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Abstract

We compute the welfare cost of egalitarianism—a tax policy that equalizes wages for all. The benchmark "laissez-faire" economy has features *a la* Aiyagari (1994) with endogenous labor supply. A progressive income tax provides insurance against income risks but at the cost of efficiency: it undermines highly productive workers' incentives to work. We find that in an economy with the labor-supply elasticity of 1, the welfare cost of egalitarianism, measured in consumption-equivalence units, is only 1% as the welfare gain from insurance against income risks nearly offsets the efficiency loss from distorting labor effort. However, with an elastic labor supply, the welfare cost of egalitarianism is as large as 7.5% of steady state consumption.

Keywords: Egalitarianism, Welfare Cost, Equal-Wage Policy, Income Risks
JEL Classification: E2, E6, J3

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1. Introduction

Egalitarianism is often popular because it provides insurance against bad outcomes in the market. At the same time, it is criticized for its efficiency loss from distorting individual choice and incentives. We compute the welfare cost of egalitarianism—a tax policy that equalizes wages for all.[1] The model economy has features *a la* Aiyagari (1994) with endogenous labor supply and capital accumulation. Workers are identical in preferences and *ex ante* ability. They face uninsurable individual productivity shocks and a borrowing constraint. Workers insure themselves against future income uncertainty by saving and working more (e.g., Pijoan-Mas (2005)). A progressive tax policy that equalizes after-tax wages (as well as earnings) is an effective insurance against income risks. However, such a policy is associated with an efficiency loss, since it discourages highly productive workers from working (e.g., Heathcote, Storesletten, and Violante (2008)).

Our benchmark "laissez-faire" economy is calibrated to capture some of the salient features of earnings and wealth of the U.S. economy. The stochastic process of the idiosyncratic productivity shock is estimated by the stochastic process of individual wages from the Panel Study of Income Dynamics (PSID). The intertemporal time preference rate is chosen to match the average real rate of return of the postwar period. The intratemporal preference between commodity consumption and leisure (i.e., the marginal rate of substitution between consumption and leisure) is calibrated to match the average hours of work observed in the Michigan Time Use Survey. Our model almost exactly reproduces the cross-sectional distribution of *ex post* earnings and wealth in the PSID. Equipped with this quantitative general equilibrium model, we evaluate the welfare cost of the egalitarian policy that equalizes the after-tax wages of all workers.

We find that under the egalitarian policy aggregate hours of work increase by 10% relative to that under the "laissez-faire" economy. The wage compression induces the labor supply to be drawn from among low productivity wokers who would otherwise supply very few hours in the market. However, the aggregate labor input measured in efficiency units increases by mere a 2% because the workers with high productivity exert much less labor effort under the

[1] An extreme form of egalitarianism would be communism. For example, "The whole of society will have become a single office and a single factory with equality of labour and equality of pay," from page 91 of *The State and Revolution* by V.I. Lenin.

wage compression. The aggregate capital stock decreases significantly by 11% in the long run as the egalitarian policy eliminates the precautionary savings motive against income risks. In our benchmark economy where the elasticity of labor supply is 1, the welfare cost of egalitarianism is a mere 1%, measured in consumption-equivalence units, as the insurance benefit nearly offsets the efficiency loss. However, with elastic labor supply (e.g., labor-supply elasticity of 4) the efficiency loss increases signficantly and the egalitarianism decreases average welfare by 7.5%.

Heathcote, Storesletten, and Violante (2008) first conducted a quantitative welfare analysis of an equal-wage policy in an incomplete markets economy. They provide an elegant and transparent analysis on the trade-off between the insurance gain and the efficiency loss of wage compression. In order to obtain analytical solutions, they abstract from capital. We extend their analysis to include production capital. It turns out that the long-run consequence of capital accumulation can be quantitatively significant enough to reverse the welfare implication of an egalitarian policy. For example, in Heathcote, Storesletten, and Violante (2008), the egalitarian policy leads to a welfare gain relative to "laissez faire" unless the labor supply is highly elastic.[2] According to our analysis with capital accumulation, the egalitarian policy leads to a welfare loss under a moderately elastic labor supply—i.e., the elasticity of 0.7 or higher.

We provide a novel way to decompose the welfare cost of egalitarianism into insurance benefit and efficiency loss by studying an efficient allocation under an economy with complete capital markets (which we refer to "complete markets" economy). When the complete set of contingent claims is available, workers effectively eliminate income risks by trading contingent claims, whereas in an incomplete-markets economy, workers have to self-insure against income risks by saving more and working more (Pijoan-Mas (2005)). While the welfare gap between the "complete markets" and benchmark "laissez-faire" economy reflects the welfare gain from eliminating income risks without distorting labor supply, the welfare gap between the "complete markets" and the "egalitarian" economies reflects the efficiency cost from distorting labor supply only because income risks are completely eliminated in both

[2] Since the size and nature of productivity risks are not identical between Heathcote at al.'s (2008) and our model, a direct comparison is not possible. Despite these differences, according to Heathcote et al., a complete wage compression leads to a welfare gain when the labor-supply elasticity is less than 2 (under log utility in consumption).

economies.[3] According to our benchmark calibration, the 1% welfare cost of egalitarianism consists of a 7% welfare gain from insurance against risks and a 8% loss from distorting labor effort. The efficiency loss crucially depends on the elasticity of labor supply. For example, with a labor supply elasticity of 4, the efficiency loss can be as large as 38% of the steady-state consumption.

