Will A Decline in The Corporate Income Tax Rate Create Jobs? *

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Abstract

We adopt a dynamic stochastic occupational choice model with heterogeneous agents and evaluate the impact of a potential reduction in the corporate income tax on employment. We show that a reduction in corporate income tax leads to moderate job creation. In the extreme case, the elimination of the corporate income tax would reduce the non-employed population by 5.4 percent. In the model, a reduction in the corporate income tax creates jobs through two channels, one from new entry firms and one from existing firms changing their form of legal organization. In particular, the latter accounts for 85.7 percent of the new jobs created.

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1 Introduction

Since its inception in 1909, the appropriateness of the corporate income tax as a revenue source has been questioned. Over the last few years, concerns with respect to high corporate income tax rates have focused on the potential negative effects on employment. Many prominent policy makers and politicians have suggested that a cut in the corporate income tax rate could be an engine for job creation. During the 2012 Presidential Election, Governor Mitt Romney stated that "if the U.S. Corporate Income tax rate is reduced ... it makes it easier for small business to keep more of their capital and hire people. And for me, this is about jobs." President Barack Obama, in responding to this comment, stated "Governor Romney and I both agree that our corporate tax rate is too high, so I want to lower it, ..., taking it down to 25 percent."

Our paper addresses the question: "Will a decline in the corporate income tax rate generate jobs?" The answer to this question is not as straightforward as the politian suggest. For instance, consider a static environment with a representative firm, which uses both capital and labor inputs in its production process. The firm chooses to maximize profits by equating the marginal returns of both inputs. If a corporate income tax is levied against the total profit of the firm, and both labor and capital expenses are tax deductible, then changes in the corporate tax rate does not distort the relative marginal returns. Hence, this simple model would predict no changes in employment levels with changing corporate income tax rate. Furthermore, even if a more sophisticated model predicts an increase in employment, the effect must be considered quantitatively in relation to others economic issues, such as economic welfare, the wealth distribution, and the long term government budget outlook.

We adopt a dynamic stochastic occupational choice model with heterogeneous agents in a fashion similar to the "Span of Control" model presented in Lucas (1978). Agents are heterogeneous in both productivity and asset holdings in the model economy. They are able to choose between being non-employed, employed, or firm managers. There are two important features in our model. The first feature is firm dynamics. Similar to Hopenhayn and Rogerson (1993), we can account for firm entry, exit, growth rate, size distribution as well as job creation, job destruction and job reallocation across firms. A reduction in the corporate income tax increases firm profitability, which can encourage the incorporation of new businesses. These newly created firms would in turn generate new jobs in the economy. The jobs generated by new entry firms is potentially very important to the long term labor market outlook. Haltiwanger et al. (2013) find that younger firms, if surviving, exhibit substantially higher employment growth as compared to mature firms. In addition, Haltiwanger et al. (2013) document that growing firms contribute the most

to job growth in the United States. Therefore, because a reduction in the corporate income tax also reduces the likelihood of less profitable corporations exiting the market, the economy would face less job destruction, and enjoy a higher rate of net job creation.

In our model, the corporate tax rate can affect employment levels through a second channel, namely firms' legal form of organization. In the United States, not all firms are subject to the corporate income tax. In fact, roughly only one-third of the firms in the U.S. are paying the corporate income tax, but they hire more than half the workers in the economy. A firm can choose to be either a pass-through business or a C corporation. Pass-through firms include sole proprietorships, partnerships, limited liability firms, and schedule S corporations. If a firm files as a pass-through entity, all profits are passed through to the owners of the firm and are only taxed at individual levels. If a firm files as a C corporation, it is subject to double taxation as the firm's profits are subject to corporate income tax and its dividend distributions are subject to personal income tax. However, the disadvantage of double taxation faced by C corporations is offset by having better accesses to funds. Well funded, C corporations have opportunities to grow faster, expand firm operations and hire more employees. Goolsbee (2004) presents evidence that a lowered corporate income tax reduces the burden of double taxation and thus encourages existing pass-through firms to refile as C corporations.

We calibrate the model to match key statistics such as employment-to-population ratio, wealth distribution, and firm statistics. Specifically, the model matches the fact that only 24 percent of the firms are C corporations who pay corporate income taxes and hire 55 percent of the workers. In addition, we validate our model predictions by comparing them to other empirical analyses regarding changes in corporate incomes taxes. For example, Goolsbee (2004) documented that a 0.1 decrease in the corporate tax rate increases the C corporations share of all firms by 5 to 10 percent and the corporate share of sales and employment by 2 to 6 percent. In our model, when we conduct the same policy experiment, the C corporation fraction goes up by 5.64 percent and the employment share by C corporations goes up by 2.86 percent. Even without directly calibrating our model to include these statistics in our moment matching exercise, our model predictions are consistent with other empirical findings. We can therefore, with the calibrated model, evaluate the impact of a potential reduction in the corporate income tax on employment. This article finds that a reduction in corporate income tax leads to moderate job creation. In the extreme case, the elimination of the corporate income tax would reduce the non-employed population by 5.4 percent. As mentioned above, a reduction in the corporate income tax creates jobs through two channels, one from new entrants and one from existing pass-through firms switching to become C corporations. In particular, the latter channel

accounts for 85.7 percent of the new jobs created.

This paper also provides welfare analysis of corporate income tax effects on employment. In our model, job creations by both channels increase labor demand. Labor wages in the economy rise in response to a higher labor demand. In addition, assuming a balanced government budget, personal income tax would rise in order to compensate for the loss of corporate income tax revenues. The higher wage and the higher personal income tax have opposite effects on overall economic welfare. Taking these countervailing forces into accounts, this article finds that a corporate income tax rate of 12 percent would maximize economic welfare. Finally, this article takes full advantage of the model's ability of track heterogeneous agents' individual occupation, consumption and saving decisions in a dynamic environment. In doing so, this article finds that 87 percent of the population would be in favor of lowering the corporate income tax rate to 12 percent, while 67 percent of the population would support the elimination of corporate income tax. In both cases, C corporations are better off from the tax policy changes because they enjoy lower tax liabilities. Workers are also better off because of higher wages. However, pass-through businesses would suffer welfare loss because they have to pay higher personal taxes to government and higher wages to their employees.

Our paper is related to a large literature on the economic implications of corporate income tax. Much of the early research focuses on tax incidence issues as exemplified by Harberger (1962)'s seminal paper as well as Ballard et al. (1985), Feldstein (1978), Feldstein and Slemrod (1980), Gravelle and Kotlikoff (1989) and Shoven (1976). The main focus of these papers are to study the welfare implications of corporate income tax. Another strand of literature, coporate finance, provides insights into the effects of corporate income tax on firm equity decisions. Bradford (1981), one of the earlier examples, analyzes a model with a tax on all corporate distributions to equity owners. Since dividends are taxed at both the corporate and individual levels, distortions are introduced and could impact investment efficiency. Some more of the related researches include but are not limited to Auerbach (2002) and Jensen (1986). Applying and extending these theoretical frameworks, empirical studies such as Chetty and Saez (2005), Gourio and Miao (2010), and Anagnostopoulos et al. (2012), focus on the implication of one particular policy (The Jobs and Growth Tax Relief Reconciliation Act of 2003), and explain the changes in corporate firms dividend distribution behaviors. Except for the employment effects that could emanate from investment changes, the literature seems to be silent on the employment impacts from a change in the corporate income tax rate. One notable exception is McGrattan and Prescott (2005). Using a representative firm model framework, McGrattan and Prescott (2005) consider three factors of production, labor, tangible

capital and intangilble capital. A change in corporate income tax changes the price of intangible capital and hence distorts the relative factor input choice. This in turn affects the value of corporate equity and hence employment decisions.

