Use It or Lose It: Efficiency Gains from Wealth Taxation*

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Preliminary. Comment Welcome.

Abstract

This paper studies the quantitative implications of wealth taxation—as opposed to capital income taxation—in an incomplete markets model with return rate heterogeneity across individuals. This heterogeneity captures the fact that some individuals have better entrepreneurial skills than others, allowing them to obtain a higher return on their wealth. In this environment, consider a flat-rate wealth tax. This will shift the after-tax return distribution downward (i.e., to the left), which has two effects. First, entrepreneurs at the left tail of the productivity distribution now have an even more negative return, causing their wealth to shrink (faster) over time, in turn increasing the share of aggregate wealth owned and operated by the more skilled entrepreneurs. This reallocation increases aggregate productivity. Second, and at the same time, because such a wealth tax is regressive, it increases wealth (and welfare) inequality in the population. In calibrated examples, we find that the first (positive) effect dominates, generating large welfare gains.

Keywords: Capital income tax; Wealth tax, Life cycle, Intergenerational mobility; Welfare gains, Efficiency gains; Rate-of-return heterogeneity

JEL Codes: E21; E62; H20; H21; J62

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1 Introduction

This paper studies the quantitative implications of wealth taxation—as opposed to capital income taxation—in an incomplete markets model with return rate heterogeneity across individuals. This heterogeneity captures the fact that some individuals have better entrepreneurial skills than others, allowing them to obtain a higher return on their wealth. In this environment, consider a flat-rate wealth tax. This will shift the after-tax return distribution downward (i.e., to the left), which has two effects. First, entrepreneurs at the left tail of the productivity distribution now have an even more negative return, causing their wealth to shrink (faster) over time, in turn increasing the share of aggregate wealth owned and operated by the more skilled entrepreneurs. This reallocation increases aggregate productivity. Second, and at the same time, because such a wealth tax is regressive, it increases wealth (and welfare) inequality in the population.

To provide a quantitative assessment of these different effects and the optimal level of wealth taxation, we build and simulate an overlapping generations model with individual-specific returns on capital and idiosyncratic shocks to labor income. Entrepreneurial ability (or rate of return) is allowed to vary both within a generation and across generations (from parents to children). In this environment, the children of very successful entrepreneurs will inherit large amounts of wealth but may not be able to work that capital as efficiently. By taxing all wealth at the same rate, society can weed out these low-productivity children from those with better uses of capital. Clearly, if capital markets were efficient, wealth would be put at its most productive use without taxes, simply by high productivity individuals renting capital from those with low returns. In this sense, the incomplete-markets feature is essential to the analysis in this paper.

The key exercise we conduct is to consider a benchmark economy with capital income taxes that is calibrated to US data and matches, among other things, the wealth distribution in the US. Then, we implement a revenue-neutral tax reform that replaces the capital income taxes with linear wealth taxes. We study the quantitative importance of the mechanism outlined above by comparing aggregate and distributional outcomes across steady states.

First, we find that in the wealth tax economy, for all ages and levels of wealth, high productivity individuals save a higher fraction of their wealth than in the capital income tax economy while low productivity individuals dissave at a higher rate. As a result, in the new steady state the top 1% hold 48% of the wealth, as compared to only 34% in the capital income tax economy, and output increases by around 4%.

Second, we study the welfare implications of switching from capital income taxes to wealth taxes. More than 70% of all individuals of all ages gain from the reform. When we focus only on newborn individuals, we find that only around 10% of them are worse-off under the wealth tax system: mostly low-ability children born to rich parents with a substantial level of wealth. Furthermore, welfare gains are substantial: Under wealth taxes the average welfare of a newborn (behind the veil of ignorance) is higher by 2-3% of lifetime consumption.

1.1 Related Literature

The earlier work on capital income taxation date back to the famous Chamley-Judd result, which established that under a general set of conditions the optimal tax on capital is zero, assuming that market are complete (Judd (1985); Chamley (1986)). Subsequent quantitative analyses by Lucas (1990), Atkeson et al. (1999), Jones et al. (1993) have shown that even in richer environments where the optimal tax rate could potentially be nonzero, in carefully calibrated models the optimal level turns out to be very close to zero.

