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Taxation of Paid- and Self-Employment*

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ABSTRACT

We compute optimal tax rates on income from paid- and self-employment and find estimates for both that are much lower than current estimates of marginal labor tax rates in the United States. This finding is based on a model of occupational choice with labor inputs allocated to production and to the building of business sweat capital—brands, customer bases, client lists and other intangible assets. With greater opportunities to substitute across sectors and activities, taxes become more distortionary and optimal tax rates will in general be lower. Our model incorporates an additional role for tax policy to induce a better allocation of hours, with more hours employed in the diversified C-corporate sector relative to the undiversified private business sector. Furthermore, at an optimum, those that choose self-employment are highly productive owners with significant sweat capital.

Keywords: Intangibles, business valuation

JEL classification: E13, E22, H25

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1. Introduction

In this paper, we study the optimal taxation of labor income, taking into consideration that business incomes of private firms are primarily compensation to owner time. The fact that owners' owner time is split between producing goods and services and building sweat capital in their businesses—in the form of brands, customer bases, client lists, and other intangible assets—also has implications for tax policy.[1] We compare optimal tax rates on paid- and self-employment to the time series of average marginal labor income tax rate computed by Barro and Redlick (2011)—and extended by the National Bureau of Economic Research—for the U.S. economy. For our benchmark parameterization, we find that the U.S. rates are significantly higher than the optimal rates on both paid- and self-employment income, and welfare gains to having lower tax rates are large.

The model we use is a version of Bhandari and McGrattan (2019) with a large number of infinitely-lived individuals who make an occupational choice each period, one that depends on asset holdings and relative productivities in paid- and self-employment. Paid employees (or workers) are hired by private or public firms and are subject to a proportional tax on their earnings. The self-employed (or owners) run their own private businesses and are subject to a proportional tax on the business income, net of expenses and payments to capital and labor. We allow for differences in tax rates on earnings and business since U.S. marginal rates on workers and most private business owners are the same de jure but not de facto—as owners have greater opportunities to underreport profits and overreport expenses.

We parameterize our model using data for the United States and compare economies with different tax rates on wages and business income, adjusting debt to guarantee budget balance. We find the highest welfare when the tax rate on employee earnings is 13 percent and the tax rate on private business net income is 9 percent. These estimates are much lower than Barro and Redlick's (2011) average estimate of 38 percent for the marginal rate on labor income. Furthermore, in the case of business net incomes, an optimal tax rate of 9 percent is significantly lower than estimates

[1] Bhandari and McGrattan (2019) use Pratt's Stats data from brokered business sales and find that 58 percent of transferred assets are categorized by the Internal Revenue Service (IRS) as Section 197 intangible assets.

based on IRS audit data, which are 24 percent. The willingness and opportunity to switch between working for someone else or oneself is an important factor for this normative analysis, since taxes become more distortionary when there are more margins of substitution. Another critical factor, especially in our framework, is the requirement of sweat capital for private business production. By boosting after-tax incomes, especially for paid-employment, a planner can achieve an improved allocation of hours, with more private business production by highly-productive owners that have accumulated significant sweat capital and can scale up the business with external hiring.

Our optimal tax rate estimates are much lower than those typically found for models that abstract from private business activity. For example, Aiyagari and McGrattan (1998) studied a one-sector version of the model here and found the equilibrium income tax rate at roughly the U.S. level, across a wide range of potential debt levels. Floden (2001) extended Aiyagari and McGrattan (1998) and varied both government debt and transfers, but never found any optima with a tax rate below the U.S. level.

2. Theory

In this section, we describe a version of the model analyzed in Bhandari and McGrattan (2019) with infinitely-lived individuals, who have an occupational choice between self- and paid-employment. We start with an overview of the economy and then describe the problems for business owners and workers.

There are two business sectors that sell imperfectly substitutable goods and services: publicly held C corporations and privately held pass-through businesses. They differ in the exposure to risk, the technologies employed, and the tax treatment.