Relating to the vast economic literature, the key contributions of our paper are two-fold. First, we highlight the importance of agent heterogeneity in evaluating the long term impact of corporate tax policy changes. A general equilibrium model with agent heterogeneity allows us to investigate the extensive margin of labor demand change, which is not present under a representative agent framework. Second, we showcase the importance of firms' legal form of organization (LFO) in labor demand decisions, which is often ignored by previous researches.[1] In fact, as aforementioned, the labor demand changes due to switches between LFO's are quantitatively important.

The remainder of the paper is organized as follows. Section 2 presents the model. Section 3 provides an equilibrium definition and analyzes agents' decision problems. Section 4 provides calibration results of the benchmark model. Section 5 considers policy experiments and discusses the implications on occupational choice, non-employment rate and welfare. Section 6 concludes.

2 The Model

We consider a dynamic stochastic occupational choice model in the tradition of the "span of control" model of Lucas (1978). Time is discrete and infinite, indexed by $t = 0, 1, 2, ...$ The economy consists of a unit measure of agents, a perfectly competitive institutional investor sector, and a government.

Agents are heterogeneous in their productive talent and can choose between being non-employed, a worker, or an entrepreneur. The entrepreneurship decisions is modelled similar to Cagetti and De Nardi (2006) and Quadrini (2000), but the key difference is that our model allows choice over the LFO. An entrepreneur can decide of operate the firm as a pass-through business or as a C corporation. A pass-through firm would include a sole proprietorship, a partnership, a limited liability company and an S corporation. A pass-through entity is not subject to the corporate income tax as all profits are passed through to the owners of the firm. A firm that organizes itself as a C corporation is subject to the corporate income tax, but benefits from the ability to accept funding from outside investors. As in Hopenhayn (1992) and Hopenhayn and Rogerson (1993), productivity is a stochastic process which generates firm entry, growth, exit, size distribution as well as job creation, job destruction and job reallocation across firms.

[1] McGrattan and Prescott (2013) consider two exogenous corporate sectors with different tax liabilities.

2.1 Agents

Each agent is endowed with one unit of time which can be allocated between work n_t and leisure $1 - n_t$. Agents value consumption, c_t, as well as leisure, $1 - n_t$. The per-period utility function $u(c_t, n_t)$ is strictly increasing and concave in both consumption and leisure. Agents discount the future at rate $\beta \in [0, 1]$.

Agent heterogeneity is reflected through the agent states. The agent specific states are the agent's productivity, z_t and her asset level, a_t. Productivity evolves according to an exogenous first-order Markov process that is independent across agents, where $\rho(z_{t+1}|z_t)$ is the probability of receiving productivity z_{t+1} tomorrow conditional on today's productivity being z_t. Each period agents must make decisions concerning saving, occupational choice and labor supply. The savings decision, a_{t+1}, earns an interest rate of r. We assume there is a non-borrowing constraint such that a_{t+1} must be non-negative. The occupational choice decision, χ_t, is defined over a set of choices. An agent can choose to be non-employed, in which case $\chi_t = N$. If an individual decides to be an employed worker, then $\chi_t = E$. An individual may also decide to become an entrepreneur. This decision also requires a decision on the legal form of organization for the firm. The entrepreneur can organize the firm as a pass-through entity denoted as $\chi_t = P$. Alternatively, the firm could be organized as C corporation, which will be denoted as $\chi_t = C$. The occupational choice decision has implications for the labor supply decision. If an agent is not employed, then all time is devoted to leisure, and $n_t = 0$. This individual does receive a lump-sum transfer unemployment benefit of b from the government each period. When employed or an entrepreneur, the agent works full time and supplies $\overline{n}$ amount of time. The income earned by the employed worker depends on wage rate w_t, productivity level z_t, and amount of labor supplied $\overline{n}$. For an individual who chooses to become a worker, labor income will be $w_t z_t \overline{n}$. If an individual decides to become an entrepreneur, the resulting firm's output depends on a production function $F(z_t, k_t, l_t)$. This function is increasing in productivity z_t, capital k_t, and labor l_t. The input prices are r_t for capital and w_t for labor. An operating business incurs a fixed cost of c_f each period regardless of the business scale. A firm can avoid paying the fixed cost by shutting down operation in a period.

$$\pi_t(z_t, k_t, l_t) = F(z_t, k_t, l_t) - (r_t + \delta)k_t - w_t l_t - c_f$$

If an agent chooses to operate a pass-through business or $\chi_t = P$, the firm he operates is subject to a collateral constraint $k_t \leq a_t$. In other words, the firm can not borrow more capital stock that the current asset holding of the entrepreneur. An agent can also decide to organize the firm as a C corporation, $\chi_t = C$. A C corporation is funded by an institutional investor. We assume institutional investors have "deep pockets," which

means that C corporations are not subject to any collateral constraints. A C corporation's profit is subject to a corporate income tax rate of τ^c.We assume that the entrepreneur negotiates a compensation package with the corporation that depends on the firm profit. Let $\varphi(z_t, k_t, l_t)$ be the share of after-tax profits that the entrepreneur received as wage compensation.

The collateral constraint is important for understanding the key trade-off between choosing a pass-through firm structure versus a corporate firm structure. A binding collateral constraint may limit a manager's ability to finance the operation of the firm. Therefore, despite the disadvantage of double taxation, entrepreneurs have incentives to file as C corporations to attract outside funding from institutional investors.

2.2 Institutional investor

There exists a representative competitive institutional investor. This investor can only invest in C corporations but not pass-through businesses. We assume that the institutional investor has full information on the firm's productivity z_t. After observing the productivity, if the institutional investor decides to invest, any investment results in a transaction cost of c_e. Capital is provided to the firm in exchange for shareholdings in the firm. The after-tax corporate profits are split so that the entrepreneur receives $\varphi(z_t, k_t, l_t)$ shares of after-tax profits and the institutional investor receives the remaining $1 - \varphi(z_t, k_t, l_t)$ shares.

2.3 Government

The government collects two types of tax revenue, a personal income tax and a corporate income tax. The total tax collections are used to finance lump-sum transfers to the non-employed and an exogenous amount of government spending, G_t. The government follows a balanced budget policy.

