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ABSTRACT

Inequality, Tax Avoidance, and Financial Instability

We model the link between inequality and excessive risk taking. In the presence of increasing returns to tax avoidance, the middle class is willing to take non rewarded financial risk despite risk aversion. Electoral pressure may lead an incumbent politician to endorse this excessive risk taking if the right tail of wealth distribution is sufficiently fat. By increasing the scope for tax avoidance, globalization of capital and human capital markets might have increased financial fragility.

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"We don't pay taxes. Only the little people pay taxes."
Leona Helmsley

1 Introduction

Following the 2007-2009 crisis, substantial attention has been devoted to deciphering the build-up of risk in the U.S. financial system. Numerous studies have underlined the role played by market failures, incentive problems and regulatory loopholes within the financial and banking sectors. For instance, it is frequently argued that artificially low interest rates induced excessive risk taking by fund managers "searching for yield", a view expressed by e.g. Diamond and Rajan (2009), Rajan (2005), or Stiglitz (2010). Other studies emphasize the fact that financial institutions had poor incentives to monitor borrower quality because they were transferring risks through securitization to final investors that were subsidized or unsophisticated (Parlour and Plantin, 2008, Purnanandam, 2010, Shleifer and Vishny, 2010). Yet, for others, the belief that the Fed would bail out "too big" or "too many to fail" institutions triggered excess exposure of individual financial actors to common risk factors (see e.g. Fahri and Tirole, 2010). Such excessive risk taking was facilitated by regulatory loopholes, such as off-balance sheet liabilities, or by taking advantage of favorable ratings provided by rating agencies.

Overall, these analyses point at sources of financial instability that are internal to the financial sector. Without denying their key role in the unfolding of the crisis, this paper focusses on sources of instability that are *external* to the financial system. We aim at putting financial instability in a broader perspective than that of the financial sector. Namely we show that political economy frictions may generate a demand for inefficient risk taking in the face of rising inequality. In our framework, the high level of risk undertaken by U.S. citizens collectively can be interpreted as the equilibrium outcome of imperfect taxation and political forces. In particular, we uncover a link between the increase of inequality and the build-up of financial risk. In doing so, our paper joins the voices of several scholars who have underlined a potential causal channel between inequality and financial fragility (see e.g. Rajan, 2010 and Krugman, 2010). To our knowledge, this is the first paper that formalizes a mechanism through which inequality creates a high level of risk taking and financial instability.

Our model has two main building blocks. The first one analyses the link between taxes and financial risk taking. If post-tax wealth is a convex function of wealth for some range of wealth, a demand for inefficient risk taking arises: Some agents are willing to add risk to their consumption without being compensated for it by a positive risk premium. We show that such convexity arises endogenously in an environment where the government can only imperfectly redistribute wealth. Specifically we introduce a tax avoidance technology with increasing returns to scale, which limits the taxation of wealthy agents. We fully solve a Mirlees program in the presence of such tax avoidance. The optimal tax scheme features a convex kink in the mapping of gross to net wealth. People with gross wealth around this kink have endogenously risk-seeking preferences on pre-tax wealth, while being intrinsically risk averse. This creates a demand for gambles that we characterize.

The key assumption that creates a transmission channel between fiscal policy and financial risk taking is that tax avoidance has increasing returns in wealth. In our model, this leads to decreasing marginal tax rates at the top of the distribution in equilibrium. The idea that tax avoidance involves a fixed cost is in line with anecdotal evidence: in many instances, tax avoidance involves the creation of special purpose vehicles or migration into a favorable country. Only richer people are likely to pay such fixed costs. Several sources document a trend toward higher levels of tax avoidance. In line with the view that post-tax wealth has become a more convex function of wealth, Piketty and Saez (2007) report that the progressivity of the U.S. federal tax system at the top of the income distribution has declined dramatically since the 1960s while average federal tax rates for the middle class have remained roughly constant over time.

The second building block of our model is concerned with the incentives of politicians to ban or endorse such inefficient risk taking. Absent other frictions, a benevolent government would ban inefficient risk taking. If, however, voting has a retrospective component (as is empirically observed), an incumbent politician may decide to encourage inefficient risk taking. The right tail of pre tax wealth distribution drives the politician's decision. In the presence of important inequalities in the form of a fat right tail, the politician endorses excessive risk taking because the bulk of the risk takers take bets with a high probability of success that will induce them to vote for him with a high probability. If, conversely, wealth distribution is more even, then the incumbent prefers to discourage the electorally costly long-shot bets that the middle class would otherwise contemplate.

2 The Importance of Tax Avoidance: Some Motivation

By their very nature, tax avoidance and evasion are hard to measure. Moreover, since (as in our model) the designers of fiscal policies might take tax avoidance constraints into account, there might be little tax avoidance in equilibrium even if tax avoidance is a major force shaping the tax code.

