, an unemployed person is paid up to 26 weeks (half a year) for an average of around $1,200 per month.[17] The BLS reports that the 2011 average monthly salary was $3,769. This means that the ratio of annual maximum unemployment insurance to average annual salary is around 16 percent. For individuals who are not employed and have no other incomes, the Supplemental Nutrition Assistance Program (food stamps) can be used as another measure of comparison. Based on the U.S. Department of Agriculture (USDA)

[16] Unemployed workers who are actively seeking a new job are considered a part of the labor force.

[17] Unemployment insurance varies by state. It is calculated based on the person's salary in a previous job. On average in the United States, unemployment insurance replaces about 46.6 percent of an unemployed person's salary in 2011, according to https://workforcesecurity.doleta.gov. Our tabulation of unemployment insurance is on an annual basis, which takes into account that the transfer would only last up to 26 weeks, or half a year.

guidelines, households without income are eligible to receive food stamps with a maximum value equivalent to the cost of foods in the USDA Thrifty Food Plan.[18] In 2011, the monthly cost of the Thrifty Food Plan for a family of four is $544.50, which is 14.4 percent of the average monthly salary in that year. In our model, the average wage of a worker is 1.63, so the non-employment transfer of $b = 0.238$ is 14.6 percent of the average wage. This means the calibrated value of the non-employment transfer is in line with the unemployment insurance and food stamp programs offered by the U.S. government.

The capital-to-output ratios by LFO are used to pin down the pair of external financing probability parameters φ^p and φ^c. As detailed in Section II.A, both NIPA and IRS data are used to calculate the capital-to-output ratios. The five-year capital-to-output ratios are 0.306 and 0.371 for pass-through firms and C corporations, respectively. The calibrated parameters are $\varphi^p = 0.462$ and $\varphi^c = 0.717$. Based on these parameters, C corporations are about 55 percent more likely to receive external financing offers than pass-through businesses in the model.

Hurst and Pugsley (2011) document that most small businesses are very different from large corporate firms, as they seldom intend to grow large. In fact, based on the Panel Study of Entrepreneurial Dynamics, Hurst and Pugsley (2011) report that 50.5 percent of entrepreneurs own businesses for non-pecuniary reasons. To see if our calibrated parameter of non-pecuniary benefits is reasonable, the model is re-simulated after setting the parameter $\eta = 0$ while holding all other parameters fixed. This change results in the number of entrepreneurs falling by 55.1 percent, which is slightly higher than what is reported in Hurst and Pugsley (2011). Furthermore, the effect of the non-pecuniary benefit on owning businesses differs by LFO. Removing the non-pecuniary benefit would reduce the number of pass-through business owners by 63.6 percent and reduce the number of C corporations by 28.6 percent. C corporations on average are larger in size than pass-through businesses. Our results, hence, are consistent with the findings in Hurst and Pugsley (2011), in that

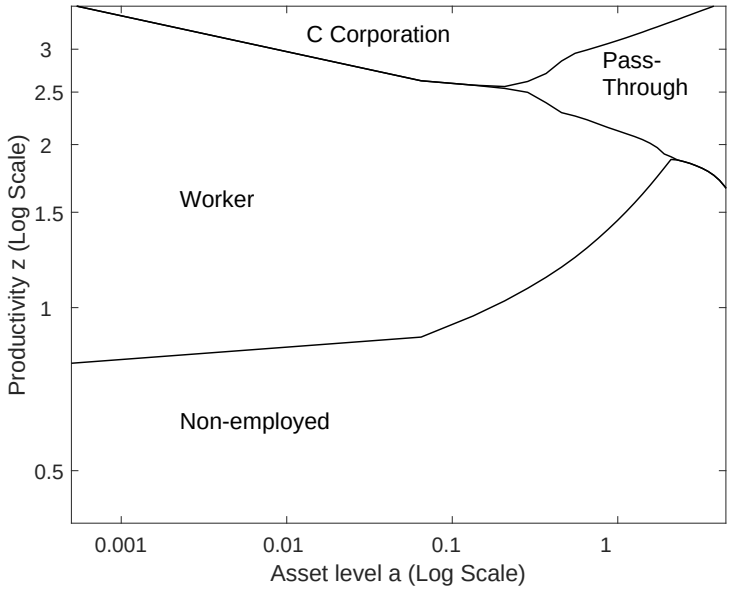
[18] For more detailed information, please refer to https://www.cnpp.usda.gov.

non-pecuniary benefits disproportionately affect small businesses.

D. Occupational Choice in the Benchmark Economy

The benchmark model provides insights into agents' occupational-choice decisions. In Figure 1, the occupational-choice decision is presented as a function of both productivity level z (Y-axis) and asset level a (X-axis). Both axes are in log scale.