The remainder of the paper is organized as follows. Section 2 lays out a benchmark model economy in which the workers face uninsurable idiosyncratic productivity shocks. In Section 3, we calibrate the model economy to match the ex post earnings and wealth distributions in the PSID and study the welfare effect of an egalitarian tax policy that compresses after-tax wages. Section 4 summarizes the results.

2. Model

The benchmark economy has features *a la* Aiyagari (1994) with endogenous labor supply (e.g., Krusell and Smith (1998), Pijoan-Mas (2005), and Chang and Kim (2007)). There is a continuum (measure one) of workers who have identical preferences. Workers are *ex ante* identical but *ex post* heterogeneous due to realized productivity shock x, which follows a Markov process with a transition probability distribution function $\pi_x(x'|x) = \Pr(x_{t+1} \leq x'|x_t = x)$. Individual productivity x_t represents idiosyncratic risks that agents face in our model economy and is the only source of heterogeneity.[4]

A worker has separable preferences over consumption c_t and hours worked h_t:

$$\ln c_t - B\frac{h_t^{1+1/\gamma}}{1+1/\gamma} \tag{1}$$

Workers trade claims for physical capital, a_t, which yields the rate of return r_t. The capital markets are incomplete. Physical capital is the only asset available to workers, and workers

[3] We assume that the utility is separable between consumption and leisure. Thus, under the complete markets economy, workers supply labor effort according to their realized productivity: the most productive worker works the most and the least productive worker supplies the least amount of labor.

[4] Heathcote, Storesletten and Violante (2008) allows for two types of productivity shocks: permanent and temporary (i.i.d.). They assume that temporary productivity shocks are insurable but permanent productivity shocks are not. Therefore, the market incompleteness in their analysis refers to the permanent productivity shocks, whereas ours refers to the temporary but persistent productivity shocks as in Aiyagari (1994).

face a borrowing constraint: $a_t \geq \underline{a}$ for all t.

The representative firm produces output according to a constant-returns-to-scale Cobb-Douglas technology in capital, K_t (which depreciates at rate δ each period), and effective units of labor, $L_t (= \int h_t x_t \, d\mu)$, where μ is the distribution of workers:[5]

$$Y_t = F(L_t, K_t) = L_t^{\alpha} K_t^{1-\alpha}.$$

Without tax, a worker earns $w_t x_t h_t$, where w_t is the wage rate per effective unit of labor x_t. For simplicity, the individual state (a, x) is a public knowledge (at least known to the government) and the government imposes a tax rate (subsidy rate if negative), $-\infty < \tau(a_t, x_t) < 1$, on wages where after-tax earnings are $\big(1 - \tau(a_t, x_t)\big) w_t x_t h(a_t, x_t)$. We assume that the government balances its budget:

$$\int \tau(a_t, x_t) w_t x_t h(a_t, x_t) d\mu(a_t, x_t) = 0.$$

The individual worker maximizes his lifetime utility:

$$\max_{\{c_t, h_t\}_{t=0}^{\infty}} E_0 \sum_{t=0}^{\infty} u(c_t, h_t)$$

subject to

$$c_t = (1 + r_t) a_t + \big(1 - \tau(a_t, x_t)\big) w_t x_t h(a_t, x_t) - a_{t+1} \text{ and } a_{t+1} \geq \underline{a}.$$

It is convenient to write (in recursive form) the value function for a worker, denoted by $V(a, x)$ as:

$$V(a, x) = \max_{a', h} \Big\{ u(c, h) + \beta E\big[V(a', x') | x\big] \Big\}$$

subject to $c = (1+r)a + \big(1 - \tau(a, x)\big) w x h(a, x) - a'$ and $a' \geq \underline{a}$. The intertemporal first-order condition (i.e., Euler equation) is:

$$\frac{1}{c(a, x)} = \beta E \left[(1 + r) \frac{1}{c(a', x')} | x \right] \tag{2}$$

The intratemporal first-order condition (i.e., the optimal labor supply function) is:

$$B h(a, x)^{1/\gamma} c(a, x) = \big(1 - \tau(a, x)\big) w x \tag{3}$$

[5]This implicitly assumes that workers are perfect substitutes for each other. While this assumption abstracts from reality, it greatly simplifies the labor-market equilibrium.

A stationary equilibrium consists of a value function, $\{V(a,x)\}$; a set of decision rules for consumption, asset holdings, and labor supply, $\{c(a,x),\, a'(a,x),\, h(a,x)\}$; aggregate inputs, $\{K,\, L\}$; factor prices, $\{w,\, r\}$; and an invariant distribution of workers $\mu(a,x)$ such that:

1. Individuals optimize: Given w and r, the individual decision rules $c(a,x)$, $a'(a,x)$, and $h(a,x)$ solve $V(a,x)$.

2. The representative firm maximizes profits:

$$w_t = \alpha k^{1-\alpha} \tag{4}$$

$$r_t + \delta = (1-\alpha)k^{-\alpha} \tag{5}$$

where $k = K/L$.