C corporations are owned by outside shareholders who hire employees and rent fixed assets, both of which are inputs to a constant-returns production technology. The business must pay corporate income taxes and the owners must pay taxes on distributions. Private pass-through firms have owners that work in the business and bear idiosyncratic risk. Owners allocate time to build customer bases and client lists, and use this sweat capital along with their own time and rented fixed assets to produce goods and services. As they grow, they can scale their businesses up by hiring outside employees and renting more fixed assets. Pass-through businesses distribute all profits to their owners, who report the income with all other taxable individual incomes.

There is an intermediation sector with risk-neutral financial intermediaries that receive deposits from households and purchase stocks and bonds. The intermediaries also purchase fixed assets and rent them to private firms.

To be consistent with national accounts, we also assume that production of households, nonprofits serving households, and government occurs in the nonbusiness sector. Thus, household net incomes include incomes from paid- and self-employment incomes as well as incomes from nonbusiness activities.

Finally, government purchases are financed by taxes on consumption, individual incomes, and business incomes.

2.1. Occupational Choice

Individuals start each period with state vector $s = (a, \kappa, \epsilon, z)$ that summarizes their financial asset holdings (a), their sweat capital stock (κ), their productivity if they choose to work as an employee (ϵ), and their productivity if they choose to run a private, pass-through business (z). The value of working is $V_w(s)$ and the value of being a private business owner is $V_p(s)$. When making their occupational choice given state s, individuals optimize:

$$V(s) = \max\{V_p(s), V_w(s)\}.$$

Individuals spend some fraction of their lives in paid-employment and some fraction in self-employment, but the spells do not overlap.

2.2. Self-employment

The dynamic programming problem for an individual currently running a private business is given by:

$$V_p(s) = \max_{\substack{c_c, c_p, a', h_y, \\ h_\kappa, k_p, n_p}} \left\{ U_p\left(c\left(c_c, c_p\right), \ell\right) + \beta \sum_{\epsilon', z'} \pi\left(\epsilon', z' | \epsilon, z\right) V\left(s'\right) \right\} \tag{2.1}$$

subject to

$$a' = \left[(1+r)\,a + py_p - (r+\delta_k)\,k_p - wn_p - e - (1+\tau_c)\,(c_c + pc_p) \right.$$
$$\left. - \tau_b\left(py_p - (r+\delta_k)\,k_p - wn_p - e\right) + tr\right] / \left(1+\gamma\right) \tag{2.2}$$

$$\kappa' = \left[(1-\delta_\kappa)\,\kappa + f_\kappa\left(h_\kappa, e\right)\right] / \left(1+\gamma\right) \tag{2.3}$$

$$y_p = z f_y\left(\kappa, k_p, n_p, h_y\right) \tag{2.4}$$

$$\ell = 1 - h_\kappa - h_y \tag{2.5}$$

$$a' \geq \chi p y_p, \tag{2.6}$$

where $V_p(s)$ is the discounted present value of utility for an owner with assets a, sweat capital κ, productivities (ϵ, z), transition probabilities for the productivities $\pi(\cdot|\cdot)$, and continuation value V. The utility function is defined over consumption of goods and services produced in C corporations, c_c, consumption of goods and services produced in private firms, c_p, and leisure ℓ. We allow for the fact that the goods c_c and c_p might be imperfectly substitutable. From the budget constraint (2.2), we see that asset holdings next period, a', are equal to incomes from current financial asset holdings that earn an after-tax interest rate of r and business net income after subtracting consumption expenditures and net tax payments. We divide terms in the budget constraint by $(1+\gamma)$ because all nonstationary variables have been detrended by the economy-wide growth rate $(1+\gamma)^t$. Business net income before tax is equal to total sales py_p less rental payments for marketable fixed assets, rk_p; depreciation, $\delta_k k_p$; employee wages, wn_p; and expenses, e. Owners take the private goods price, p; the interest rate, r; and the wage rate, w, as given when solving the maximization problem (2.1). Business owners pay a tax of τ_b on business income and τ_c on consumption, and they receive tr in transfers and other incomes.

Owners allocate nonleisure hours between growing their businesses, h_κ, and producing goods and services, h_y. These hours enter the production functions for sweat capital (2.3) and goods and services (2.4), respectively. We assume that owners cannot produce without sweat capital—that is, $f_y(0, k_p, n_p, h_y) = 0$. In other words, businesses need customers or clients before producing goods and services for them. The capital accumulates with owner time and expensing, as in (2.3).[2] The constraint (2.6) is a working capital constraint on owners that ensures sufficient assets in the bank accounts before renting fixed assets.