For the personal income tax, both interest and non-interest earnings are subject to the personal income tax are the rate τ_p. All C corporations must pay an entry cost of c_e. This cost is tax deductible. Hence, net corporate profits, $\pi_t^*(z_t) - c_e$, are subject to the corporate income tax rate of τ^c.

2.4 Timing of Events

The timing of events within a period proceeds as follows:

1. An agent enters a period with productivity z_t and asset level a_t;

2. The agent makes an occupational decision χ_t to be non-employed, an employed worker, a pass-through entrepreneur, or a C corporation entrepreneur;

3. Production occurs. All agents receive their respective earnings;

4. The government levies taxes on personal and corporate income, then makes transfers to non-employed agents and finance the exogenous government spending G_t;

5. Consumption and saving decision are made; and

6. Agents draw new productivity shocks and the period ends.

3 Equilibrium

We define the general equilibrium for the dynamic stochastic occupational choice model sketched in the prior section. Since our focus is on the stationary equilibrium, all time subscripts t are suppressed. We will employ the standard convention of using a prime to denoted a variable in the following period.

3.1 Agent's Problem

Let $V(z, a)$ represent the value function for an agent with productivity z and asset level a. Let $W^{\chi}(z, a)$ ne the value function given an occupational choice χ.

3.1.1 Non-employed Agents

A non-employed agent receives a lump-sum transfer b from the government. The government transfer and interest income ra are subject to a personal income tax at the rate τ^p. This agent maximizes lifetime utility by making consumption c and asset decisions a' subject to the budget constraint, consumption non-negativity constraint, and non-borrowing constraint. The value function for the non-employed agent is:

$$\begin{aligned} W^N(z,a) &= \max_{c,a'} \; u(c,1) + \beta E_{z'|z} V(z',a') \qquad (1) \\ \text{subject to} & \\ c &= (1-\tau^p)(b+ra) + a - a' \\ c &\geq 0; \quad a' \geq 0 \end{aligned}$$

3.1.2 Employed Workers

An employed worker receives a wage w on effective labor of $z\overline{n}$. Total earnings of an employed agent is comprised of labor income $wz\overline{n}$ and interest income of ra. Total earnings are subject to a personal income tax with rate τ^p. Utility depends on consumption and leisure. The workers value function is defined as:

$$\begin{aligned} W^E(z,a) &= \max_{c,a'} \quad u(c, 1-\overline{n}) + \beta E_{z'|z} V(z', a') \qquad (2) \\ \text{subject to} & \\ c &= (1-\tau^p)(wz\overline{n} + ra) + a - a' \\ c &\geq 0; \quad a' \geq 0 \end{aligned}$$

3.1.3 Pass-through Entrepreneurs

An entrepreneur under the pass-through organizational form must self-finance the firm's operation. The profit generated by this firm type is not subject to the corporate income tax. However, both profits $\pi(z,k,l)$ and interest income ra are subject to the personal income tax at rate τ^p. The value function for this type of entrepreneur is:

$$\begin{aligned} W^P(z,a) &= \max_{c,a',k,l} \quad u(c, 1-\overline{n}) + \beta E_{z'|z} V(z', a') \\ \text{subject to} & \\ c &= (1-\tau^p)(\pi(z,k,l) + ra) + a - a' \\ 0 &< k \leq a \\ c &\geq 0; \quad a' \geq 0 \qquad (3) \end{aligned}$$

The optimal capital and labor choices for pass-through entrepreneurs are denoted by $k(z,a)$ and $l(z,a)$, which are functions of productivity z and asset level a.

3.1.4 C Corporation Entrepreneurs

Because of the involvement of institutional investors, C corporations do not face the collateral constraint as the pass-through entrepreneurs do. Profits the entrepreneurs receive $\varphi(z,k,l)\pi(z,k,l)$ are subject to both the corporate income tax and the personal income tax.

$$
\begin{aligned}
W^C(z,a) &= \max_{c,a',k,l} \; u(c, 1-\overline{n}) + \beta E_{z'|z} V(z', a') \qquad (4)\\
\text{subject to} & \\
c &= (1-\tau^p)(\varphi(z,k,l)(1-\tau^c)\pi(z,k,l) + ra) + a - a' \\
c &\geq 0; \quad a' \geq 0
\end{aligned}
$$

The optimal capital and labor choices for C corporations only depend on the productivity z but not the manager's asset level a, because they are not constrained by collateral requirement. We denote their optmal capital and labor choices to be $k^*(z)$ and $l^*(z)$.

In the beginning of the period, an agent knows the asset position a and learns about productivity z. Given this information, the static occupational choice is simply choosing the greatest value of each of the occupational value functions. That is,

$$V(z,a) = \max\{W^N(z,a), W^E(z,a), W^P(z,a), W^C(z,a)\} \qquad (5)$$

The solution to this problem generates the optimal occupational choice decisions, $\chi(z,a)$, the consumption choices, $c(z,a)$, asset choice decisions, $a'(z,a)$, and the labor supply decisions, $n(z,a)$.

3.2 Institutional Investor

The institutional investor chooses the number $\iota(z) \geq 0$ of C corporations with productivity z to invest to maximize the after-tax profit every period. Since the capital and labor choices of C corporations are not subject to manager's own savings, they are only functions of productivity z,

$$\Pi^I = \max \int_z \iota(z)(1-\tau^c)\left[(1-\varphi(z,k^*(z),l^*(z)))\pi(z,k^*(z),l^*(z)) - c_e\right] \qquad (6)$$

If a solution exists, then this optimization problem requires that

$$(1-\phi(z))\pi^*(z) \geq c_e \text{ if } \iota(z) > 0 \qquad (7)$$

and

$$(1-\phi(z))\pi^*(z) < c_e \text{ if } \iota(z) = 0 \qquad (8)$$

where $\phi(z) = \varphi(z, k^*(z), l^*(z))$ and $\pi^*(z) = \pi(z, k^*(z), l^*(z))$.

Because the fixed transaction cost c_e is tax deductible, the investment decision does not depend the corporate income tax rate. In addition, because the institutional investor is competitive, the profit to invest a C corporation with talent z is non-positive when

$$(1 - \phi(z))\pi^*(z) \leq c_e.$$

Together with the participation constraint in Equation (7), an institutional investor must make zero profit in equilibrium. Therefore, $(1 - \phi(z))\pi^*(z) = c_e$.

Because the transaction cost c_e is fixed, when a firm is more productive, fewer shares are needed to make the institutional investor willing to invest. This means the fraction of shares the firm can keep to itself $\phi(z)$ is increasing in productivity z. Furthermore, if the productivity is extremely low, the institutional investor may not be able to cover the transaction cost even when offered all the shares. In other words, the participation constraint is violated. We can define a cutoff productivity $\underline{z} > 0$ such that

$$\pi^*(\underline{z}) = c_e.$$

The institutional investor will refuse to invest at all for any firm that has productivity lower than this cutoff level, so $\phi(z) = 0$, $\forall z \leq \underline{z}$.