3. The goods market clears:

$$\int \big\{a'(a,x) + c(a,x)\big\} d\mu = F\big(L, K\big) + (1-\delta)K.$$

4. The factor markets clear:

$$L = \int xh(a,x)d\mu(a,x),$$
$$K = \int ad\mu(a,x).$$

5. Individual and aggregate behaviors are consistent: For all $A^0 \subset \mathcal{A}$ and $X^0 \subset \mathcal{X}$,

$$\mu(A^0, X^0) = \int_{A^0,X^0} \left\{ \int_{\mathcal{A},\mathcal{X}} \mathbf{1}_{a'=a'(a,x)}\ d\pi_x(x'|x)d\mu \right\} da'dx'.$$

Following Aiyagari and McGrattan (1998), we define social welfare as:[6]

$$\mathcal{W} = \int V(a,x)d\mu(a,x),$$

$$V(a,x) = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left\{ \log c(a_t,x_t) - B\frac{h(a_t,x_t)^{1+1/\gamma}}{1+1/\gamma} \right\},$$

[6]This measure of social welfare or its variants have been widely used in the literature. Examples include Domeij and Heathcote (2004), Young (2004), Pijoan-Mas (2005), Heathcote, Storesletten and Violante (2008) and Rogerson (2009). Detailed justifications for this welfare measure are provided in Aiyagari and McGrattan (1998).

This is the utilitarian social welfare function that measures the *ex ante* welfare in the steady state—i.e., the welfare of an individual before the realization of initial assets and productivity, which is drawn from the steady-state distribution $\mu(a, x)$. We measure the welfare gain or loss from a policy change by the constant percentage change in consumption each period for all individuals, which is required to equate social welfare before and after the policy change. Specifically, we compute Δ that solves

$$\begin{aligned} \int \left\{ \mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t \left\{ \log\big((1+\Delta)c_0(a_t, x_t)\big) - B\frac{h_0(a_t, x_t)^{1+1/\gamma}}{1+1/\gamma} \right\} \right] \right\} d\mu_0(a_t, x_t) \\ = \int \left\{ \mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t \left\{ \log c_1(a_t, x_t) - B\frac{h_1(a_t, x_t)^{1+1/\gamma}}{1+1/\gamma} \right\} \right] \right\} d\mu_1(a_t, x_t) \end{aligned} \tag{6}$$

where c_0, h_0, and μ_0 is consumption, labor supply, and steady-state distribution before the policy change and c_1, h_1, and μ_1 are those after. A positive Δ implies that average welfare improves upon a policy change. Equation (6) further simplifies to:

$$\mathcal{W}_1 = \mathcal{W}_0 + \frac{1}{1-\beta}\log(1+\Delta), \tag{7}$$

where $\mathcal{W}_0$ and $\mathcal{W}_1$ are social welfare before and after the policy change, respectively. Hence,

$$\Delta = \exp\big((\mathcal{W}_1 - \mathcal{W}_0)(1-\beta)\big) - 1 \tag{8}$$

3. Quantitative Analysis

3.1. Calibration

We briefly explain the choice of the model parameters. The parameters of the model economy are chosen to match some key aspects of the U.S. economy. A more detailed explanation of the calibration can be found in Chang and Kim (2006, 2007). The unit of time is a year. We assume that individual productivity x follows an AR(1) process: $\ln x' = \rho_x \ln x + \varepsilon_x$, where $\varepsilon_x \sim N(0, \sigma_x^2)$. We estimate ρ_x and σ_x by estimating the AR(1) process of wages from the Panel Study of Income Dynamics (PSID) for 1979-1992. According to our model, workers are *ex ante* identical but *ex post* heterogeneous due to idiosyncratic productivity shocks. In order to capture *ex post* heterogeneity only, we first restrict the sample to arguably *ex ante* homogeneous households, whose head is a high school graduate and whose age is between 35 and 55 as of 1983 (1984 survey). We denote this sample as "PSID Primary Households." We further control for individual fixed effects by including sex, age, and age-squared.[7] Finally, we control for time effects (aggregate business-cycle effect) by annual dummies. The estimated values we obtain are $\rho_x = 0.777$ and $\sigma_x = 0.266$.[8]

The other parameters are in accordance with the standard values in the literature. The elasticity of labor effort, γ, is 1. This value is larger than a typical micro estimate (e..g, MaCurdy, 1981). However, considering that typical micro estimates do not reflect the extensive margin of labor (e.g., labor-market participation decision), it is desirable to use a larger number for the labor supply elasticity. For example, Heckeman and MaCurdy (1980) find that the labor supply elasticity of female workers can be as large as 5 when the participation decisions are taken into account. In a recent study in which the human capital investment part of compensation is taken into consideration, Imai and Keane (2004) estimate that the labor supply elasticity for males is 3.7. According to our earlier work with an indivisible labor with incomplete capital markets (Chang and Kim (2006)), the aggregate labor-supply elasticity is about 1. Since the labor supply elasticity is a crucial aspect of efficiency loss under an egalitarian policy, we consider a wide range of γ between 0.1 to 4, which constitutes the lower and upper bounds estimates in the literature. Workers are not allowed to borrow: $\underline{a} = 0$. The labor-income share, α, is 0.64, and the annual depreciation rate of capital, δ, is 10%.