FIGURE 1. OCCUPATIONAL CHOICES IN BENCHMARK ECONOMY



With very low productivity draws, the vast majority of the non-employed agents choose a fixed non-employment lump-sum transfer b over an effective labor wage $wz\bar{n}$. A small fraction of very wealthy individuals also choose to be non-employed, because of their preference toward leisure. Of all the non-employed individuals, less than 0.02 percent have wealth in the top 1 percent of the wealth distribution.

A majority of agents (61.2 percent) are workers. A typical worker is moderately talented, and his wage income is higher than the non-employment transfer. However, given the productivity level, the opportunity cost of forgoing wage income is greater than his likely income from operating a business. Employed workers are not among

the most wealthy in the economy, as wealthier individuals choose to either own businesses or simply not work and enjoy leisure.

Entrepreneurs who can self-finance a large portion of their business typically prefer the pass-through legal form, because they can avoid double taxation. However, not all pass-through businesses are self-financing. A majority of pass-through entrepreneurs are capital constrained ex ante, but find double taxation to be too prohibitive to choose the C corporation legal form. On average, a constrained pass-through entrepreneur's personal wealth accounts for only about 8.6 percent of the optimal level of capital required by his firm.

Very talented managers who intend to operate large-scale firms are more likely to face stringent capital constraints, so they prefer to operate a C corporation. Conditional on having the same productivity, pass-through entrepreneurs on average have higher personal wealth than C corporation owners. However, C corporation entrepreneurs generally have higher productivity levels along with a better chance of accessing external capital. Despite having less than one-third of the number of pass-through businesses, C corporations hold about 60 percent of the total capital stock. All C corporation entrepreneurs choose the C corporation legal form to increase the chance of receiving external financing. In the model, the average C corporation entrepreneur's personal wealth accounts for about 0.03 percent of the optimal level of capital required by his firm. Because some C corporations do not receive external financing offers, these firms are severely capital constrained. As a result, the model is able to generate a distribution of small C corporations.

IV. Policy Experiment

In this section, we use the benchmark model to study the aggregate impact of a decline in the corporate income tax rate. In the policy experiment, we vary the corporate income tax rate from the benchmark rate of 28.5 percent all the way to zero while holding the calibrated parameters fixed. Throughout the policy experiment, the personal income tax parameter a_2 changes so that the government

budget remains balanced. Wage and interest rates adjust to clear both the labor and capital markets, allowing for the general equilibrium effects.

A. Aggregate Policy Effects

The aggregate policy effects from lowering the corporate income tax are summarized in Table 5. In the table, the percentage changes from the benchmark values appear in parentheses.

Table 5—Effects of Lowering the Corporate Income Tax

	Benchmark	Change in Corporate Income Tax Rate		
	τ^c =28.5%	τ^c =20%	τ^c =10%	τ^c =0%
Panel A				
Fraction of C Corp.	22.6%	34.4%	44.5%	56.0%
		(52.2%)	(96.9%)	(147.8%)
Emp. Fraction of C Corp	56.1%	68.5%	82.5%	94.3%
		(22.1%)	(47.1%)	(68.1%)
Avg. Worker per Firm	21.778	21.557	21.167	20.643
		(−1.0%)	(−2.8%)	(−5.2%)
Panel B				
Labor (L)	0.313	0.314	0.317	0.320
		(0.3%)	(1.3%)	(2.2%)
Capital (K)	0.263	0.266	0.274	0.281
		(1.1%)	(4.2%)	(6.8%)
Output (Y)	0.625	0.633	0.644	0.650
		(1.3%)	(3.0%)	(4.0%)
Consumption (C)	0.533	0.539	0.549	0.553
		(1.1%)	(3.0%)	(3.8%)
Panel C				
Wealth Gini Index	0.845	0.843	0.852	0.864
		(−0.2%)	(0.8%)	(2.3%)
Panel D				
Non-Employment Rate	34.1%	33.0%	32.3%	31.7%
		(−3.3%)	(−5.3%)	(−7.0%)

Note: The percentage changes from the benchmark statistics are included in parentheses.

Panel A presents the effect of a corporate tax policy change on firms. The most direct effect of lowering the corporate income tax is on the size of the C corporation sector. As can be seen, both the share of firms that file as a C corporation and the fraction of employment by C corporations increase as the corporate income tax rate declines. These changes are expectedly large. In comparison with the benchmark equilibrium, if the corporate income tax is eliminated, the fraction of C corporations

in the economy more than doubles, from 22.6 percent to 56.0 percent. As a result, the C corporation sector would account for more than 94 percent of the employment in the economy, compared with 56.1 percent in the benchmark economy.

The increase in the share of C corporations comes from two sources. First, a significant fraction of pass-through firms switch their LFO and become C corporations. Lowering the corporate income tax lessens the burden of double taxation. The C corporation legal form, offering a higher chance of receiving external financing, becomes more attractive to entrepreneurs. In fact, at the zero corporate income tax rate, the remaining pass-through businesses are entirely self-financing and hire less than 6 percent of the overall employed workers in the economy.