3.3 Distributions

Let $\mu(z, a)$ denote the invariant cross-sectional distribution measures 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 the productivity z. For any set of future asset levels contained in A and any future productivity z', the following equation must be satisfied:

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

3.4 Government's Budget Constraint

The government collects revenue through a personal income tax that applies to the non-employed, workers, and all forms of entrepreneurs. In addition, C corporations are subject to a corporate income tax. The revenue generated by the personal income tax can be

defined as

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

where the indicator functions represent the revenue generated for a particular occupational type of agent. The revenue generated from the corporate income tax from C corporations is simply

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

This government spends an exogenous amount, G, to buy current goods and offers a non-employment transfer for those workers who choose not to work. The aggregate amount of these transfers, B, can be defined as:

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

Under that balance budget assumption, the government budget constraint can be defined as

$$G + B = R^p + R^c \tag{9}$$

3.5 Labor Market Clearing Condition

The equilibrium wage clears the labor market.[2] 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,

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

Both pass-through firms and C corporations demand labor. The pass-through firm demands labor based on the firm's productivity and asset position. The demand for labor emanating from entrepreneurs who are C corporations, $l^*(z)$ depends solely on the firm's productivity. Aggregating labor demand across entrepreneurs over different organizational

[2]In this paper we assume the interest rate is fixed. In other words, financial intermediaries have access to a global financial market. Hence, in the domestic capital market, $K^D \geq K^S$.

forms results in the measure of labor demand. That is,

$$L^D = \int_{z,a} [1_{\{\chi(z,a)=P\}} l(z,a) + 1_{\{\chi(z,a)=C\}} l^*(z)] \mu(dz, da)$$

The excess supply in the labor market is defined as:

$$\Delta_L = L^S - L^D. \tag{10}$$

In equilibrium, wages adjust to clear the labor market with zero excess supply.

3.6 Equilibrium Definition

A steady-state equilibrium consists of a set of agents' decision rules, $\chi^*(z,a)$, $c^*(z,a)$, $a'^*(z,a)$, $n^*(z,a)$, a profit sharing rule for the C corporation entrepreneur, $\phi^*(z)$, a wage rate w^*, a corporate income tax rate τ^c, a personal income tax rate τ^P, and a distribution $\mu^*(z,a)$ such that given the exogenous government spending, G, non-employment transfer, and risk-free interest rate r:

1. The decision rules $\chi^*(z,a)$, $c^*(z,a)$, $a'^*(z,a)$, $n^*(z,a)$ solve the agent's optimization problem as stated in equations (1), (2), (3), (4), and (5);
2. the profit sharing rule $\phi^*(z)$ satisfies the zero profit condition for the institutional investor as in (6);
3. the labor market as expressed in equation (9) is satisfied;
4. The government budgets constraint as stated in equation (8) is satisfied; and
5. the distribution $\mu^*(z,a)$ as defined in equation (7) reproduces itself.

4 Benchmark Model

4.1 Parameter Assignments and Calibration

The model period is one year. The discount rate β is set at 0.96. An agent's utility function is assumed to be separable in consumption c and leisure $1-n$, and takes the functional form:

$$u(c,l) = \frac{c^{1-\alpha_c}}{1-\alpha_c} + \psi \frac{(1-n)^{1+\alpha_n}}{1+\alpha_n}.$$

Labor supply decisions in the model are discrete. If an agent decides to be unemployed, the amount of leisure $1 - n$ would be equal to one. However, if the agent decides to work or become an entrepreneur, we assum they must work full-time, or $\overline{n}$. This value is set to be 0.45., which corresponds to 45 hours a week. The risk free interest rate is set to be 0.01 so as to be consistent with the average long-term U. S. inflation indexed securities. The depreciation rate of capital δ is set to be 10 percent from standard estimation.

Agents face corporate and personal income tax rates. These rates are are assumed to be flat. As a result, we set them to their average effective tax rate. The personal income tax rate is set to 20 percent. For the corporate income tax, we follow the U. S. Bureau of Economic Analysis (BEA) by defining the corporate tax rate as obligations paid to federal, state, and local governments as a percentage of corporate income. The tax rate for the period 2001 to 2008 is calculated as the average of the annual rates, or 25.7 percent. The set of parameters that are calibrated independently from data are summarized in Table 1.

Table 1: Parameters Cailibrated Independently

Description	Parameter	Value
Corportate Income Tax Rate	τ^C	0.257
Personal Income Tax Rate	τ^P	0.200
Discount Rate	β	0.960
Risk-free Interest Rate	r	0.010
Depreciation Rate on Capital	δ	0.100
Full-time Hours Worked	$\overline{n}$	0.450

For all other parameters that appear in the model, we calibrate their values through a moment matching exercise. These parameters are summarized in Table 2. The logarithm of productivity z is assumed to follow an AR(1) process with autocorrelation ρ_z and standard deviation σ_z, or $\log(z') = \rho_z \log(z) + \varepsilon$, where $\varepsilon \sim N(0, \sigma_\varepsilon^2)$. The autocorrelation and the standard deviation of the log productivity are calibrated to be 0.879 and 0.198.

The production function is assumed to take the functional form $F(z, k, n) = zk^\gamma n^\theta$. The captal and labor share parameters in the production function calibrated to be 0.223 and 0.485 respectively. The fixed cost of operating a business c_f is set at 1.698, while the entry cost that must be paid to the institutional investor in order to acquire additional funds c_e is found to be 4.858. Lastly, the lump-sum transfer b received by non-employed workers is 0.248.

As for preference parameters for the utility function, three parameters must be calibrated. The constant relative risk aversion coefficient α_c is 3.251. The parameters related

to leisure that must be calibrated are ψ and $\alpha_{n.}$ The leisure parameter ψ is 0.171, while the power parameter associated with leisure α_n is specified to be 0.142.

Table 2: Parameters Calibrated Jointly in Equilibrium

Description	Parameter	Value
Productivity Persistence	ρ_z	0.879
Standard Deviation of Productivity	σ_z	0.198
Constant Leisure Parameter	ψ	0.171
Power Parameter on Leisure	α_n	0.142
CRRA Parameter on Consumption	α_c	3.251
Production Function Parameter on Capital	γ	0.223
Production Function Parameter on Labor	θ	0.485
Firm Fixed Cost	c_f	1.698
Entry Cost to Access Outside Funds	c_e	4.858
Non-employment Lump Sum Transfer	b	0.248

These parameters are estimated jointly so that key data and model moments are matched. We want the model to match a set of key employment statistics. According to the Bureau of Labor Statistics (BLS), the fraction of the civilian workers between age 25 and 64 who were employed was around 75 percent. Hence, we target the non-employed fraction to be 25 percent. The U.S. Census Bureau in their 2007 release on Statistics of U.S. Business present data on both the number of firms and the number of workers hired by legal form of organization. This data source suggests that 23.9 percent of firms choose the C corporation legal structure. In addition, the C corporation legal structure accounts for 54.63 percent of employment. Another labor statistic we target concerns job creation. This data source indicates that job creation from new firm entrants accounts for 36.2 percent of total new jobs.