We search for the preference parameter for disutility from working, B, such that average hours worked are 0.33. According to Juster and Stafford (1991), a typical married couple in the Michigan Time Use Survey spends about one-third of their discretionary time working for paid compensation. The time discount factor β is chosen so that the real rate of return to capital is 4% in the steady state (e.g., Kydland and Prescott (1982)). There is no tax in the benchmark "laissez-faire" economy. While the average hours worked are 0.33 in the steady state, the aggregate labor input measured in efficiency units is 0.36 higher than physical hours because, on average, workers with higher productivity work longer hours. Due to

[7] We estimate the AR(1) process of the wage residual using Heckman's (1979) maximum-likelihood estimation procedure, correcting for a sample selection bias because productivities (wages) of workers who did not work are not reported. See Chang and Kim (2006) for details.

[8] Our estimate is slightly lower than, but comparable to, the persistence of individual earnings risks in Storesletten, Telmer, and Yaron (1999). The difference is due to their decomposition of individual shocks into a persistent AR(1) and purely temporary *i.i.d.* components, whereas we assume a single AR(1) process.

precautionary savings, the steady-state interest rate is 4%, while the assumed subjective time discount rate is 5.3% ($\beta = 0.9493$). Table 1 summarizes the parameter values of the benchmark model economy.

3.2. Cross-sectional Distributions of Earnings and Wealth

Since we investigate the trade-off between insurance against idiosyncratic productivity risks and efficiency loss associated with an egalitarian policy, it is desirable for the model economy to possess a reasonable amount of income risks comparable to those in the data. We report the cross-sectional distribution of earnings and wealth of the benchmark economy—two observable measures of cross-sectional heterogeneity generated by income shocks.

Figure 1 shows the Lorenz curves of household wealth and earnings distributions from both the "PSID Primary Households" and the model. Household wealth in the PSID (1984 survey) reflects the net worth of houses, other real estate, vehicles, farms and businesses owned, stocks, bonds, cash accounts, and other assets. Household earnings in the PSID are the sum of earnings of the household head and spouse. Both earnings and wealth distribution in our model are fairly close to those in the "PSID Primary Households" (which arguably reflects *ex post* heterogeneity). Specifically, the Gini coefficients of earnings and wealth distributions in our model are 0.5 and 0.28, respectively, and those of the "PSID Primary Households" are 0.53 and 0.32, respectively.[9]

Table 2 summarizes detailed information on wealth and earnings in both the PSID (1984 survey) and the model. For each quintile group of wealth distribution, we calculate the wealth share, ratio of group average to economy-wide average, and the earnings share. In both the data and the model, the poorest 20% of families in terms of wealth distribution were found to own virtually nothing (about 1% of aggregate wealth). The PSID found that households in the 2nd, 3rd, 4th, and 5th quintiles own 7.07, 13.01, 21.10, 57.76% of total wealth, respectively, while, according to the model, they own 5.52, 13.50, 25.88, 54.67%, respectively.[10] The average wealth of those in the 2nd, 3rd, 4th, and 5th quintiles is,

[9] The Gini coefficients of wealth and earnings for all households in the PSID 1984 survey are 0.68 and 0.41, respectively.

[10] One should note that the unconditional wealth distribution is much more skewed than that of "PSI Primary Households." For example, according to the unconditional wealth distribution (i.e., all households

respectively, 0.36, 0.64, 1.06, and 2.97 times larger than that of a typical household, according to the PSID. These ratios are 0.28, 0.67, 1.28, and 2.73 according to our model. Households in the 2nd, 3rd, 4th, and 5th quintiles of wealth distribution earn, respectively, 14.67, 20.08, 25.07, and 25.86% of total earnings, according to the PSID. The corresponding groups earn 19.58, 20.70, 21.63, and 22.30%, respectively, in the model. The model generates the cross-sectional dispersions in earnings and wealth that are reasonably comparable to those in the data. We now investigate the welfare consequence of an egalitarian policy that eliminates income risks by compressing the after-tax wages.

3.3. Welfare Cost of Egalitarian Policy

It is straightforward to show that under the tax policy $\tau(a, x) = 1 - \frac{1}{x}$, all workers' after-tax wages, hours, and earnings are identical in the steady state. Under this policy, the wealth distribution is degenerate, and the equilibrium allocation is equivalent to that of a representative agent with the mean productivity, $x = 1$.[11]

Table 3 compares the steady-state aggregate hours, capital, output, consumption and social welfare under the egalitarian tax policy. With an egalitarian policy that equalizes wages regardless of individual productivity, aggregate hours of work increase by 10.1%. The wage compression draws the labor supply from low-productivity workers who would otherwise supply very few hours in the market. However, the labor effort in efficiency units increases by mere 2% as highly productive workers exert much less labor effort. Capital decreases significantly by 11%. Thanks to perfect insurance against income risks provided by the egalitarian tax policy, there is no need for precautionary savings. As a result, the economy produces less output. Output falls by 2% and aggregate consumption is virtually unaffected. Overall, the egalitarian policy reduces the utilitarian social welfare by 1.1%, measured in consumption-equivalence units.