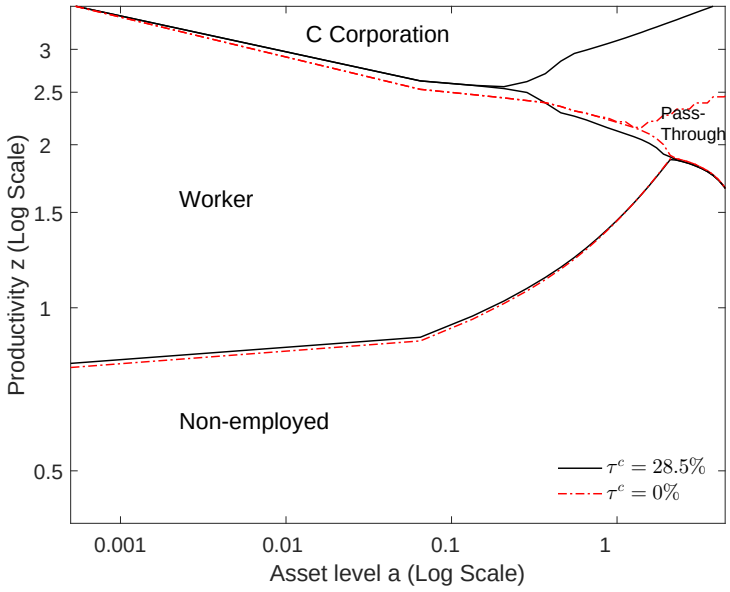
Second, the decline in the corporate tax burden encourages some workers to change occupations and become C corporation entrepreneurs. These agents have moderately high productivity but relatively low wealth. The decline in the corporate income tax rate raises their expected earnings of operating an externally financed C corporation. When the expected after-tax corporate profit becomes higher than their effective labor income, they become C corporation entrepreneurs. In the model, if the corporate income tax is eliminated, the increase in overall entrepreneurship is about 5 percent. Most of the new entrepreneurs operate small businesses, so the fraction of small businesses correspondingly increases by 4.6 percent. This contributes to the overall decrease in average firm size. As seen in Table 5, the average number of workers per firm drops by 5.2 percent compared with the benchmark economy when the corporate income tax is eliminated.

The two aforementioned sources of the C corporation sector expansion are illustrated in Figure 2, where agents' occupational choices are examined in the benchmark economy relative to an economy without a corporate income tax. The relative importance of the two margins is measured in Subsection IV.C.

Panel B of Table 5 shows the aggregate economic implication of a corporate income tax cut. Both aggregate output and aggregate consumption increase. The elimination of the corporate income tax would increase aggregate consumption by 3.8 percent and aggregate output by 4.0 percent. The capital stock would increase

by 6.8 percent, while the effective labor would increase by 2.2 percent. This means that firms' more intensive use of capital contributes more to the aggregate output increase. The increase in capital stock is tied to the expansion of the C corporation sector, which improves firms' access to capital. The large increase in capital stock suggests that the corporate income tax potentially distorts capital allocation among firms. We discuss the implications of this distortion on productivity in Subsection IV.D.

FIGURE 2. OCCUPATIONAL CHOICES IN POLICY EXPERIMENT



Panel C of Table 5 shows that a reduction in the corporate income tax skews the wealth distribution to the right. The Gini coefficient increases from 0.845 to 0.864. As a share of the total wealth in the economy, the wealth of the top 1 percent of individuals increases from 42.4 percent to 44.7 percent, and the wealth of the top 10 percent of individuals increases from 78.4 percent to 81.6 percent. Lowering the corporate income tax allows high-productivity entrepreneurs to keep a larger fraction of their corporate profits. For instance, entrepreneurs who are in the top 5 percent in terms of productivity have on average 17 percent higher asset holdings

when the corporate income tax is eliminated. This is the main reason behind the increase in the wealth Gini.

Panel D of Table 5 reports the employment effect from a reduction in the corporate income tax rate. If the corporate income tax rate is reduced to zero, the model finds that the fraction of non-employed individuals decreases from 34.1 percent to 31.7 percent. This reduction of 2.4 percentage points corresponds to a 7.0 percent decline in the non-employment rate relative to the benchmark economy.[19] The causes of the observed employment effect are discussed in Section IV.B.