According to *The Economic Report of the President,* between 2001 and 2011 the corporate income tax accounted for 9.4 percent of Federal Revenue in the United State. We set the share of total federal revenue due to the corporate income tax at 0.09. Another set of targets relate to the labor supply response to tax policy changes. The labor share in output is targeted to 0.60. An important question is the labor response to a change in the after tax real wage rate. There are large differences in the literature between microeconometric estimates of the Frisch labor supply elasticity, which are small and the values employed by macroeconomists to calibrate general equilibrium models. The Frisch elasticity in macro models ranges between 2.0 and 5.0. In this study, we target the

Frisch labor supply elasticity to be 3.0.[3] Finally, we want the model to match key wealth statistics. The 2007 Survey of Consumer Finance (SCF) reports the wealth gini index is 0.820. We also target the percentage of wealth held by households at various percentages. We present the comparison between data and model moments in Table 3. Our benchmark model fits the data fairly well.

Table 3: Data and Model Moments

Statistics	Data	Model
Non-employment Fraction in Population	0.250	0.239
Fraction of C Corporations	0.239	0.238
Employment Fraction of C Corporations	0.546	0.564
Fraction of Jobs Created by Firm Entry	0.362	0.271
Ratio of Corporate Income Tax to Total Tax Revenue	0.090	0.122
Labor Share of Income	0.666	0.637
Labor Supply Elasticity	3.000	2.976
Wealth Gini Index	0.820	0.803
Percentage of Wealth in Top 60%	0.990	0.988
Percentage of Wealth in Top 40%	0.950	0.954
Percentage of Wealth in Top 20%	0.830	0.860
Percentage of Wealth in Top 10%	0.710	0.695
Percentage of Wealth in Top 1 %	0.340	0.172

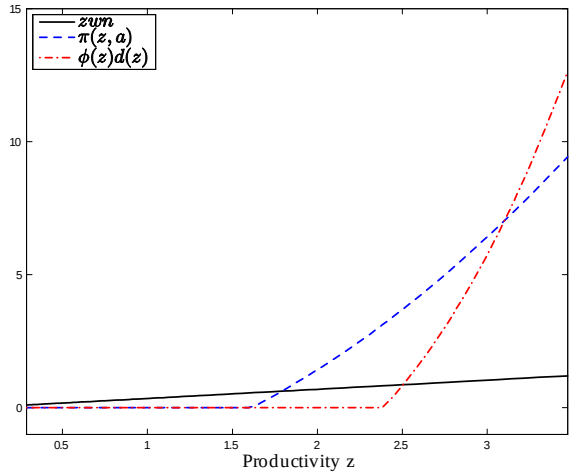
4.2 Equilibrium for the Benchmark Model

The benchmark model provides some interesting insights concerning the decisions of various agents. Since labor choice is discrete, agents receive the same disutility once they work. This means the decision on whether to be a worker or become an entrepreneur depends solely on non-interest income. If an individual decides to become a worker, they receive earnings of $wz\overline{n}$. Given the equilibrium wage w and full time hours worked $\overline{n}$, a worker's labor income is linear in productivity. If an individual decides to be an entrepreneur and chooses to be a pass-through firm, they operate subject to a collateral constraint and receive profits of $\pi(z, k(z,a), l(z,a))$. An individual entrepreneur could decide to operate as a C corporation in which case they would receive dividends depending on their share of ownership, or $\phi(z)\pi^*(z)$. As can be seen in Figure 1, at lower levels of productivity an individual will be more likely to choose to be worker and receive the market wage. When

[3] (to be added)

the productivity increases, agents start switching to be a pass-through firm. However, at very high productivity, the C corporation is much more profitable. This is a result of the C corporation having access to external funds while the pass-through corporation is limited by the collateral constraint.

Figure 1: Per-Period Non-Interest Income for Employed Agents

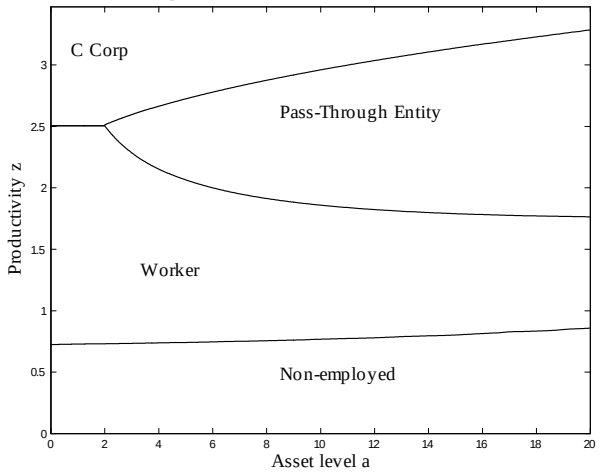


Examining the relationship between productivity and asset (or capital) levels gives additional insights into the occupational choice decisions. At very low productivity levels and asset levels, an individual will choose to be a worker rather than an entrepreneur. At the lowest productivity levels, some individuals will choose to be non-employed. For these individuals, they receive a non-employment lump-sum transfer b that is independent of their ability. Because agents value leisure, the individuals with the lowest level of productivity will tend to be non-employed. Figure 2 indicates that as productivity increases individuals will tend to be less constrained due to a lower demand for capital, and they will choose to have a pass-through business. Agents with very high productivity will demand much more capital. These individuals are willing to pay the corporate income tax in order to have better access to external funds.

5 Policy Experiment

In this section, we use the benchmark model to study the implications of a lower corporate income tax rate on employment. Our strategy to address this important policy question is to analyze this question using the model we have constructed and parameterized. The experiment will be to lower the benchmark corporate income tax rate of 0.257 to 0 to see how employment is impacted. The policy experiment is conducted under the assumption that government obligations are maintained by an appropriate increase in the personal

Figure 2: Occupation Choices in Benchmark Model



income tax rate. The aggregate findings are summarized in Table 4. The model predicts employment will increase. This section focuses on the various economic effects at play that result in the ultimate change in employment.

Table 4: Aggregate Impacts of a Change in the Corporate Income Tax

Variable	Benchmark	Policy Experiment	Percentage Change
Policy Variables			
Corporate Income Tax Rate	0.257	0.000	
Personal Income Tax Rate	0.200	0.212	
Economic Variables			
Output	0.467	0.481	2.90
Wages	0.762	0.780	2.25
Total Employment	0.761	0.774	1.70
C Corporation Employment	0.429	0.467	8.90
Pass-Through Firm Employment	0.332	0.307	-7.50
Fraction of Non-Employed in Total Population	0.239	0.226	-5.40
Fraction of Firms - C Corporations	0.238	0.270	13.40
Fraction of Firms - Pass-Through Firms	0.762	0.730	-4.20
Fraction of Employed Workers hired by C Corporation	0.564	0.603	7.00
Fraction of Employed Workers hired by Pass-Through Firms	0.436	0.397	-8.90

5.1 Will a Decrease in the Corporate Income Tax Rate Generate An Increase in Employment and Why?

As a starting point, we examine how individual decisions are impacted if the corporate income tax rate is set to zero. In Figure 3, the decline in the corporate income tax rate impacts the choice of legal form of organization in two ways. First, for the more productive pass-through firms the removal of double taxation and the ability to have access to external financing make the C corporation more attractive. Second, some pass-through firms may become a worker as wages are higher due to the increase in labor demand. Some non-employed workers will respond to the increase in wages by re-entering the work force. It should be pointed out that our extreme example of the removal of the corporate income tax does not mean that all firms will choose the C corporate form of legal organization. Some individuals will continue to choose to be pass-through entities. These are firms that tend to be low productivity and do not find it beneficial to give up a share of ownership in order to attract more capital.