A parallel literature has relaxed the complete markets assumption and have shown that the optimal tax can be positive and sometimes large: among others, Hubbard et al. (1986); Aiyagari (1995); Imrohoroglu et al. (1998); Erosa and Gervais (2002); Garriga (2003); Conesa et al. (2009); Kitao (2010).

There is a large and growing literature on capital income taxation (among many others, Rogerson (1985), Judd (1985); Chamley (1986); Lucas (1990); Golosov et al. (2003), Kocherlakota (2005), Conesa et al. (2009)).

2 A Simple Example

Consider two entrepreneurs, each with \$1000 of wealth, who differ in the rate of return they are able to generate on their capital. The low ability entrepeneur earns an annual return of $r_1 = 0\%$, whereas the second one earns $r_2 = 10\%$. There is a government expenditure of $G = \$25$ that needs to be financed with tax revenues. If the government taxes the capital income, the required tax rate is 25% on income and is paid entirely by the second entrepeneur. Thus, the after-tax return of each entrepeneur is 0% and 7.5%. By the end of the period, the first entrepeneur's wealth has not changed whereas the second entrepeneur experienced a rise from \$1000 to \$1075 after paying his taxes. Now suppose that the government raises the same revenue by imposing a flat tax on the stock of wealth. Now the base of taxation is broader because both individuals have a stock of wealth, for a total of \$2100 at the end of the period. The tax rate on wealth is $25/2100 \approx 1.19\%$. Out of the \$25, approximately \$12 is paid by the first entrepreneur and \$13 is paid by the second. The after-tax rate of return is, respectively, $(\$0 - \$12)/\$1000 \approx -1.2\%$ and $(\$100 - \$13)/\$1000 \approx 8.7\%$. Notice that the dispersion in after-tax returns is higher with wealth taxes and the end of period wealth inequality is also higher: 1087/988 versus 1075/1000 before. But what happens most crucially is that at the end of the period, the entrepreneur who is better at investing owns a larger fraction of aggreagate wealth 52.4% vs 51.8%. It is clear that if this one period example was repeated over many years, the more productive entrepeneur would own a larger and large portion of aggregate wealth and obtain much higher returns, leading to faster aggregate growth, which can generate large efficiency gains.

So, wealth taxation has two potential effects. First, capital is allocated (mechanically) to the more productive agent. And second, if savings rates respond to changes in returns, this could further increase reallocation of capital to the more productive agent. The downside is increased wealth inequality.

Table I: Capital Income vs. Wealth Tax

	$r_1 = 0\%$	$r_2 = 10\%$	$r_1 = 0\%$	$r_2 = 10\%$
Wealth	1000	1000	1000	1000
Pre-tax Income	0	100	0	100
Tax rate	$\tau_k = \frac{25}{100}$		$\tau_w = \frac{25}{2100}$	
Tax liability	0	25	$1000\frac{25}{2100} \cong 12$	$1100\frac{25}{2100} \cong 13$
After-tax rate of return	0	$\frac{100-25}{1000} = 7.5\%$	$-\frac{12}{1000} = -1.2\%$	$\frac{100-13}{1000} = 8.7\%$
After-tax Wealth Ratio	$W_2/W_1 = 1075/1000$		$W_2/W_1 = 1087/988$	

3 The Model

The economy is populated by overlapping generations of finitely lived individuals. Individuals face mortality risk and can live up to a maximum of H years. Let ϕ_h be the unconditional probability of survival up to age h, where $\phi_1 = 1$. Let $s_h \equiv \phi_h/\phi_{h+1}$ be the conditional probability of surviving from age $h-1$ to h.