An important issue is whether the model can reasonably predict firms' LFO responses to a corporate income tax rate change. Previous literature, such as Gordon and MacKie-Mason (1994), Mackie-Mason and Gordon (1997), and Goolsbee (1998), find very little movement between LFO caused by a corporate tax rate change. Part of the reason is that these papers use time-series data, where the variation in corporate tax rates has been historically small. Goolsbee (2004) uses cross-sectional census data in the retail trade sector across states and finds that the relative taxation of corporate to personal income plays an important role in the share of firms, employment, and sales by C corporations. Based on his findings, if the corporate income tax rate increases by 1 percentage point, the C corporation share of all firms is reduced by 2.5 percentage points and employment share by 1.5 percentage points. In this model, when the tax rate is increased from 0.285 to 0.295, the C corporation fraction of all firms goes down by about 1.2 percentage points and employment share by 1.3 percentage points. While the employment impact generated from the model is similar to Goolsbee (2004), the change in the C corporation share of all firms is smaller. This may be attributed to the fact that Goolsbee (2004) restricts the empirical analysis to the retail trade sector, while this paper does not make restrictions with respect to firms being in a specific sector. In addition, Goolsbee (2004) finds little evidence that a change in the corporate income tax rate impacts relative

[19]The employment effect found in this paper is relatively robust with respect to the specifications of the external financing probability parameters. If the parameter φ^p is increased by 10 percent while φ^c remains unchanged, the decrease in the relative non-employment rate changes from 7.0 percent to 7.3 percent. Similarly, if the parameter φ^c is increased by 10 percent while φ^p remains unchanged, the decrease in the relative non-employment rate changes from 7.0 percent to 7.5 percent.

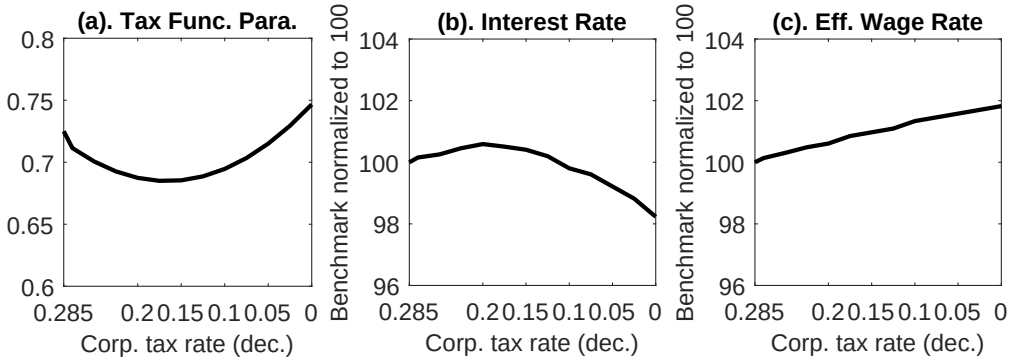
operating ratios of corporate versus non-corporate sectors, such as labor intensity. The model finds a similar result. In our model, a 10 percentage points increase in the corporate income tax rate from 0.285 to 0.385 changes the relative ratio of average effective labor demand to output between the two LFO by approximately 0.3 percentage points.

B. Personal Income Tax and Input Factor Prices

Besides affecting entrepreneurs' LFO choices, a change in the corporate income tax rate indirectly affects agents' occupational decisions through its effects on other important economic variables. Of particular importance are personal income taxation, the interest rate, and wages. This subsection considers the implication of the changes in these variables.

The decline in the corporate income tax rate would necessarily change the government revenue collected from C corporations. In the policy analysis, the personal income tax function parameter a_2 is adjusted so that the government would maintain a balanced budget. The higher parameter a_2 is, the more personal tax is collected, and vice versa. The changes required in this parameter for various changes in the corporate income tax rate are depicted in Panel (a) of Figure 3.

Figure 3. Policy Effects on Wage, Interest Rate, and Personal Income Tax



A decline in the corporate income tax rate does not always result in a loss of government revenue. If the decline in the corporate income tax rate is small, the

increase in corporate entrepreneurship raises corporate taxable income, which outweighs the decline in the corporate income tax rate. This would result in an increase in tax revenue. Consequently, the government would be able to cut the personal income tax (a lower a_2) while maintaining a balanced budget. As the reduction in the corporate income tax rate becomes larger, resulting in a loss of total tax revenue, the government must then increase personal income tax collection to maintain the policy's revenue neutrality. In the extreme case of the elimination of the corporate income tax, the personal income tax function parameter increases from 0.725 in the benchmark economy to 0.750 when the corporate income tax is zero. To give some perspective on such an increase, for a typical non-employed agent with no other income except for the government transfer, his personal income tax would increase by 2.7 percent. Because this type of agent has the lowest possible individual tax base, this increase represents the largest possible percentage increase in taxes. This means that the government needs only a relatively mild personal income tax increase to balance its budget.

Panel (b) of Figure 3 shows that the interest rate would increase with a small decline of the corporate income tax rate, and it would decrease when the decline becomes large. A reduction in the corporate income tax rate leads to more C corporations in the economy. C corporations have a higher chance of accessing external capital, resulting in an increase in the demand for capital and a higher interest rate. The lowering of the corporate income tax rate also mitigates its distortionary effects on the economy. This results in agents holding and saving more assets, thus increasing the supply of capital in the economy. The increase in the capital supply puts downward pressure on interest rates and would dominate the capital demand response when the corporate income tax cut becomes large. Compared with the benchmark economy, agents on average save 5.2 percent more assets (a') in the economy without the corporate income tax. As a result, the interest rate actually decreases by about 2 percent when the corporate income tax is eliminated.