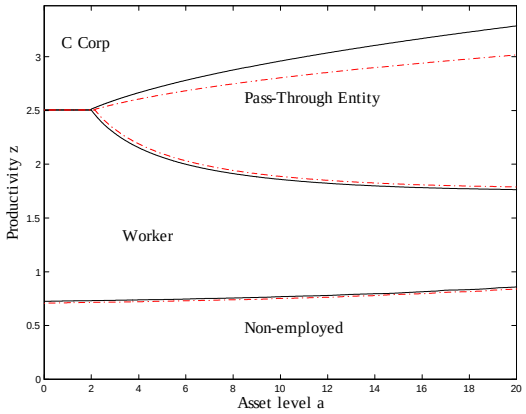


Figure 3: Occupation Choices in Policy Experiment

In Figure 4, we attempt to get some idea on the size of the increase in the number of C Corporations and the employment increase of this type of firm. In order to address these issues, we solve the model under a set of corporate tax rates and measure the change in the number of C corporations and the changes in employment in C corporations. Since we are interested in the effect of a reduction in the corporate income tax rate, the horizontal axis in Figure 4 is decreasing in the tax rate. If the tax rate declines from 25.7 percent to zero, the fraction of firms that have the C corporation legal form of organization increases by 14 percent. Perhaps, more importantly, employment increases in the corporate sector is approximately 7 percent. From Figure 3, there is an increase in the number of workers who

become pass-through entities. These firms, which can be new entrepreneurs, also create employment. Our model suggest that approximately 86 percent of the total change in employment is due to employment increases from the change in legal form of organization and 14 percent is due to new entrepreneurs who operated as pass-through entities.

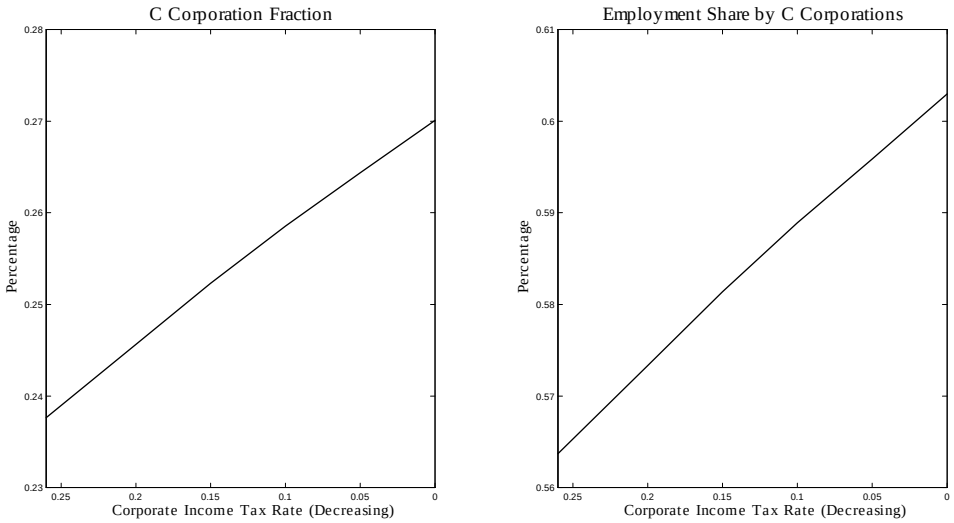


Figure 4: Firm Statistics In Policy Experiments

The change in the corporate income tax rate has consequences for output, wages, the wealth distribution and the personal income tax rate. In top panel of Figure 5, we examine the effect of the change in the corporate income tax rate on output and wages. The decline in the corporate income tax rate encourages households to become entrepreneurs. As a result, total output increases as the corporate income tax decreases. The increase in output requires additional workers. This drives up the wage rate. Lastly, the decline in the corporate income tax has implications for the personal income tax rate. The decline in the corporate income tax rate results is a loss of revenue for the government. In order to maintain a revenue neutral policy experiment, the personal income tax rate must increase. In the extreme case of removal of the corporate income tax, the personal income tax rate must increase six percent.

Since equilibrium wage rates are higher, the wealth gini decreases which is seen in the lower left panel of Figure 5. An explanation for the change in wealth gini can be seen in Figure 6. The left panel presents the distribution of asset holding for the benchmark economy, and the right panel presents the asset distribution change for the economy with a zero corportate income tax rate. The right panel shows that households are no longer clustered around the lower end of the wealth distribution. This increase in asset holding

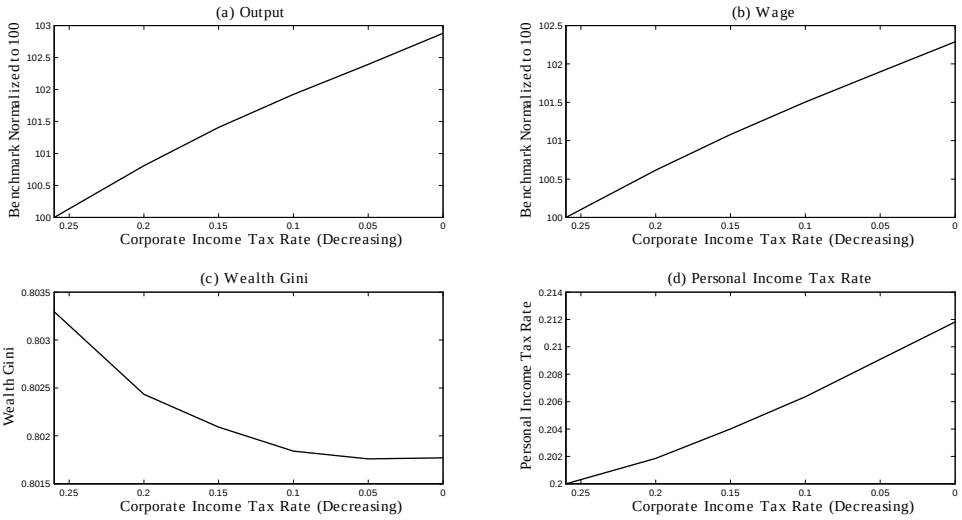


Figure 5: Output, Wage, Wealth Gini, and Personal Income Tax Rate from the Policy Experiment

is a direct consequence of the increase in wages. These effects tend to reduce the degree of income inequality.