As illustrated by Heathcote et al. (2008), the egalitarian tax policy highlights the trade-off between the insurance benefit against income risks and the efficiency loss from distorting

in the 1984 PSID), from the 1st to 5th quintiles, households own, respectively, -0.52, 0.50, 5.06, 18.74, and 76.22% of total wealth.

[11] While our model economy allows for trading in a decentralized market, the wealth distribution degenerates in the steady state under the egalitarian policy.

labor effort. In order to decompose this trade-off, we compute the equilibrium under complete capital markets, where the complete set of contingent claims is available. Under complete capital markets, the efficient allocation is achieved as workers supply hours according to their realized productivity. Consumption is equalized for all workers (under the separable utility between consumption and leisure) and the hours of work is determined by the intra-temporal optimality condition in (3). The welfare gap between the "complete markets" and the "egalitarian" economy reflects the efficiency cost from distorting labor supply because income risks are completely eliminated in both economies. The welfare gap between the "complete markets" and benchmark "laissez-faire" economy reflects the welfare gain from eliminating income risks because neither economy is subject to distortion in labor effort other than precautionary motive. While workers tend to save more and work more for precautionary motive under incomplete markets economy (Pijoan-Mas (2005)), such distortion is due to lack of insurance. Thus, we view the welfare gap beween "complete markets" and "laissez-faire" economies as insurance benefit.

The last column of Table 3 reports the aggregate quantities from the "complete markets" economy. While workers on average work 6.2% less hours than the "laissez-faire," the labor input measured in efficiency units is 4% larger than the "laissez-faire" because highly productive workers supply more hours. Since there is no need for precautionary savings, capital decreases by 9.8%. While the aggregate output is smaller in the "complete markets" economy by 1.2%, aggregate consumption is slightly higher in the "complete markets" economy. The social welfare gap of 7.3% between the "laissez-faire" and the "complete markets" reflects the welfare gain associated with eliminating income risks. Relative to the "egalitarian" economy, the social welfare of "complete markets" is higher by 8.4% which reflects the efficiency loss due to distortion of labor effort only because income risks are completely eliminated in both economies.

Heathcote, Storesletten, and Violante (2008) first analyze the trade-off from an equal-wage policy in a quantitative model. In order to obtain a transparent analytical solution, they abstract from capital. We extend their analysis with capital. It turns out that the long-run consequence of capital accumulation can be quantitatively important. For example, in Heathcote, Storesletten, and Violante (2008), the egalitarian policy leads to a welfare gain relative to "laissez-faire" unless labor supply is fairly elastic. According to our analysis with capital, the egalitarianism leads to a welfare loss with a moderately elastic labor supply. While a direct comparison is not possible because the size and nature of productivity risks are not identical between Heathcote at al.'s (2008) and our model, when both labor supply elasticity and relative risk aversion are 1, the wage compression improves average welfare by 5% in Heathcote et al. (Panel (C) of Figure 2 in Heathcote at al. (2008)), whereas such a policy results in a welfare loss in our model with capital.

The elasticity of labor effort is crucial in determining the magnitude of efficiency loss from an egalitarian policy. In our benchmark calibration, we use an elasticity of 1. Although this value is larger than a typical micro estimate based on prime-age male workers (e.g., MaCurdy (1981)), much larger values are preferred once we take into account the so-called extensive margin of labor supply. For example, Heckeman and MaCurdy (1980) find that the labor-supply elasticity of female workers can be as large as 5 when the participation decisions are taken into account. We re-do our analysis with a wide range of labor supply elasticities from 0.1 to 4. These values constitute the lower and upper bounds of labor supply elasticities in the literature. When we use a different labor supply elasticity, we re-calibrate the preference parameters B and β so that avearage hours worked and real interest rate in steady state are identical across economies. Specifically, for each value of γ, we choose the parameter for disutility from working B and discount factor β to obtain aggregate hours of 0.33 and a real interest rate of 4% under "laissez-faire." As Table 4 shows, a higher value of γ (less painful to supply additional hours) requires us to lower the value of B (disutility from working) to yield the same average hours in the steady state. As an elastic labor supply (a higher value of γ) yields higher output and capital, we need a smaller discount factor (β) to obtain the same equilibrium interest rate.

Table 5 shows two polar cases ($\gamma = 0.1$ and 4). When labor supply is inelastic ($\gamma = 0.1$), the efficiency unit of labor (0.34) is barely larger than the average hours of work (0.33). Compared to the benchmark economy, capital, output, and consumption are smaller. The egalitarian policy increases the average welfare by 2.4% as the insurance gain (3.2%) dominates the efficiency loss (0.8%). When labor effort is highly elastic ($\gamma = 4$), the efficiency unit of labor (0.39) is much greater than the average hours of work (0.33). The economy produces, saves, and consumes more. In this economy, the egalitarian policy decreases the welfare significantly by 7.5%. In particular, the efficiency loss from distorting labor effort is enormous, as large as 38%.

Figure 2 shows average hours of work, hours in efficiency units, capital, and consumption of "egalitarian" and "complete markets" economies (relative to "laissez-faire" steady states). As γ increases, (relative) average hours in the "egalitarian" increase whereas the hours in the "complete markets" decrease. By contrast, the efficiency unit of hours in the "complete markets" increase siginficantly as the efficient allocation induces much labor effort from highly productive workers.