Household preferences are given by:

$$\mathbb{E}_0\left(\sum_{h=1}^{H} \beta^{h-1}\phi_h u(c_h, \ell_h)\right)$$

Each household is a worker-entrepreneur who supplies labor in the labor market and produces a differentiated intermediate good by using her capital (wealth). At a given age individuals differ in their labor market ability, y_{ih}, and entrepreneurial ability z_{ih}. y_{ih} has three components

$$\log y_{ih} = \underbrace{\alpha_i}_{\text{permanent}} + \underbrace{\kappa_h}_{\text{lifecycle}} + \underbrace{\eta_{ih}}_{\text{AR(1)}}$$

where α_i is the individual fixed effect, κ_h is the lifecycle component that is common to all individuals and η_{ih} is an individual specific AR(1) process:

$$\eta_{ih} = \rho_\eta \eta_{i,h-1} + \epsilon_\eta,$$

where ϵ_η is an i.i.d. shock with mean zero and variance $\sigma^2_{\epsilon_\eta}$. When an individual dies at age h, she is replaced by her offspring with $h = 1$ who inherits her wealth, and inherits labor market and entrepreneurial ability imperfectly. Individual-specific labor market ability α is imperfectly inherited from parents:

$$\alpha^{child} = \gamma \alpha^{parent} + \epsilon_\alpha,$$

where ϵ_α is an i.i.d. shock with mean zero and variance $\sigma^2_{\epsilon_\alpha}$.

Household i owns the product line i and produces x_{ih} units of intermediate good i according to

$$x_{ih} = z_i a_{ih},$$

where z_i is the individual i's entrepreneurial ability and a_{ih} is her wealth at age h. The key source of heterogeneity is in entrepreneurial ability, z. Initially, we assume that z is constant over the lifecycle of a household. Thus there are only permanent differences across individuals. A newborn inherits z imperfectly from her parent:

$$\log(z^{child}) = \rho_z \log(z^{parent}) + \epsilon_z.$$

Final Goods Producer: The final goods producer buys intermediate goods and combines them with labor to produce the final good at a competitive market. The output of the final good producer is given by

$$Y = Q^\alpha L^{1-\alpha},$$

where Q is the intermediate goods aggregator given by

$$Q = \left(\int_i x_i^\mu di \right)^{1/\mu}.$$

The problem of the final good producer can be written as

$$\max_{\{x_i\},L} \left(\int_i x_i^{\mu} di \right)^{\alpha/\mu} L^{1-\alpha} - \int_i p_i x_i di - wL,$$

where p_i is the price of the intermediate good i and w is the wage rate. Taking the first order conditions, we obtain the following pricing function for intermediate good i

$$p_i\left(x_i\right) = \alpha x_i^{\mu-1} Q^{\alpha-\mu} L^{1-\alpha},$$

and the wage rate

$$w = (1-\alpha) Q^{\alpha-1} L^{1-\alpha}.$$

Note that the price of the intermediate good i only depends on the quantity of intermediate good. Therefore, we can drop i in the price and write the price as only a function of quantity x

$$p\left(x\right) = \alpha x^{\mu-1} Q^{\alpha-\mu} L^{1-\alpha}.$$

Government: Initially, the government taxes capital and labor income at rates τ_k and τ_l to finance government expenditure G. We consider a revenue-neutral switch to a tax system where the government taxes the wealth stock and labor income at rates τ_w and τ_l. The labor income tax is fixed at the initial steady state level. For now, we will compare steady allocations with these two tax systems.

Household's problem: An individual with capital a_i produces $z_i a_i$ units of the intermediate good and earns $p\left(z_i a_i\right) z_i a_i$. The consumer's capital depreciates at rate δ after production. Capital depreciation is tax deductible. For now, we assume that the household supplies labor inelastically. Later we will consider the case where labor supply is endogenous. An individual's exogenous state vector is given by $\mathbf{S} = (z, \alpha, \eta)$. An individual's dynamic program is given by

$$V_h(a, \mathbf{S}) = \max_{c,a'} u\left(c\right) + \beta s_{h+1} E\left[V_{h+1}(a', \mathbf{S}') \mid \mathbf{S}\right]$$