The most important factor in an agent's employment decision is the wage rate.

As can be seen in Panel (c) of Figure 3, the effective wage rate is monotonically increasing with a decline in the corporate income tax rate. The decline in the corporate income tax rate encourages the formation of C corporations, which in turn drives up total labor demand in the economy. Hence, employees receive higher compensation per effective unit of labor. In considering this result, three aspects of the model must be discussed. First, all entrepreneurs are considered working full-time, so the switching between workers and entrepreneurs does not change the non-employment rate. Second, tax avoidance has little to do with the change in the non-employment rate, despite the increase in the personal income tax burden when the corporate income tax is eliminated. The model predicts that most of the employment effect comes from non-employed agents switching to be workers, which is shown in Figure 2. The model, as in the U.S. tax code, stipulates that the non-employment transfer b is subject to personal income tax. This means that if the effective wage $wz\bar{n}$ is higher than the non-employment transfer b, an agent with a given amount of interest income ra would have a higher after-tax income from being a worker than being non-employed regardless of the changes to the personal income tax function. Third, a higher effective wage increases the marginal cost of labor, which has disproportionate negative effects on more labor-intensive pass-through firms. A higher wage rate also increases the opportunity costs of entrepreneurship. As a result, some of the least profitable pass-through business owners choose to become workers in this new tax regime.

To analyze the general equilibrium effect on input factor prices, a separate policy simulation is conducted holding the effective wage rate fixed at the benchmark economy level. Compared with the general equilibrium setting, an elimination of the corporate income tax in this setting leads to an increase in the demand for capital that is 2.6 times higher and an increase in the demand for labor that is 7 times higher. These results indicate that the general equilibrium price feedback effect is important in the analysis of the corporate tax reform. This is consistent with the findings in the literature, such as Gourio and Miao (2010).

C. Employment Effect Decomposition

Section IV.A shows that lowering the corporate income tax encourages the formation of additional C corporations and subsequently leads to a higher employment rate in the economy. The increase in the number of C corporations comes from two possible sources: LFO switching by pass-through entrepreneurs and entry by previous non-entrepreneurs. In this section, the employment effect is decomposed by these two sources and evaluated.

FIGURE 4. RESPONSIVENESS OF NON-EMPLOYMENT RATE TO CORPORATE TAX RATE CHANGE

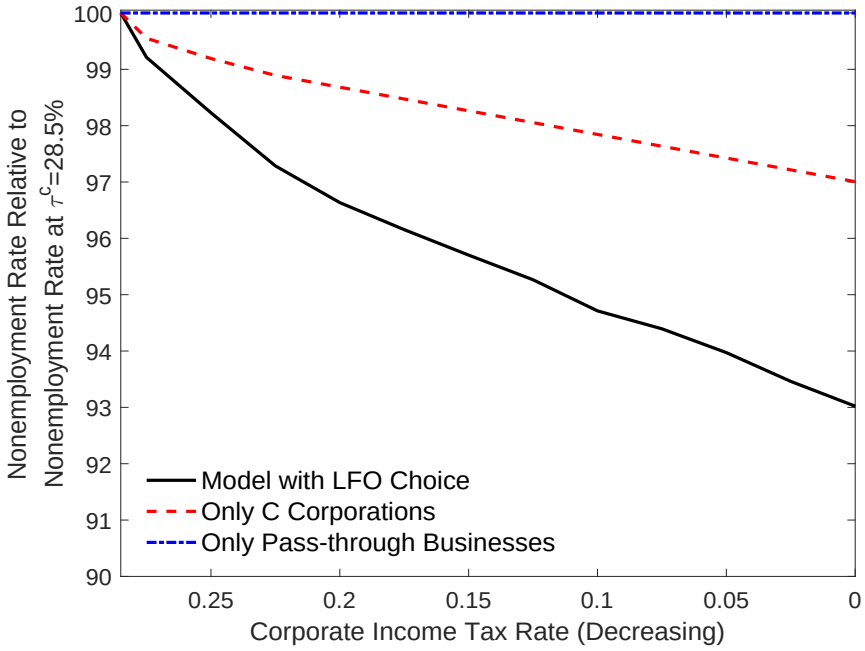


Figure 4 examines the responsiveness of the non-employment rate to a corporate income tax rate change. In this figure, the non-employment rate change for a given corporate income tax rate τ^c is normalized by the non-employment rate in the benchmark economy, where the corporate income tax rate is 28.5 percent.[20] The solid black line shows the changes of the relative non-employment rate with a decline

[20] Figure 4 graphs $\frac{\text{non-employment rate}(\tau^c)}{\text{non-employment rate}(\tau^c=28.5\%)}$ for each possible corporate tax rate in the policy analysis.

in the corporate income tax rate. If the corporate income tax rate is reduced to zero, the non-employment rate is reduced by 7 percent relative to the non-employment rate in the benchmark economy. The same information is also summarized in Panel C of Table 5.