2.3. Paid-employment

The problem of employees is relatively standard. (See, for example, Aiyagari (1994), Imrohoroglu et al. (1995), and Huggett (1996).) Those working in paid-employment choose consumption of C-corporate goods and services, c_c, consumption of private firm goods and services, c_p, leisure ℓ, and financial assets next period a'. The dynamic program that these workers solve is:

$$V_w(s) = \max_{c_c, c_p, \ell, a'} \{U(c(c_c, c_p), \ell) + \beta \sum_{\epsilon', z'} \pi(\epsilon', z'|\epsilon, z) V(s')\} \tag{2.7}$$

subject to

$$a' = [(1+r)a + w\epsilon n - (1+\tau_c)(c_c + pc_p) - \tau_w(w\epsilon n) + tr]/(1+\gamma) \tag{2.8}$$

$$\kappa' = (1-\lambda)\kappa, \tag{2.9}$$

$$\ell = 1 - n \tag{2.10}$$

$$a' \geq 0, \tag{2.11}$$

where $V_w(s)$ is the discounted present value of utility for an individual with state $s = \{a, \kappa, \epsilon, z\}$, transition probabilities for productivities $\pi(\cdot|\cdot)$, and continuation value $V(s)$. These individuals earn asset income that pays after-tax interest r and wages that earn w per effective hour regardless of whether they work for a private or public firm. They pay taxes on wage earnings at rate τ_w and on consumption expenditures at rate τ_c and receive transfers and other incomes tr. If they have previously run a business and accumulated sweat capital, we assume that $\lambda > 0$ of the value deteriorates each period while not in use.

[2] In Bhandari and McGrattan (2019), we model business transfers of sweat capital through inheritances or sales.

2.4. C Corporations

The C-corporate business sector is competitive and comprised of firms choosing hours n_c and next-period fixed assets k_c' to solve the following dynamic program:

$$v_c(k_c) = \max_{n_c, k_c'} \{(1 - \tau_d) d_c + \frac{(1+\gamma)}{(1+r)} v_c(k_c')\} \tag{2.12}$$

subject to

$$k_c' = [(1 - \delta_k) k_c + x_c] / (1+\gamma) \tag{2.13}$$

$$y_c = AF(k_c, n_c) \tag{2.14}$$

$$d_c = y_c - wn_c - x_c - \tau_p (y_c - wn_c - \delta_k k_c), \tag{2.15}$$

where d_c are corporate dividends that are taxed at rate τ_d after paying corporate income taxes at rate τ_p, x_c is C-corporate investment, and y_c is C-corporate output from a constant returns to scale technology F with TFP given by A. Employees working for C corporations earn the same hourly wage, w, as employees in private businesses.

2.5. Financial Intermediaries

The intermediation sector is competitive and comprised of risk-neutral financial intermediaries that accept deposits and use the funds to invest in C-corporate equities, government bonds, and fixed assets.

At the beginning of each period, the net worth of an intermediary is the value of its equity shares ς, bonds b, and fixed assets k, less the value of deposits owed to households a. During the period, the intermediary receives dividend income from C corporations, interest income from bonds, rental income on fixed assets, and pays interest on deposits. The dynamic program in this case is:

$$v_I(x) = \max_{x'} \{d_I + \frac{(1+\gamma)}{(1+r)} v_I(x')\}, \tag{2.16}$$

where the state vector is $x = [\varsigma, b, k, a]'$. The intermediary dividends d_I, income y_I, and net worth

nw are as follows:

$$d_I = y_I + (1 - \delta_k)\, k + nw - (1+\gamma)\, nw' \tag{2.17}$$

$$y_I = (1 - \tau_d)\, d\varsigma + rb + (r + \delta_k)\, k - ra \tag{2.18}$$

$$nw = q\varsigma + b + k - a, \tag{2.19}$$

where q is the per-share price of corporate equities. Free entry into the intermediary sector means that the present value $v_I(x)$ is equal to zero.