subject to

$$c + a' = \pi(a, z, \tau) + wy_h (1 - \tau_\ell)$$

$$a' \geq 0.$$

where

$$\begin{aligned}
\pi(a, z, \tau) &= a + (p(za) za - \delta a)(1 - \tau_k) \quad \text{under capital income tax} \\
\pi(a, z, \tau) &= ((1 - \delta) a + p(za) za)(1 - \tau_w) \quad \text{under wealth tax}
\end{aligned}$$

and

$$\log y_h = \alpha + \kappa_h + \eta.$$

3.1 Equilibrium

Let $c_h(a, \mathbf{S})$ and $a_{h+1}(a, \mathbf{S})$ denote the optimal decision rules and $\Gamma(h, a, \mathbf{S})$ be the stationary distribution of agents. A competitive equilibrium is given by the following conditions:

1. Consumers maximize given $p(x)$ and w and taxes.
2. The solution to the final goods producer gives the pricing function $p(x)$ and the wage rate w.
3. $Q = \left(\sum_{h,a,\mathbf{S}} (za)^\mu \Gamma(h, a, \mathbf{S})\right)^{1/\mu}$ and $L = \sum_{h,a,\mathbf{S}} y_h \Gamma(h, a, \mathbf{S})$.
4. The government budget balances. We will compare the following two alternatives:
    (a) Taxing capital and labor income, in which case the government's budget becomes

    $$G = \tau_k \sum_{h,a,\mathbf{S}} (p(za) za - \delta a) \Gamma(h, a, \mathbf{S}) + \tau_\ell w \sum_{h,a,\mathbf{S}} y_h \Gamma(h, a, \mathbf{S})$$

    (b) Taxing wealth stock and labor income, in which case the government's budget

Table II: Calibration Parameters and Target Moments

			Calibrated Parameters					Target Moments		
H	R	δ	β	ρ_z	σ_z			Fraction of wealth held by		$\frac{wealth}{output}$
								Top 1%	Top 10%	
							Data	34	71	3
80	45	0	0.94	0.74	0.28		Model	34	70	2.97

becomes

$$G = \tau_w \sum_{h,a,\mathbf{S}} \left((1-\delta)\, a + p\,(za)\, za \right) \Gamma\,(h,a,\mathbf{S}) + \tau_\ell w \sum_{h,a,S} y_h \Gamma\,(h,a,\mathbf{S})$$

4 Quantitative Analysis

4.1 Calibration

The benchmark model is calibrated to US data. Survival probabilities are obtained from Bell and Miller (2002). Maximum age in the model H is set to 80 (which corresponds to 100 in reality) and retirement age R is set to 45. We set depreciation rate of capital δ to zero in order to not deal with negative capital income for now. But we will address this issue later.

Labor market efficiency. The parameters governing the labor market efficiency over the life cycle are estimated from the data by matching moments of related to the distribution and dynamics of earnings.

Entrepreneurial skills. The intergenerational process in entrepreneurial skill is governed by the parameters (ρ_z,σ_z). Therefore, (ρ_z,σ_z) and the discount factor β are calibrated in order to match three moments from the data (see Table II): (i) a share of wealth held by the top 1% of 34%, (ii) a share of wealth held by the top 10% of 71%, and (iii) a wealth-to-income ratio of 3. Table II show that the benchmark economy matches very well the wealth distribution in the data, as well as the wealth-to-income ratio.

Table III: Share of Wealth by Top Percentile

	1%	10%	20%	40%	60%	Bott. 40%
US data	34	71	83	95	99	1
Benchmark	34	70	84	96	99.5	0.5
Wealth tax	48	80	90	98	99.9	0.1

Table IV: Welfare Gains

ΔCE	$\Delta CE(h=1)$	Fraction with $\Delta CE > 0$	Δy
1.09%	2.17%	71%	3.52%

4.2 The experiment: replacing the capital income tax with a wealth tax

The key exercise we conduct is to consider a benchmark economy with capital income taxes that is calibrated to US data and matches, among other things, the wealth distribution in the US. Then, we implement a revenue-neutral tax reform that replaces the capital income taxes with linear wealth taxes. We study the quantitative importance of the mechanism outlined above by comparing aggregate and distributional outcomes across steady states.