Figure 3 exhibits the relative welfare of "egalitarian" and "complete markets" economies. As expected, the welfare cost rises as the labor supply becomes more elastic so that workers can more easily take advantage of high-productivity opportunities. The welfare under egalitarian policy (relative to "laissez-faire") turns from a gain to a loss around the labor supply elasticity of 0.7. This turning point occurs at the elasticity of 2 (under the log utility in consumption) in Heathcote et al. (2008)'s analysis without capital accumulation.

While the utilitarian criterion is a useful concept for the welfare analysis, one might argue that the median welfare is important from a political economic perspective. In Figure 4 we compare the welfare of the median worker based on the steady state distribution $\mu(a, x)$, and find that the median worker is better off in the "egalitarian" economy as long as the labor supply elasticity is less than 2.

4. Summary

We compute the welfare cost of egalitarianism—a tax policy that equalizes individual wages. In our benchmark "laissez-faire" economy, workers are identical in preferences but face a borrowing constraint and uninsurable individual productivity shocks. Workers can insure themselves against income risks by working and saving more. A progressive tax policy can provide insurance against income risks. However, insurance is obtained at the cost of efficiency: it undermines highly productive workers' incentives to work—the trade-off highlighted by Heathcote et al. (2008). We find that the equal-wage policy decreases aggregate capital by 11% in the long run. Aggregate hours of work increase by 10%, while the labor input measured in efficiency units increases by a mere 2% as productive workers exert less labor effort. The welfare cost of egalitarianism, in consumption-equivalent units, is 1%. This welfare cost consists of a 7% welfare gain from insurance against income risks and a 8% welfare loss due to distortion in labor effort. The efficiency loss depends crucially on the elasticity of labor supply. With elastic labor supply (elasticity of 4) the efficiency loss from an egalitarian policy can be as large as 38% of steady state consumption, which results in a welfare cost of 7.5% despite perfect insurance against income risks.

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Table 1: PARAMETERS OF THE BENCHMARK ECONOMY

Parameter	Description
$\beta = 0.9493$	Discount factor
$\gamma = 1$	Labor-supply elasticity
$B = 7.16$	Utility parameter
$\underline{a} = 0$	Borrowing constraint
$\rho_x = 0.777$	Persistence of idiosyncratic productivity shock
$\sigma_x = 0.266$	Standard deviation of innovation to idiosyncratic productivity
$\alpha = 0.64$	Labor share in production function
$\delta = 0.1$	Capital depreciation rate

Table 2: Characteristics of Wealth Distribution

	Quintile					
	1st	2nd	3rd	4th	5th	Total
PSID Primary Households						
Share of wealth	1.03	7.07	13.01	21.10	57.76	100
Group average/population average	0.05	0.36	0.64	1.06	2.97	1
Share of earnings	14.29	14.67	20.08	25.07	25.86	100
Benchmark Model						
Share of wealth	0.68	5.52	13.50	25.88	54.67	100
Group average/population average	0.03	0.28	0.67	1.28	2.73	1
Share of earnings	15.78	19.58	20.70	21.63	22.30	100

Notes: The PSID statistics reflect the household wealth and earnings in the 1984 survey. The statistics of "Primary Households" are those for household heads whose education level was 12 years and whose age is between 35 and 55. The participation rate is based on individual employment status (household head and spouse) for the same group.

Table 3: Steady States: Benchmark

	"Laissez-faire" (Levels)	"Egalitarian" (relative to "Laissez-faire")	"Complete Markets" (relative to "Laissez-faire")
Labor Hours	0.33	+ 10.1 %	- 6.2 %
Labor in Efficiency Units	0.36	+ 2.2 %	+ 4.0 %
Capital	1.57	- 11.4 %	- 9.8 %
Output	0.61	- 2.9 %	- 1.2 %
Consumption	0.45	+ 0.1 %	+ 1.8 %
Social Welfare		- 1.1 %	+ 7.3 %

Notes: The numbers for "egalitarian" and "complete markets" economies are relative to the benchmark economy. The social welfare is in consumption-equivalence units.

Table 4: CABLIBRATED VALUES OF B AND β UNDER VARIOUS γ

γ	.1	.2	.4	.6	.8	1.0	2.0	3.0	4.0
B	14450	593	37.78	15.04	9.45	7.16	4.07	3.365	3.05
β	.95494	.95426	.95294	.95167	.95046	.9493	.94437	.94061	.93772