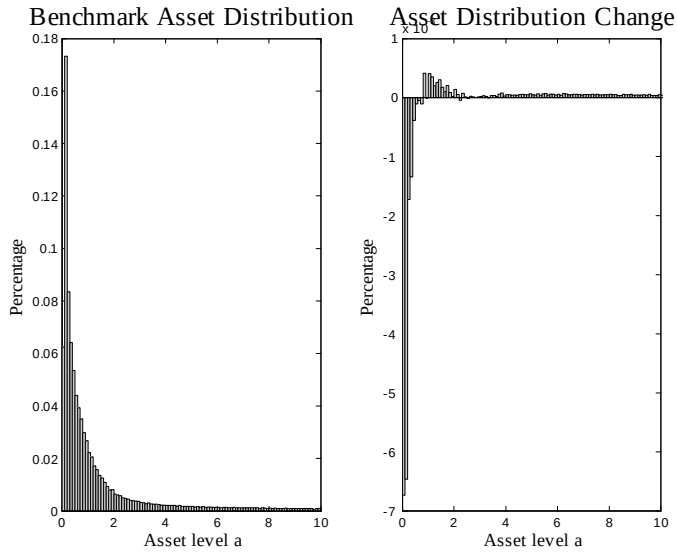


Figure 6: Asset Distribution Changes in Policy Experiment

Figure 7 graphs the fraction of non-employed households in the economy after a reduction in the corporate income tax rate. When there is a decline in the corporate income tax rate, we can see that fewer households are non-employed. This suggests that jobs can be generated by cutting the corporate income tax rate. The model suggests that if the corporate income tax rate is reduced to zero, the amount of non-employed individuals can

be reduced by 5.4 percent.

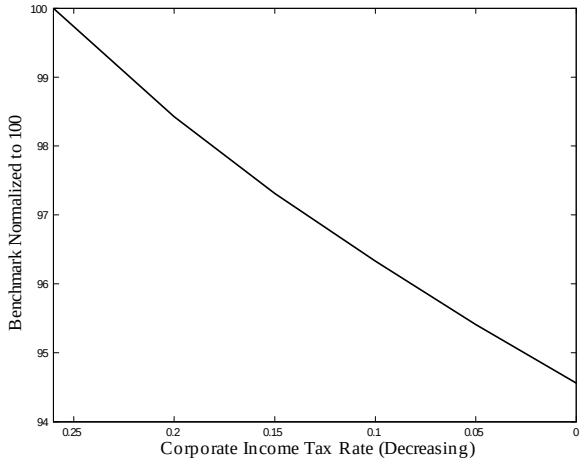


Figure 7: Non-employment Rate in Policy Experiment

5.2 The Importance of the Selection of the Legal Form of Organization

An important part of the model is the choice of the legal form of organization (LFO). In this section, we examine this choice more carefully. Figure 8 graphs non-employment for various corporate tax rates relative to non-employment when the corportate tax rate is 25.7 percent. As can be seen in the baseline economy, when the corporate income tax rate is decreased from 25.7 percent to zero, non-employment rate is reduced by more than 5 percent relative to the non-employment rate at 25.7 percent.[4] The solid black line summarizes the findings for this experiment.

In order to determine the importance of the choice of the LFO, we restrict the model so that all firms are organized as C corporations. We compare the restricted model to the benchmark model in two ways. First, to understand the importance of legal organizational choice, we maintain the benchmark parameters. Using this revised model, we calculate the non-employment response to a change in the corporate tax rate and normalize these responses by non-employment for this revised model when the tax rate is 25.7 percent

[4] That is, we compare $\frac{\text{non-employment rate}(\tau^c)}{\text{non-employment rate}(\tau^c=25.7\%)}$ for each possible corporate tax rate.

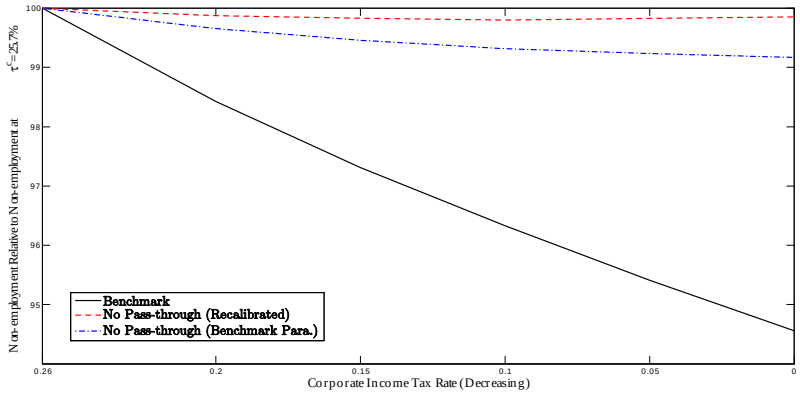


Figure 8: Responsiveness of Non-employment to Corporate Tax Rate Changes

The results are represented by the dashed-dotted line. Secondly, to allow for the effect of possible parameters changes, we recalibrate the model restricted to only the C corporate structure. Using the same normalization approach, we generate the dashed line.

In the benchmark model, a decline in the corporate income tax rate, lowering the burden of double taxation, gives incentives for firms to switch from the pass-through organizational form to the C corporate form. When such switches of organizational form occur, firms previously facing restricted access to funds under the pass-through organizational form would expand their operations under the C corporate form. The growth of firms due to organizational form switches is likely to increase labor demand and reduce the non-employment rate in the economy. This channel of job creation is missing in the restricted models. We see in Figure 8 that this channel of job creation by switching LFO is important, or else the dashed and dashed-dotted lines should coincide with the solid line. In fact, in both restricted environments, the non-employment change would be less that one percent. Compared to the 5.4 percent non-employment change in the benchmark model, we know that the choice of LFO accounts for 85.7 percent of the new jobs created.

A more important issue is whether firms actually change legal form of organization in response to tax rate changes. Goolsbee (2004) presents evidence that a lowered corporate income tax reduces the burden of double taxation and thus encourages existing pass-through firms to refile as C corporations. He documents that a decrease in the corporate tax rate by 0.1 increases the C corporations share of all firms by 5 to 10 percent and the corporate share of sales and employment by 2 to 6 percent. In our model, when we conduct the same policy experiment, the C corporation fraction goes up by 5.64 percent and the employment share by C corporations goes up by 2.86 percent. Even without directly calibrating our model to include these statistics in our moment matching exercise, our model predictions are consistent with other empirical findings.

6 Welfare Analysis

Lowering the corporate income tax has an ambiguous effect on welfare. On one hand, C corporations are no longer subject to the corporate income tax and thus can retain more of their corporate profits. On the other hand, the reduction in tax revenues has to be offset by an increase in the personal income tax. In our example, the personal income tax is increased so that the decline in the corporate income tax is revenue neutral. The increase in the personal income tax affects all agents in the economy. We quantify this effect by calculating the consumption equivalent welfare.