First, we find that in the wealth tax economy, for all ages and levels of wealth, high productivity (z) individuals save a higher fraction of their wealth than in the capital income tax economy. On the other hand, low productivity (z) individuals dissave at a higher rate (see Figure 1). As a result, wealth is allocated towards the more productive entrepreneurs in the economy and wealth inequality increases: Table III shows that in the new steady state the top 1% hold 48% of the wealth as compared to only 34% in the capital income tax economy. Since in the new steady state, capital is more concentrated in the hands of the most productive agents, output also increases by 3.52%.

Second, we study the welfare implications of switching from capital income taxes to wealth taxes. We ask every individual in the first steady state, how much she is willing to pay as a fraction of lifetime consumption to be in the second steady state. The average welfare gain is 1.09%.

Table V shows the welfare gains for individuals with a given age group (grouped by

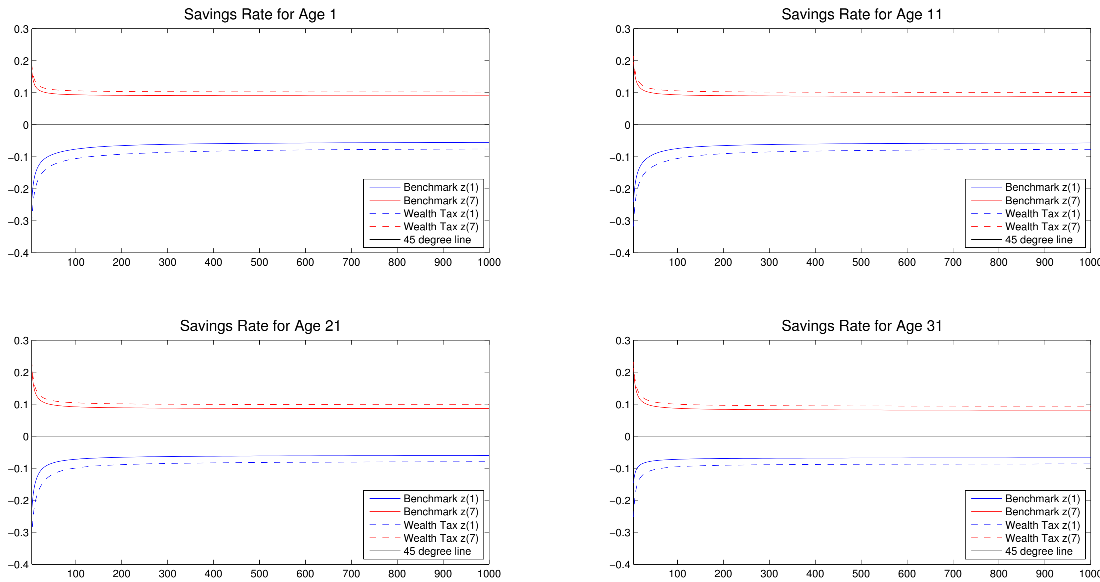
Table V: Welfare Gain by Age and Productivity z

	Welfare gain by age group						
	z1	z2	z3	z4	z5	z6	z7
1	2.27	2.3	2.18	1.88	1.67	4.29	14.89
6	2.72	2.6	2.36	1.93	1.42	4.05	15.74
11	2.76	2.7	2.39	1.84	1.11	3.74	15.32
16	2.81	2.57	2.29	1.62	0.76	3.27	14.6
21	2.46	2.38	2.04	1.32	0.33	2.64	13.01
26	2.31	2.02	1.66	0.91	-0.14	1.75	11.1
31	1.81	1.54	1.19	0.36	-0.74	0.51	7.4
36	1.21	0.88	0.53	-0.23	-1.44	-1.37	2.74
41	0.69	0.33	0.01	-0.77	-2.39	-4.24	-4.07
46	1.14	0.9	0.54	-0.31	-2.15	-5.1	-7
51	1.88	1.75	1.5	0.78	-0.97	-3.92	-6
56	2.59	2.56	2.37	1.84	0.42	-2.62	-4.91
61	3.16	3.13	3.05	2.69	1.68	-1.12	-3.84
66	3.45	3.44	3.41	3.31	2.81	0.65	-2.62
71	3.49	3.49	3.49	3.48	3.38	2.5	-1.15
76	3.49	3.49	3.49	3.49	3.49	3.41	1.3