2.6. Fiscal Policy

Fiscal policy is summarized by spending g, borrowing b, and tax collections. The government collects taxes on consumption at rate τ_c, labor earnings at rate τ_w, private business income at rate τ_b, C-corporation dividends at rate τ_d, and C-corporation profits at rate τ_p. Thus, the budget constraint is given by

$$\begin{aligned} g + (r-\gamma)\, b + Tr = \tau_c \int \left(c_c(s) + \int pc_p(s) \right) d\mu(s) + \int \tau_w \left(w\epsilon(s)\, n(s) \right) d\mu(s) \\ + \int \tau_b \left(py_p(s) - (r+\delta_k)\, k_p(s) - wn_p(s) - e(s) \right) d\mu(s) + \tau_p \left(y_c - wn_c - \delta_k k_c \right) \\ + \tau_d \left(y_c - wn_c - (\gamma + \delta_k)\, k_c - \tau_p \left(y_c - wn_c - \delta_k k_c \right) \right). \end{aligned} \tag{2.20}$$

where all variables have been divided by $(1+\gamma)^t$, Tr is government transfers, and $\mu(s)$ is the measure of individuals with state s.

2.7. Equilibrium

A stationary recursive competitive equilibrium is value functions V_p, V_w; policy functions a', κ', c_c, c_p, ℓ, n, k_p, n_p, h_y, h_κ, and e; C-corporate factor inputs n_c, k_c; prices r, w, p; and a measure over types indexed by the state s such that

- given prices, the policy functions for private business owners—namely, a', κ', c_c, c_p, ℓ, k_p, n_p, h_y, h_κ, e—solve the dynamic programming problem in (2.1);

- given prices, the policy functions for paid employees—namely, a', κ', c_c, c_p, ℓ, and n—solve the dynamic programming problem in (2.7);
- given prices, the policy functions for C corporations—namely, n_c and k_c'—solve the dynamic programming problem in (2.12);
- given prices, the policy functions for financial intermediaries—namely, $x = [\varsigma, b, k, a]'$—solve the dynamic programming problem associated in (2.16);
- the labor market clears: $n_c = \int (n(s)\epsilon(s) - n_p(s))d\mu(s)$;
- the asset market clears: $\int a(s)d\mu(s) = b + (1-\tau_d)k_c + \int k_p(s)d\mu(s)$;[3]
- the private business goods market clears: $\int y_p(s)d\mu(s) = \int c_p(s)d\mu(s)$;
- the C-corporate goods market clears:

$$y_c = \int \left(c_c\left(s\right) + e\left(s\right)\right) d\mu\left(s\right) + \left(\gamma + \delta_k\right)\left(k_c + \int k_p\left(s\right) d\mu\left(s\right)\right) + g + \bar{x}_{nb} - \bar{y}_{nb};$$

- the government budget constraint in (2.20) is satisfied;
- the measure of types over states (a, κ, ϵ, z) is invariant.

2.8. National Accounts

The national accounts for the model can be summarized mathematically as follows:[4]

Income shares:

Sweat income	$\int (py_p(s) - (r+\delta_k)k_p(s) - wn_p(s) - e(s))d\mu(s))/y$
Nonsweat labor income	$w(n_c + \int n_p(s)d\mu(s))/y$
C corporations	wn_c/y
Private business	$w\int n_p(s)d\mu(s)/y$
Business capital income	$((r_c+\delta_k)k_c + (r+\delta_k)\int k_p(s)d\mu(s))/y$

[3] The relative price of $1-\tau_d$ on corporate capital follows from the differences in tax treatment on corporations and pass-through entities.

[4] See Bhandari and McGrattan (2019) for a complete description of the data analogues of all income categories.

C corporations	$(r_c + \delta_k)/y$
Private business	$(r + \delta_k) \int k_p(s) d\mu(s)/y$
Nonbusiness income	$\bar{y}_{nb}/y$

Product shares:

Private consumption	$(\int c_c(s) + pc_p(s)) d\mu(s))/y$
Government consumption	g/y
Investment	$(x_c + \int x_p(s) d\mu(s) + \bar{x}_{nb})/y$
C corporations	x_c/y
Private business	$\int x_p(s) d\mu(s)/y$
Nonbusiness	$\bar{x}_{nb}/y$