To ascertain the relative importance of the two aforementioned sources of employment effect, two cases are examined. One case restricts all firms to be pass-through businesses, while the other case restricts all firms to be C corporations. For each case, the restricted model is recalibrated and then the non-employment responses to changes in the corporate income tax rate are examined and compared with the unrestricted case.

The blue dashed-dotted line in Figure 4 represents the non-employment rate changes in the first restricted model. If firms are not allowed to be organized as C corporations, not surprisingly, changes in the corporate income tax rate have no effect on the non-employment rate. Clearly, any employment effect of the corporate income tax policy can only come from having C corporations in the economy. The second restricted model, where firms are restricted to be only C corporations, is more interesting. This restricted model allows for C corporation formation from upstart non-entrepreneurs, but does not allow firms to switch LFO. The non-employment rate in this case is represented by the red dashed line in Figure 4. As indicated, the non-employment rate falls when the corporate income tax rate is lowered. However, the decline is much less compared with the case where an LFO choice is allowed. If the corporate income tax is eliminated in an economy with only C corporations, the normalized non-employment rate declines by 3 percent, compared with 7 percent in an economy where the LFO choice is allowed.[21]

This result shows the importance of considering LFO choice in the corporate tax policy analysis. In particular, the decline in the non-employment rate due to a corporate income tax cut can be more than twice as large when entrepreneurs'

[21] Alternatively, the benchmark model's parameters are used to simulate the restricted model's non-employment rate response without recalibration. The response to a lowering of the corporate income tax is even smaller in that case. The non-employment rate drops by only 1.6 percent when the corporate income tax is eliminated.

endogenous LFO choices are taken into full consideration.

D. Effects on Aggregate Productivity

In the model, a mismatch exists between agents' entrepreneurial talents and their ex ante wealth. Ideally, the financial market should channel capital from less-talented agents to more-talented entrepreneurs who are capital constrained. Capital reallocation would continue until the marginal returns to capital are equalized across firms in the economy. A corporate income tax does not directly distort the capital input choice within a firm. The distortion occurs when managerially talented entrepreneurs with little personal wealth choose the pass-through legal form in order to avoid double taxation. The adoption of the pass-through legal form can limit the flow of external capital into a firm and lead to inefficient allocation of capital. The severity of capital constraints faced by pass-through entrepreneurs determines the magnitude of productivity loss from the misallocation of capital in the economy.

A decline in the corporate income tax rate could encourage a firm to change LFO from a pass-through business to a C corporation. Changing LFO can reduce a firm's capital constraint and improve the efficiency of capital reallocation in the economy. In the policy experiment, the fraction of capital-constrained entrepreneurs decreases from 38.4 percent in the benchmark economy to 28.9 percent in an economy where the corporate income tax is removed. Improved access to capital allows the firm to choose the efficient level of capital stock, which can lead to more hiring.

Besides the distortion to LFO choice, the corporate income tax can serve as a barrier to firm entry. In the benchmark economy, the most productive workers would earn less income from operating capital-constrained pass-through businesses. These workers, however, would earn more pre-tax income operating C corporations with access to external capital. The burden of double taxation keeps these individuals from changing occupations. If the corporate income tax rate is reduced, conditional on having the same productivity levels, these individuals may choose to switch occupations from being employed workers to C corporation entrepreneurs. The new-

entry C corporations are on average less productive than the C corporations in the benchmark economy. As a result, the average managerial quality of a firm declines as the corporate income tax rate is lowered. We define the average managerial quality per firm as $Z^* = \frac{\int_{\chi z, a\in\{P,C\}} z\mu^*(z,a)}{\int_{\chi z, a\in\{P,C\}} \mu^*(z,a)}$. As presented in Table 6, Z^* declines by as much as 1.6 percent if the corporate income tax is eliminated.

Table 6—Corporate Income Tax and Measures of Productivity

	Benchmark	Change in Corporate Income Tax Rate		
	τ^c =28.5%	τ^c =20%	τ^c =10%	τ^c =0%
Average Managerial Quality (Z^*)	2.379	2.371	2.359	2.340
		(−0.3%)	(−0.8%)	(−1.6%)
Average Effective Labor (n^*)	0.511	0.508	0.505	0.503
		(−0.6%)	(−1.1%)	(−1.5%)
Average Labor Productivity (Y/L)	1.997	2.016	2.032	2.031
		(1.0%)	(1.7%)	(1.7%)
$TFP_1 = Y/(L^\theta K^\gamma)$	1.820	1.834	1.841	1.836
		(0.8%)	(1.2%)	(0.9%)
$TFP_2 = Y/(Z^* L^\theta K^\gamma)$	0.765	0.774	0.781	0.785
		(1.1%)	(2.1%)	(2.6%)

Note: The percentage changes from the benchmark statistics are included in parentheses.