Table VI: Welfare Gain by Age and Productivity z

	Fraction with positive welfare gain						
	z1	z2	z3	z4	z5	z6	z7
1	0.91	0.91	0.9	0.88	0.86	1	1
6	0.97	0.95	0.94	0.89	0.83	1	1
11	0.97	0.97	0.94	0.88	0.78	1	1
16	0.98	0.97	0.94	0.86	0.68	1	1
21	0.96	0.96	0.92	0.8	0.58	1	1
26	0.95	0.93	0.87	0.7	0.48	1	1
31	0.88	0.81	0.74	0.6	0.36	0.76	1
36	0.73	0.68	0.63	0.51	0.23	0.08	1
41	0.65	0.61	0.56	0.41	0.15	0.01	0
46	0.72	0.68	0.63	0.48	0.18	0.01	0
51	0.84	0.82	0.77	0.65	0.33	0.03	0
56	0.95	0.95	0.93	0.85	0.57	0.06	0
61	0.99	0.99	0.99	0.97	0.83	0.24	0
66	1	1	1	1	0.98	0.62	0
71	1	1	1	1	0.99	0.95	0.18
76	1	1	1	1	1	1	0.77

Figure 1: Saving Rates for Low- and High-Productivity Individuals



5 years) and productivity. 71% of all individuals of all ages gain from the reform. The only groups that lose are middle-aged individuals with high entrepreneurial skills. These individuals are too old to benefit from the higher returns (brought about by replacing capital income tax with wealth tax) in their remaining lifetimes but have a large stock of wealth that is taxed away under the wealth tax system. We also observe from Table V that welfare gains for all groups are typically declining until the retirement age since all individuals are accumulating wealth. But after retirement they start increasing by age as people dissave.

Table VI report the fraction of inividuals with positive welfare gains. This statistic also displays a similar pattern to the average welfare gain. Most young and old individuals benefit from the reform while a smaller fraction among middle aged benefit.

When we focus only on newborn individuals—age 1 in Table V—they are better off, on average, for all levels of productivity. We find that only around 10% of them are worse-off under the wealth tax system: mostly low-ability children born to rich parents with a substantial level of wealth. Furthermore, welfare gains are substantial: Under wealth taxes the average welfare of a newborn (behind the veil of ignorance) is higher by 2.2% of lifetime consumption.

Despite the fact that the welfare gains are positive among one-year olds for all productivity groups and that the majority of individuals in each group benefit from the reform, there is still substantial variation in welfare gains within each group. Figures 2 and 3 show, for different levels of entrepreneurial ability, (i) the welfare gain by wealth and (ii) the disribution of wealth for inviduals with that particular entrepreneurial ability and median labor market ability. The top left panel in Figure 2 shows the welfare gains as a function of wealth for individuals with z_2. As seen in the figure, those with little wealth have positive welfare gains despite the fact that they have low productivity. This is due to the fact that in the new steady state wages are higher by 3.52%. Welfare gains decrease with wealth and become negative above a certain wealth threshold. The individual with the minimum amount of wealth in this group receives a welfare gain of 3.29% while the individual with the maximum amount of wealth experiences a 7.25% decline in welfare. However, as the lower left panel in Figure 2 illustrates, most individuals in this group have very little wealth. Thus, most of them gain from the reform and the average welfare gain is positive. We see a similar pattern if we look at individuals with a productivity level of z_3 in the right panels in Figure 2. Figure 3 shows the welfare gains, by wealth, for the most productive individuals. For individuals with productivity z_6, welfare gains decline with wealth, but are always positive. Those with a productivity level of z_7 benefit most from the reform. The top right panel in Figure 3 illustrates that for this group the welfare gains are actually increasing with wealth.

5 Extensions

We are implementing several extensions of the framework to further understand the quantitative effects of the mechanism we are analyzing.