We have introduced some new notation here, specifically, the nonbusiness net incomes and the investments. We denote by $\bar{y}_{nb}$ and $\bar{x}_{nb}$ the net income and investment, respectively, of the nonbusiness sector, which includes households, nonprofits, and government. In the dynamic programs (2.1) and (2.12), we have assumed that tr includes the nonbusiness net income less investment since we will assume it is exogenous when computing a solution. We denote by x_c and $\{x_p(s)\}$ the investments in fixed assets used in C corporations and private businesses, respectively. Finally, we let y denote GDP, which is the sum of C-corporate output, y_c; private output less intermediate expenses, $\int (py_p(s) - e(s)) d\mu(s)$; and nonbusiness income, $\bar{y}_{nb}$.

3. Model Parameters

In this section, we parameterize the model using key moments from the U.S. aggregate data and microsamples of business owners. Our main data sources are the Bureau of Economic Analysis (BEA), which publishes data for the national income and product accounts (NIPA) and fixed asset tables; the IRS, which publishes data on the distribution of taxable incomes and tax rates. the Bureau of Labor Statistics (BLS) which publishes data on time use; the Survey of Business

Owner (SBO), which provides a microsample with information on business-owner characteristics, including financial constraints and time use; and Pratt's Stats, which is data on brokered sales, which provides information on intangible assets in private businesses.[5]

3.1. Functional Forms

The functional forms that we use for utility functions, and production functions are given as follows:

$$\begin{aligned} U(c,\ell) &= \left(c\ell^{\psi}\right)^{1-\sigma}/(1-\sigma) \\ c(c_c,c_p) &= c_c^{\eta}c_p^{1-\eta} \\ F(k_c,n_c) &= k_c^{\theta}n_c^{1-\theta} \\ f_{\kappa}(h_{\kappa},e) &= h_{\kappa}^{\vartheta}e^{1-\vartheta} \\ f_y(\kappa,k_p,h_y) &= \kappa^{\phi}k_p^{\alpha}h^{\nu} \\ h(h_y,n_p) &= \left(\omega h_y^{\rho}+(1-\omega)\,n_p^{\rho}\right)^{\frac{1}{\rho}}, \end{aligned}$$

where $\phi+\alpha+\nu=1$. In addition, we need to parameterize depreciation rates δ_k, δ_κ, the discount rate β, the growth rate γ, and the rate of deterioration of sweat capital λ. We set the level of TFP in C-corporate production, A, so that y_c is normalized to 1 in equilibrium. This is done without loss of generality.

Parameters are reported in Table 1 and described in more detail below.

3.2. Preferences

Choices for preference parameters are reported in panel A of Table 1. We set the weight on leisure, ψ, equal to 1.38 in order to generate the same level of total hours of work as observed in the United States. This total includes hours of the paid-employed in C corporations, n_c, and private pass-throughs, $\int n_p(s)d\mu(s)$, as well as hours of the self-employed, $\int(h_y(s)+h_\kappa(s))d\mu(s)$.[6]

[5] When parameterizing the model, we use data for 2007 when possible in order to be consistent with the SBO microsample.

[6] Using population and hours data from the BLS, we estimate that 28.2 percent of aggregate available time is

To ensure a noncorporate business income share of 9 percent of GDP, we set the consumption share parameter η equal to 0.365. For curvature parameter σ, we use a standard estimate of 1.5. Finally, we set the discount factor β equal to 0.98 to ensure the benchmark annual interest rate is roughly 4 percent.

3.3. Technologies

Parameters of technologies are reported next in Table 1A. The aggregate growth rate in technology, γ is set equal to the U.S. trend rate of 2 percent. Fixed asset shares in C corporations and private pass-through businesses are set so as to to ensure that k_c/y and $\int k_p(s)d\mu(s)/y$ are roughly the same as U.S. shares.[7] To achieve this, we set the C-corporate share θ equal to 0.5 and the private pass-through share α equal to 0.3. The stocks also depend on choices of depreciation rates. We set $\delta_k = 0.041$ to match data in the NIPA fixed asset tables.