As the corporate income tax rate declines, the most productive workers in the benchmark economy switch to become C corporation entrepreneurs under the new tax regime. This necessarily lowers the average labor productivity, defined as $n^* = \frac{\int_{\chi z, a\in\{E\}} z\bar{n}\mu^*(z,a)}{\int_{\chi z, a\in\{E\}} \mu^*(z,a)}$. As can be seen in Table 6, the average labor productivity declines by as much as 1.5 percent when the corporate income tax is eliminated.

The decline in the corporate income tax rate allows more efficient allocation of capital but reduces the average managerial quality and the average labor productivity in the economy. These two counterbalancing forces make the effect of a corporate tax policy change on aggregate productivity theoretically ambiguous. Therefore, three measures are constructed to understand the policy effect on aggregate productivity.

One measure is aggregate output per unit of effective labor Y/L, which takes into account the decline in average labor productivity. As can be seen in Table 6, aggregate output per unit of effective labor increases with a moderate reduction in the corporate income tax rate, but declines when the tax rate reduction becomes large.

The same non-monotonic relationship between aggregate productivity and the corporate income tax rate can be shown through a measure of total factor productivity (TFP). Suppose the relationship between aggregate output, Y, aggregate capital, K, and aggregate effective labor, L, can be written as $Y = TFP_1 \cdot K^{\gamma} L^{\theta}$, where γ and θ are the calibrated capital and labor intensity parameters of the production function. As can be seen in Table 6, productivity measure TFP_1 increases by 1.2 percent relative to the benchmark economy when the corporate income tax rate is 0.10. However, TFP_1 increases by only 0.9 percent when the corporate income tax is set to zero.[22]

The model allows two channels for capital market imperfections to impact TFP, the capital misallocation channel and the entry distortion channel. To measure aggregate productivity loss due to only capital misallocation, a second measure TFP_2 is constructed to take into account the decline in average managerial quality of firms Z^*. With this measure, aggregate output is defined as $Y = TFP_2 \cdot K^{\gamma} \cdot (Z^* \cdot L^{\theta})$. In Table 6, TFP_2 increases monotonically with a decline in the corporate income tax rate. More efficient capital reallocation can increase aggregate productivity in the economy by 2.6 percent when the corporate income tax is eliminated.

Like many papers in the literature, such as Hsieh and Klenow (2009), Restuccia and Rogerson (2008), and Restuccia and Rogerson (2013), the above results highlight the importance of agent heterogeneity in measuring productivity misallocation. The corporate income tax generates dispersion in marginal returns to capital across existing firms because of different tightness of capital constraints by LFO. In addition, an increase in the employment rate need not be uniformly correlated with an increase in productivity. As less-talented entrepreneurs enter the market, the average managerial quality falls, which could cause TFP to fall. The idea that the entry margin counterbalances with the productivity misallocation margin is similar to that in Midrigan and Xu (2014).

[22] All the computations in Table 6 assume that the government maintains a balanced budget by varying the personal income tax parameter a_2 . Doing away with this assumption changes the results very little. For example, Table 6 has $TFP_1 = 1.836$ when $\tau^c = 0$. If parameter $a_2$is held fixed, $TFP_1 = 1.838$ when $\tau^c = 0$.

E. Welfare

A decline in the corporate income tax rate has an ambiguous effect on aggregate welfare. On one hand, C corporations benefit from such a reduction, as they can retain more of their profits. On the other hand, corporate tax revenue may decrease, which requires an increase in personal income tax revenue to maintain a balanced government budget. The increase in personal income taxation can adversely impact all agents in the economy. For this reason, the welfare effects of lowering the corporate income tax rate is quantitatively evaluated in this section. Our analysis is limited to comparing the consumption-equivalent welfare values between steady states under different corporate income tax rates.

The consumption-equivalent welfare is defined in a standard way as the percent of consumption an agent is willing to forgo in all contingencies and in all future periods in order to live in the counterfactual economy with the new corporate income tax rate.[23] In the model, as the corporate income tax rate declines, the average consumption-equivalent welfare initially increases but then decreases. The peak occurs at a corporate income tax rate of about 10 percent, where the average welfare gain is 1.32 percent. If the corporate income tax is eliminated, the average welfare gain is 1.21 percent.

In addition to examining the aggregate welfare implications, the distributional welfare impacts from this policy change are also considered. Two changes in the corporate income tax rate are examined. In one scenario, the corporate income tax rate is decreased to 10 percent, which is the rate that maximizes aggregate consumption-equivalent welfare. In the other scenario, the corporate income tax is completely eliminated. Both policy changes would enjoy support in the economy. In either scenario, more than 97 percent of the agents would support a corporate income tax cut.