- First, we introduce a bequest motive by modeling a warm-glow utility from leaving bequests. In the absense of a bequest motive, newborn individuals start with similar levels of wealth and then, over the life cycle, individuals with a high rate-of-return accumulate more wealth under a wealth tax than under a capital income

Figure 2: Welfare Gain by Asset for z_2 and z_3 for one year-olds

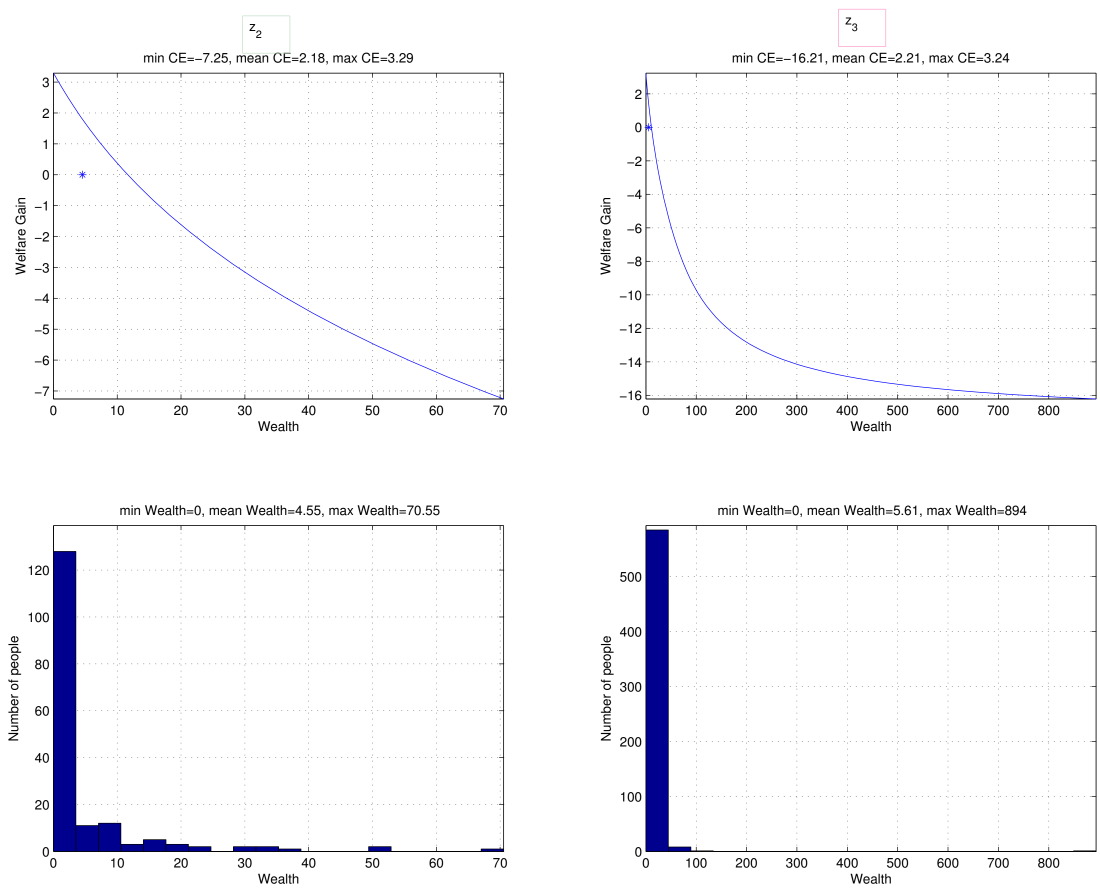
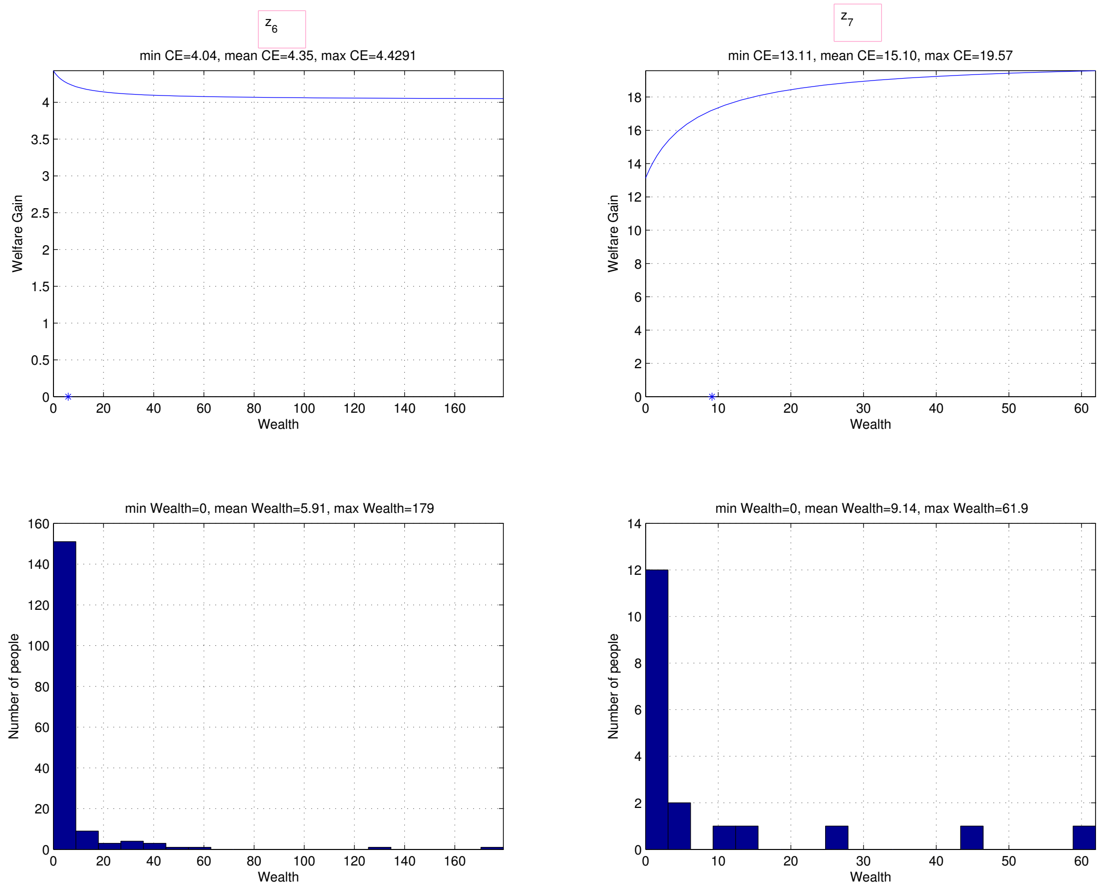


Figure 3: Welfare Gain by Asset for z_6 and z_7 for one year-olds



tax. This is beneficial because it allocates more capital towards the productive individuals in the economy. In the presence of a bequest motive, however, this mechanism is amplified. There will be low-rate-of-return newborn individuals with a large amount of assets and reallocating as quickly as possible those assets away from them and towards the more productive high-rate-of-return entrepreneurs is crucial, something which a wealth tax achieves much better than a capital income tax.

- Second, we introduce uncertainty in the individual's entrepreneurial skill over the life cycle. Intuitively, this feature increases the efficiency gains from a wealth tax in a way similar to the introduction of a bequest motive. Some individuals who started as high-skill and accumulated large wealth might find themselves low-skill entrepreneurs at some point later in their life cycle. At that point it is preferrable to reallocate some of their wealth towards the more productive entrepreneurs in the economy: something which a wealth tax would facilitate much better than a capital income tax.

- Third, wealth taxation as currently modeled has the unappealing feature that individuals with low assets are also taxed and see their wealth disappear, which can lead to potentially large welfare losses. A better system would be one that sets zero (or negative) taxes below an exemption level of assets.

- Finally, we introduce endogenous labor supply into this framework in order to study the optimal labor income tax and the corresponding capital income or wealth tax.

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