Relative to the corporate sector, we have less direct evidence for the private business sector. Thus, for sweat capital production, f_κ, we use indirect evidence from the BEA's benchmark 2007 input-output table on labor and intermediate shares in the advertising and related services sector (NAICS 5418). This provides some discipline for the hours share ϑ which is set to 0.418 in our benchmark parameterization. For production of private goods and services, f_y, we need share parameters for sweat capital and labor inputs as well as the elasticity of substitution between owner and employee time. To identify the sweat capital share, ϕ, we use Pratt's Stats' broker data on sales of private businesses. This dataset provides us a sample of 6,855 sales over the period 1994–2017 with records of the purchase-price allocation across different asset categories. We set ϕ equal to 0.15 in order to generate a prediction for the intangible intensity of private business—the ratio of intangible to total assets—of roughly 58 percent. The elasticity of substitution between

allocated to work, assuming that each person has 5200 hours of annual discretionary time, with 22.4 percent in business and 5.8 percent in nonbusiness.

[7] We include more investments in the intellectual property product (IPP) category given roughly 1/3 are currently included in NIPA.

owner and employee hours in private business is determined by our choice of ρ. We set $\rho = 0.5$ to ensure a payroll share per owner hour that is consistent with the 2007 SBO microsample.

Finally, we need to set the deterioration rate λ for sweat capital owned by those that have left self-employment. The parameter and the income share parameter ϕ are critical for generating an age profile of businesses that is consistent with U.S. observations. With ϕ identified off of the average intangible intensity, we set the deterioration rate to ensure consistency of the model and data for the business age profile. This implies a rate of 0.5 for λ.

3.4. Financing

For the benchmark parameterization, we set χ equal to zero. This choice is based on the work of Hurst and Lusardi (2004) and Chari (2014). Hurst and Lusardi (2004) find no relationship between wealth and business entry, except for the very wealthy. Chari (2014) finds that available funds for businesses across size classes are higher than total investments. These findings suggest that firms are not constrained in their working capital requirements.

3.5. Tax Rates

Tax rates for the benchmark parameterization are shown at the bottom of Table 1, panel A. The tax rate on consumption, τ_c, is equal 6.5 percent, which is the ratio of total sales and excise taxes in NIPA to personal income expenditures. The tax rate on profits is the weighted average of the domestic profits tax rate of 40 percent and a foreign corporate tax rate of 25 percent, which is in turn a weighted average rate with shares of foreign corporate earnings used as weights. The overall effective rate for τ_p is 36 percent. Tax rates on on dividends, wages, and sweat income to business owners are average marginal tax rates based on IRS individual income tax returns. We use the same procedure as Barro and Redlick (2011) to compute the average marginal tax rate and assume non-taxed and unreported incomes earn a tax rate of zero. Doing so, we find an effective tax rate on dividends of 13.3 percent, wages of 38 percent, and business income of 23.6 percent. What is noteworthy is how much lower the *effective* tax rate on owners of private business is than that on employees or owners of C corporations, who pay taxes on dividends and corporate profits. On the spending side, we choose g and Tr to ensure that the shares of government spending are roughly equal to the NIPA values.

3.6. Productivity processes

Productivity processes are displayed in Table 1, panel B. The Markov chain for ϵ_t is constructed from simulations of the model in Low, Meghir, and Pistaferri (2010), who estimated U.S. wage rate processes. We run a fixed effect regression of their simulated log wages on one lag and a set of controls to determine an estimate for serial correlation (0.7) and the standard deviation (0.16) of the shock process. With these estimates, we apply Tauchen's (1986) method to estimate the Markov chain. For business productivity, z_t, the Markov chain is taken from Debacker, Panousi, and Ramnath (2013), who use a panel of businesses in the IRS Statistics of Income subsample to construct transitions for business incomes. Although they do not directly observe the productivity measure, the implied transition matrix for business income in our model is not significantly different from the Markov chain displayed in Table 1B.

4. Results

Given a benchmark parameterization capable of generating predictions consistent with U.S. data, we now compute welfare for economies with different levels of taxes on income from paid- and self-employment, holding fixed government spending and transfers and setting the level of debt residually to balance the government budget. We will show that the optimal tax rates are significantly lower than U.S. levels, especially so for the tax rate on paid-employment.