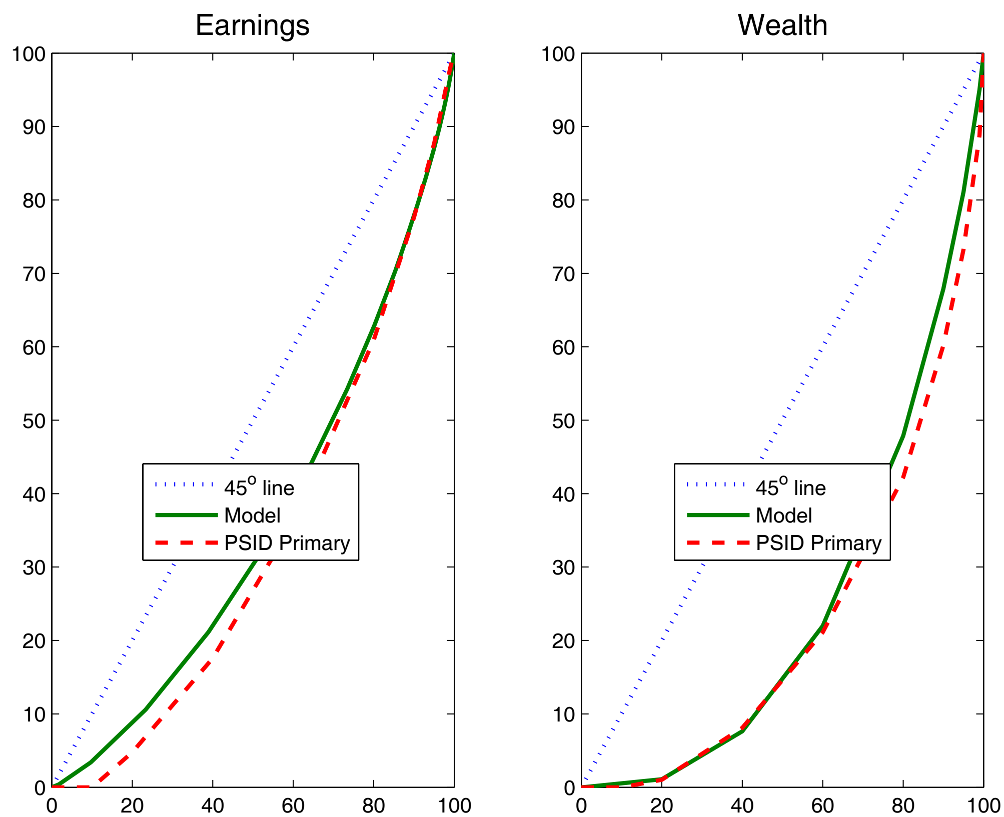
Notes: Given the labor-supply elasticity (γ), we choose the parameter for disutility from working (B) and discount factor (β) to yield the average hours of work of 0.33 and real rate of return of 4% in the "laissez-faire" steady state.

Table 5: Steady States under inelastic and elastic labor supply

	"Laissez-faire" (Levels)	"Egalitarian" (relative to "Laissez-faire")	"Complete Markets" (relative to "Laissez-faire")
Inelastic Labor: $\gamma = 0.1$			
Labor Hours	0.33	+ 1.6 %	- 0.5 %
Labor in Efficiency Units	0.34	+ 0.8 %	+ 0.4 %
Capital	1.47	- 6.8 %	- 7.1 %
Output	0.57	- 1.9 %	- 2.3 %
Consumption	0.42	- 0.3 %	- 0.7 %
Social Welfare		+ 2.4 %	+ 3.2 %
Elastic Labor: $\gamma = 4$			
Labor Hours	0.33	+ 18.3 %	- 26.8 %
Labor in Efficiency Units	0.39	+ 0.4 %	+ 26.7 %
Capital	1.71	- 23.2 %	- 3.2 %
Output	0.67	- 8.8 %	+ 15.0 %
Consumption	0.50	- 3.7 %	+ 21.4 %
Social Welfare		- 7.5 %	+ 30.3 %

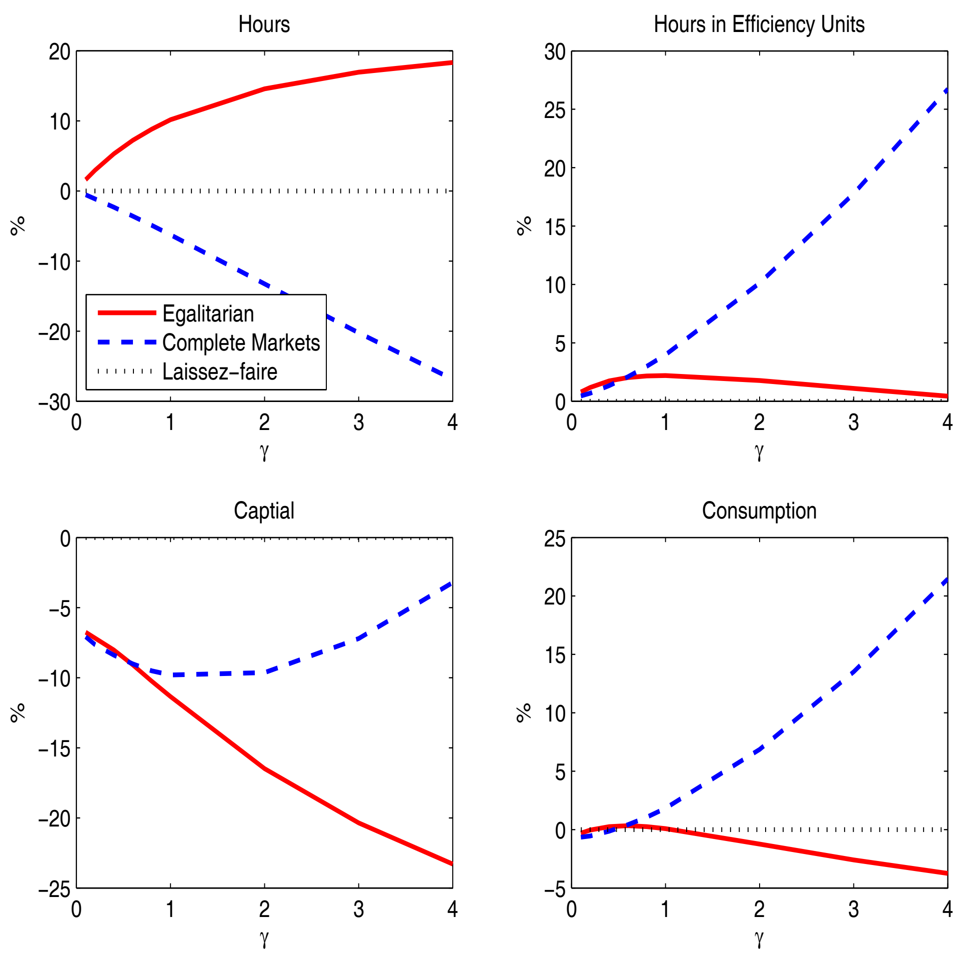
Notes: The numbers for "egalitarian" and "complete markets" are relative to "laissez-faire." The social welfare is measured in consumption-equivalence units.