We start with the cross-sectional distribution of our benchmark economy and ask each agent what is the percentage of consumption they are willing to give up in all contingencies in all future periods in order to live in the economy after a tax policy change. Let $V(z, a; \tau^c)$ be lifetime utility for an agent in state (z, a) in an economy with corporate income tax rate τ^c. The consumption equivalent welfare $\eta(z, a; \tau^c)$ is given by:

$$\eta(z, a; \tau^c) = \left(\frac{V(z, a; \tau^c)}{V(z, a; \tau^c_{\text{bench}})} \right)^{\frac{1}{1-\alpha_c}} - 1$$

If the consumption equivalent welfare $\eta(z, a; \tau^c)$ is positive, then the agent is better off in the counterfactual economy with the corporate income tax rate τ^c. If it is negative, the agent has incurred a welfare loss after the policy change.

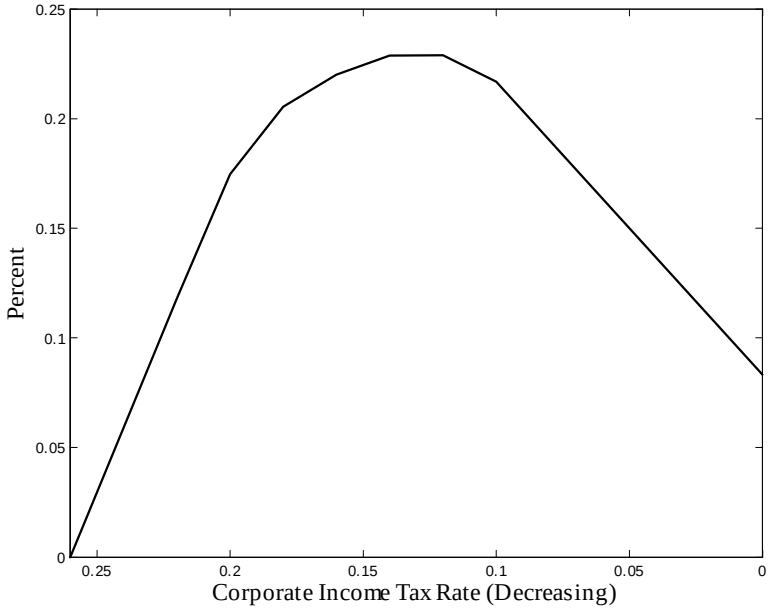


Figure 9: CE Welfare in Policy Experiment

Figure 9 graphs the average consumption equivalent welfare for different corporate

income tax rates. Initially, agents benefit from declines in the corporate tax rate from having higher wages, and corporations benefits from having higher after-tax profits. These benefits more than compensate for the costs associated with higher personal income tax rates. However, if the corporate income tax continues to be decreased, the welfare gains gradually decline. This is directly related to the increasing personal income tax rate. At some points the welfare gains from a cut in the corporate income tax rate are more than offset from the welfare costs associated with high personal income tax rates. The graph of consumption equivalent welfare has an inverse U shape in the model. We find the peak of the welfare gains reaches the maximum at the corporate income tax rate of 12 percent.

Table 5 reports the consumption equivalent welfare by each occupation when we consider two alternative tax scenarios. In the first case, we consider the corporate income tax rate that maximizes average consumption equivalent welfare. In the second case, we consider the elimination of the corporate income tax.

As can be seen, C corporations contribute the most welfare gains in both cases because of the lower corporate tax liability. Workers all benefit from the policy change due to higher wages. Since the personal income tax rate must be increased to generate additional revenue to compensate for the loss of corporate income tax revenue, pass-through businesses do not benefit from the lower corporate tax rate. However, these firms have higher costs as wages increase and pay higher personal income taxes. This type of firm does not benefit from the corporate income tax reduction. Non-employed workers have an increased incentive to become a worker due to higher wages, but also face a bigger personal income tax rate. The two policies can have different welfare results for non-employed workers. When the corporate income tax rate is 12 percent, non-employed workers are slightly better off because they enjoy higher wages when they change occupations. However, the loss in welfare from the higher personal income tax is mitigated because corporations share the bulk of these tax liabilities in the economy. If the corporate income tax is completely eliminated, non-employed workers are worse off because of the burden from the personal income tax liability.

The overall welfare can be calculated by integrating over individual welfare $\eta(z, a; \tau^c)$ weighted by the distribution measure $\mu(z, a; \tau^c_{\text{bench}})$ from the benchmark economy. The average welfare gain is 0.23 percent when the corporate income tax is set at 12 percent. If the corporate income tax is eliminated, the welfare gain declines to 0.08 percent. Although the average welfare measures are small, a large majority of the economy would be in favor of the policy change. Specifically, 87.27 percent of all households would prefer the optimal income tax rate at 12 percent and 67.6 percent would prefer eliminating the corporate income tax from the economy.

Table 5: Welfare By Occupation

Occupation	Non-employed	Worker	Pass-Through	C Corp	Overall
Proportion of Agents	0.2386	0.7304	0.0236	0.0074	1.000
$\tau^c = 12\%$					
Average Percent Welfare Gain	0.03	0.29	-0.34	2.12	0.23
Percent in Favor of Policy Change	66.23	96.45	12.21	100.0	87.27
$\tau^c = 0\%$					
Average Percent Welfare Gain	-0.26	0.19	-0.74	3.54	0.08
Percent in Favor of Policy Change	6.85	89.05	8.46	100.0	67.61

7 Conclusion

We adopt a dynamic stochastic occupational choice model with heterogeneous agents to evaluate the impact of a potential reduction in the corporate income tax rate on employment. This paper finds that a reduction in the corporate income tax leads to moderate job creation. In the extreme case, the elimination of the corporate income tax would reduce the non-employed population by 5.4 percent. In the model, the reduction in the corporate income tax creates jobs through two channels, one from new entry firms and one from existing firms changing legal organization forms. In particular, the latter accounts for 85.7 percent of the new jobs created.

This articles finds that a corporate income tax rate of 12 percent would maximize economic welfare. In addition, we find that 87 percent of the population would be in favor of lowering the corporate income tax rate to 12 percent, and 67 percent of the population would support the elimination of the corporate income tax. In both cases, C corporations are better off from the tax policy change because they enjoy lower tax liability. Workers are also better off because they now receive higher wages. However, pass-through businesses are those who suffer from welfare loss, because they have to pay higher personal tax to government and higher wages to their employees.

For future research, we intend to explore two aspects of the choice of becoming a C corporation. First, we will include dynamics decisions for C Corporations. One potential reason for a firm to become a C corporation is the ability to use retained earning to invest in firm specific capital. Firm owned capital, in a dynamic environment, can aid faster firm growth and therefore provides incentives to incorporate. The main challenge of this future direction is modeling of C corporation's ownership structure in multiple periods. A

potentially helpful way is to incorporate asset pricing within the current model. Second, we need to consider debt financing and the possibility of firm default. Corporations, including C corporations and S corporations, have limited liabilities. Firms may choose to incorporate to manage the risk of future default.

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