What accounts for this support? C corporation entrepreneurs on average have the most to gain, as lowering the corporate income tax rate directly lowers their

[23]The detailed analysis of consumption-equivalent welfare is given in on-line Appendix E.

tax obligation and increases their after-tax profitability. Workers in the benchmark economy would also support the corporate income tax cut. Workers benefit from an increase in the effective wage rate, which is more than enough to offset the increase in the personal income tax burden. The average non-employed agent in the benchmark economy is better off under either tax-cut regime. A lower corporate income tax rate increases labor demand in the economy, resulting in a non-employed agent having a better chance of becoming employed in the future.

Pass-through businesses in the benchmark economy do not uniformly benefit from a lower corporate tax rate. A sizable fraction of pass-through entrepreneurs in the benchmark economy would change LFO and become C corporation entrepreneurs under the new tax regime. They would benefit from the tax rate changes due to the improved access to capital and higher profitability. The remaining pass-through entrepreneurs would be hurt from the policy change. These entrepreneurs do not receive any relief in their tax burden when the corporate income tax rate is lowered, but face a higher personal income tax and higher labor costs. About 64 percent of pass-through businesses in the benchmark economy would support lowering the corporate income tax rate to 10 percent. This percentage declines to 41 percent if the corporate income tax is eliminated.

The corporate income tax reform in our model improves production efficiency by lessening capital constraints for a significant fraction of the firms in the economy. Better production efficiency leads to higher aggregate output and larger average corporate profit in the economy. As a result, the corporate tax base in the economy becomes larger, and the government does not need to rely on a large increase in the personal income tax to maintain a balanced budget. A higher wage rate also means that working-class households are likely to support this reform. In addition, higher aggregate productivity leads to an increase in wealth for a large fraction of the population, so the tax reform does not result in a large redistribution of wealth from the poor to the wealthy, as in papers such as Domeij and Heathcote (2004). An important contribution of Domeij and Heathcote (2004) is that they take into account transitional dynamics and show that comparing welfare across steady states

can be misleading. We intend to continue this research and evaluate the welfare effect of lowering corporate income tax rates under transitional dynamics.

V. Conclusion

This paper develops a dynamic stochastic occupational choice model with heterogeneous agents and incorporates endogenous entrepreneurial decisions with respect to legal forms of organization. Taking into consideration the general equilibrium effect under the assumption of revenue neutrality, a calibrated model is employed to evaluate the impact of a reduction in the corporate income tax rate. Both LFO switching and new firm entry lead to a significant increase in the relative size of the C corporation sector. Because the C corporation legal form offers better access to capital, the expansion of the C corporation sector increases economic output, consumption, and capital formation. Decreasing the corporate income tax burden also moderately increases the wealth gap.

A reduction in the corporate income tax rate leads to moderate job growth. If the corporate income tax were eliminated, the model predicts that the non-employed population would decrease from 34.1 percent to 31.7 percent, about a 7 percent fall in the relative non-employment rate. Endogenous LFO choice is a key margin in explaining the employment effect. In particular, the non-employment reduction due to a corporate income tax cut can be more than twice as large if the model takes into full consideration entrepreneurs' endogenous LFO choices.

In the economy, the corporate income tax distorts firm entry decisions and generates dispersion in marginal returns to capital across existing firms due to different tightness of capital constraints. Interestingly, the effect of a reduction of the corporate income tax rate on overall economic efficiency is non-monotonic. Because of the two counterbalancing forces, eliminating the corporate income tax has a relatively small overall effect on TFP (an increase of only about 0.9 percent). The productivity loss due to capital misallocation caused by the corporate income taxation is estimated to be 2.6 percent.

A welfare analysis is conducted to examine the different corporate income tax regimes. A reduction in the corporate income tax rate does not always improve welfare. Average welfare is maximized with a 10 percent corporate income tax rate. With a lower corporate income tax rate, the widening of the corporate income tax base allows the government to maintain revenue neutrality without large increases in the personal income tax burden. An overwhelming majority of the population would be in favor of such a corporate income tax cut in this environment.

An important contribution of the paper is to point out the importance of considering LFO choice when evaluating the corporate income tax policy. For future research, two aspects of the LFO choice can be further explored. C corporations can finance business operations using retained earnings. Firm-owned capital, in a dynamic environment, can aid faster firm growth. This offers an alternative explanation of why firms choose to be C corporations. The current model can also be extended to analyze the sources of corporate finance and LFO choice. For debt financing, we can consider the possibility of firm default. Corporations, including both C and S corporations, have limited liabilities. Better management of future default risk offers another possible reason for firms to incorporate. For equity financing, the model can incorporate modeling of shareholders. The corporate income tax can potentially affect the risk of equity issuing and investment efficiency, which in turn affect a firm's LFO choice. In both aspects, the main challenge is the complexity in modeling firms' ownership structure across periods while taking into account possible changes in LFO, which we hope to overcome in future papers.

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