Figure 1: Lorenz Curves of Earnings and Wealth



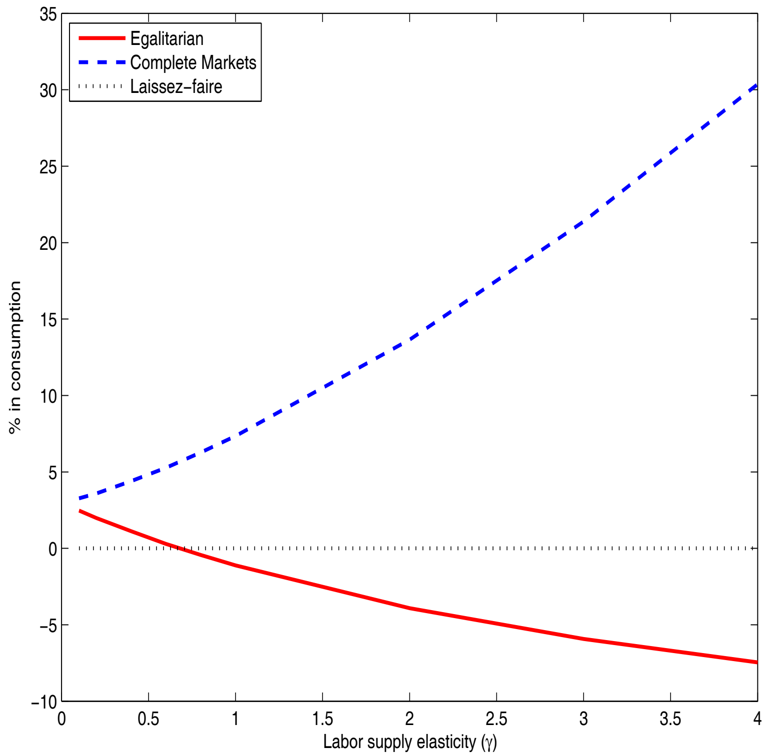
Notes: The PSID statistics reflect the household wealth and earnings in the 1984 survey. The statistics of "Primary Households" are those for household heads whose education level was 12 years and whose age is between 35 and 55. The participation rate is based on individual employment status (household head and spouse) for the same group.

Figure 2: Steady-State Comparison



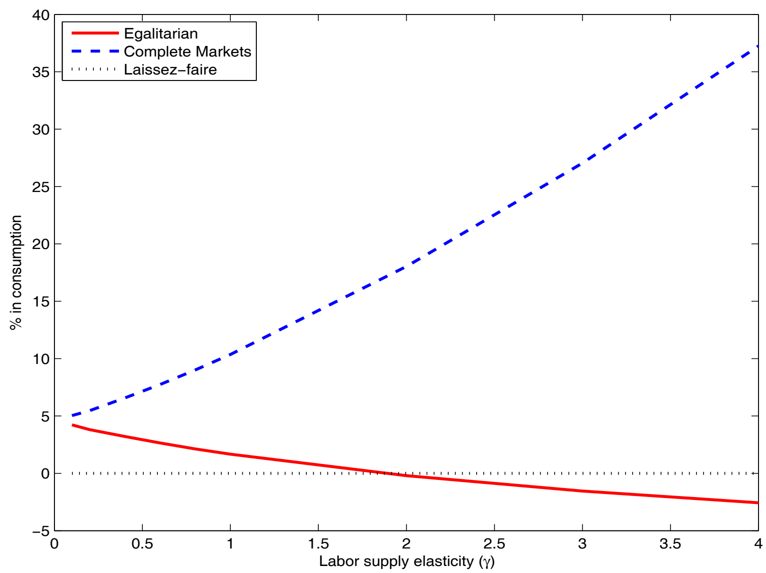
Notes: The numbers for "egalitarian" and "complete markets" are relative to "laissez-faire."

Figure 3: Social Welfare



Notes: The social welfare is measured in consumption-equivalence units relative to the "laissez-faire."

Figure 4: Welfare of the Median



Notes: The numbers for "egalitarian" and "complete markets" are relative to "laissez-faire."