The welfare criterion we use is the utilitarian social welfare function:

$$\Omega = \int U\left(c\left(s\right), \ell\left(s\right)\right) d\mu\left(s\right).$$

We convert this welfare measure into units of consumption by computing the percentage increase in benchmark consumption at every date and state that implies the same value of welfare for an alternative choice of (τ_w, τ_b). Following Floden (2001), we also decompose this consumption-equivalent welfare gain into the gain for increasing the level of consumption, the gain for improved insurance, and the gain for improved redistribution.

Our main findings are displayed in Figure 1, which shows the consumption-equivalent welfare gains as we vary the tax rates. From the figure, we see that the gains are large in economies with low tax rates on both wages and business income. At an optimum, τ_w is 13 percent and τ_b is 9 percent, and the consumption-equivalent gain relative to the benchmark economy is large at roughly 32.7 percent. If we compare across economies, we find that most of the gains are achieved by lowering τ_w and adjusting debt levels to balance the budget. For example, we find large gains even in cases with relatively high tax rates on self-employment, as long as the rate on paid-employment is low.

To provide some intuition for this result, we report summary statistics our benchmark economy and the optimal economy in Table 1 (marked 'unrestricted'). First, note that we have repeated the main result shown in Figure 1 concerning the optimal tax rates and welfare gains. If we compare the equilibrium prices in the case of optimal tax rates, we see large differences: the after tax interest rate is lower by 300 basis points, the wage rate is nearly doubled, and the private goods prices is higher by 30 percent. With these new prices, factor inputs are much higher. Hours in business rise by 60 percent, primarily as a result of a more than doubling of hours in corporate paid-employment.

Because the tax rates on workers fall by relatively more than the tax rates on owners, there is an occupational shift from self-employment to paid-employment. At the optimum, there are fewer owners but, as we can see from the table, the total hours in private business do not change that much. The reason for this is that potential owners—those with little sweat capital and relatively low productivities—choose paid-employment when $\tau_w = 13$ percent and $\tau_b = 9$ percent. Only the very productive choose to be self-employed. In fact, if we only count owners with the highest level of z (which is level 5 in our case), we find they account for 46 percent of owners in the benchmark economy and 78 percent in the economy with optimal tax rates. Thus, the change tax policy induces a better allocation of hours, with more paid-employment in the diversified C-corporate sector and a greater concentration of superstar self-employed with significant sweat capital in the undiversified private business sector.

Along with higher hours, we find much higher fixed assets to GDP at the optimum. The interest rate in this case is extremely low, at roughly 1.4 percent after accounting for corporate taxes. The lower rates imply a fixed assets to GDP ratio of roughly 6.5, which is double that of the benchmark economy. Consistent with the results for hours, we find most of the difference is due to increases in C-corporate activity: at an optimum, the fixed asset to GDP ratio is 4.8 in C corporations and 1.7 in private business.

Higher hours and fixed assets imply higher GDP and consumption. At an optimum, GDP is 2.3 times higher than in the benchmark, with most of the rise due to corporate value added. Consumption is 2.1 times higher than in the benchmark, We should note though that the standard deviation is also much higher. At an optimum, we find that the standard deviation of log consumption is actually much higher than in the benchmark, 20 percent versus 12 percent. In fact, if we apply the method of Floden (2001) and decompose the welfare gain into gains for higher consumption levels, gains for improved insurance, and gains for improved redistribution, we find the increased level accounts for nearly all of the gain.

If we compare government budget items relative to GDP, we find much lower government spending, debt servicing, and taxation at the optimum. Recall that we held levels of government consumption and transfers at the benchmark values. With a more than doubled GDP, these ratios are significantly lower. The optimal debt level is negative (at -5.5 GDP) implying government saving and the interest rate is lower than the growth rate implying a positive debt service. As a check on the results, we recompute welfare gains and statistics assuming an interest rate that exceeds the growth rate, that is, $r \geq \gamma$. The results are shown in the third column of Table 1. As we can see, despite restricting the scope of the exercise, the welfare gains of changing the tax rates on paid- and self-employment are still high at 24.5 percent and the optimal tax rates are low at 0 percent for τ_w and 10 percent for τ_b. The changes in factor inputs and outputs are not as dramatic, but the mechanism is the same: the lower tax rates induce a shift in occupational choice from running private businesses to working in paid-employment.

5. Conclusions

In this paper, we studied optimal taxation of paid- and self-employment in a model of with a large number of infinitely lived individuals whose saving behavior is influenced by precautionary saving motives and borrowing constraints. We find optimal rates that are much lower than current U.S. effective tax rates on labor. We also find the consumption-equivalent welfare gains are large: on the order of 30 percent. These gains arise primarily from higher levels of consumption rather than from improved insurance or redistribution. Future work is needed to relate these findings to those of standard models—those that abstract from labor inputs in private business—that find optimal tax rates on labor that are higher than current U.S. rates.

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Table 1. Baseline Model Parameters

A. Preferences, Technologies, Financing, and Tax Rates

Parameter	Expression	Value
Preferences		
Discount factor	β	0.98
Leisure weight	ψ	1.38
Intertemporal elasticity inverse	σ	1.5
C-corporate good share (%)	η	36.5
Love of business parameter	ξ	0
Technologies		
Technology growth (%)	γ	2.0
C-corporate fixed asset share (%)	θ	50.2
Private business fixed asset share (%)	α	30.0
Fixed asset depreciation (%)	δ_k	4.1
Sweat capital depreciation (%)	δ_κ	4.1
Sweat capital owner hour share (%)	ϑ	41.8
Private business sweat capital share (%)	ϕ	15.0
Private business labor share (%)	ν	55.0
Sweat capital deterioration (%)	λ	50.0
Private business owner hour share (%)	ω	42.5
Private business hours substitution parameter	ρ	0.5
Financing		
Working-capital constraint	χ	0
Tax rates		
Consumption (%)	τ_c	6.5
Profits (%)	τ_p	36.0
Dividends (%)	τ_d	13.3
Wages (%)	τ_w	38.0
Business income (%)	τ_b	23.6

Table 1. Baseline Model Parameters (cont.)

B. Productivity Transition Probabilities

Productivity in t	Productivity in $t+1$				
Employment, ϵ_t	.509	.713	1	1.40	1.97
.509	.424	.549	.027	0	0
.713	.046	.621	.327	.005	0
1	.001	.145	.709	.145	.001
1.40	0	.005	.327	.621	.046
1.97	0	0	.027	.549	.424
Business, z_t	.432	.657	1	1.52	2.32
.432	.612	.170	.098	.065	.055
.657	.172	.551	.187	.064	.025
1	.099	.191	.475	.190	.045
1.52	.060	.055	.164	.558	.164
2.32	.046	.009	.034	.135	.776

Table 2. Benchmark and Optimal Economies

Statistics	Benchmark	Optimal: Unrestricted	Optimal: $r - \gamma > 0$
Consumption-equivalent gain	0.0	32.7	24.5
Paid-employment tax rate	38.0	13.0	0.0
Self-employment tax rate	23.6	9.0	10.0
Interest rate, after-tax	4.4	1.4	3.0
Wage rate relative to benchmark	1.0	1.8	1.2
Private goods price	1.0	1.3	1.2
Hours in business	21.4	35.0	33.0
Workers, corporations	9.7	21.1	17.5
Workers, private business	6.1	8.2	10.1
Owners, private business	5.6	5.7	5.4
High-productivity owners	45.7	78.1	69.7
Corporate fixed assets to GDP	1.8	4.8	2.8
Private business fixed assets to GDP	1.3	1.7	1.6
GDP relative to benchmark	1.0	2.3	1.7
Private business sales to GDP	36.0	31.6	37.2
Consumption relative to benchmark	1.0	2.1	1.7
Standard deviation of log consumption	12.1	20.4	17.5
Public consumption to GDP	13.3	5.7	8.0
Net borrowing to GDP	2.4	3.5	−3.1
Transfers to GDP	7.8	3.3	4.7
Tax revenue to GDP	23.5	12.6	9.5
Paid-employment taxes	12.4	5.3	0.0
Self-employment taxes	2.4	0.8	0.9
Consumption taxes	3.7	3.2	3.8
Profit taxes	4.5	3.6	4.8
Dividend taxes	0.6	−0.4	0.4

Note: All statistics are percentages with the exception of price ratios and fixed asset to GDP ratios.

Figure 1. Consumption-equivalent Welfare Gains