2.1 Tax evasion

Tax evasion is the use of illegal means by individuals (mostly under-reporting of income) to decrease their fiscal burden. Aggregate tax evasion can be estimated by observing the gap between effective taxes paid and expected taxes due given aggregate activity. The IRS defines the gross tax gap as the difference between taxes that would be collected if individuals were truthfully reporting and effective taxes. An IRS study (Internal Revenue Service, 2006, quoted in Slemrod, 2007) provides an extensive estimate of the gross tax gap of $345 billion in 2001. This legally due tax income is not collected as the result of misreporting and amounts to 16.3 percent of estimated actual (paid plus unpaid) tax liabilities. $187 billion from that amount stem from unreported individual income ($109 billion of which comes from unreported business income). There is evidence in this study that evasion for sole proprietor income is very high compared to that for wages. Independently, Pissarides and Weber (1989) estimate that self-employed people in the United Kingdom are on average underreporting their income by about one-third. Schneider and Enste (2000) estimate the size of the shadow economy to be between 10% and 15% of total GDP in OECD countries for the 1989-1993 period. Exploiting inconsistencies in international accounts, Zucman (2010) estimates that 8% of total household financial wealth is held in tax havens.

2.2 Tax avoidance

Contrary to plain evasion, tax avoidance consists in using legal means to avoid paying taxes. A major source of tax avoidance is the transformation of labor income into capital income (dividends or capital gains), which allows to avoid payroll and wage taxes. The ability of private equity and hedge fund managers to structure their pay as carried interest, which is taxed as dividends is an example of such legal avoidance. Our modelling choices involve the existence of increasing returns in tax avoidance. Fixed costs associated with tax avoidance can be interpreted as those of setting up a business entity to collect dividend income rather than wages, or the cost of paying a lawyer to set-up a tax optimization structure. If such fixed costs exist, people who have high incomes are more likely to pay their taxes as capital income. Consistent with this, there is substantial evidence that at the top of the distribution, individuals' income includes a disproportionate fraction of capital and business income (see e.g. Piketty and Saez (2007)).

The UK tax code offers a striking built-in example of such fixed costs to tax avoidance. Eligible individuals (e.g., foreign residents) can claim the non-UK domicile tax status against a lump sum payment of £50,000. This status entails that no income earned outside the UK is reportable to nor taxed by the UK tax authorities.

Avoidance can also take the form of geographic mobility. For instance, using data on the geographic mobility of soccer players, Kleven, Landais and Saez (2010) document a very high elasticity of location choice to taxes at the top of the distribution. Last, avoidance can take the form of biased occupational choice. For instance, an abnormally high fraction of the population is likely to invest in human capital which is harder to tax (e.g. becoming a hedge fund manager).

2.3 Time Trends

The globalization of capital and labor markets since the 70s might have decreased the ability of governments to tax the rich. "Tax havens" and "tax shelters" have become commonly used names over that period. Schneider (2000) documents a sharp increase in the size of the shadow economy between 1970 and 1998 across OECD countries. Simultaneously, the fiscal pressure on high incomes has decreased in the US. Piketty and Saez (2007) document a sharp decrease in the progressivity of US federal income taxes between 1960 and 2004. In their data, the top US income group paid 71.4% of their income in 1960 as taxes but only 34.7% in 2004. Krueger and Perri (2004), using data on disposable income find that the gap between total earnings and disposable earnings inequality has declined over time and conclude that this is a likely consequence of the fact that the government tax and transfer system has become less progressive over time, causing an increase in disposable earnings inequality. Landais Saez and Piketty (2011) show that in France, income taxes have become regressive at the top of the distribution.

At the same time, there is evidence that the level of individual risk taken by individuals has risen. Dynan et al. (2008) investigates the volatility of household income using household level data from the PSID and find that the standard deviation of time changes in household-level income rose by a third from the early 1970s to the early 2000s (see also Krueger and Perri (2004)). They show that this rise of household income volatility is due to a greater frequency of very large income changes. Our model provides a link between these two trends (less progressive taxes and increased individual risk taking).

3 Increasing Returns to Tax Avoidance and The Mirrlees Problem

3.1 Optimal Taxation Under Increasing Returns to Tax Avoidance

Consider a population comprised of a continuum of individuals with unit mass. There is a single consumption good. Individuals consume positive quantities at a single date, and have identical preferences represented by an increasing and strictly concave utility function u such that $u'(0) = +\infty$, $\frac{u(y)}{y} \underset{y \to +\infty}{\to} 0$. Individuals differ only with respect to their initial endowments of the consumption good ("wealth"). All endowments are positive. Let $F(.)$ denote the wealth distribution, which is common knowledge. We suppose that

$$\int_0^{+\infty} w dF(w) < +\infty,$$

and that the support of the distribution is equal to $[0, +\infty)$. The assumption of an unbounded support is only meant to simplify the discussion. That the support is an interval is the substantial (and arguably realistic) part of the assumption.

A social planner seeks to maximize utilitarian welfare. The social planner faces an informational friction. Each individual privately observes its endowment, and can secretly consume all or part of it before reporting the residual. An individual who reports only y units out of a total endowment of x secretly consumes $G(x, y)$, where G is continuous, and satisfies

$$x \geq y \geq 0 \to 0 \leq G(x, y) \leq x - y. \tag{1}$$

This secret consumption adds up to the amount that the individual receives after the social planner redistributes aggregate reported income.

In application of the Revelation Principle, one can write down the planner's problem using only direct mechanisms. A direct mechanism is a pair of functions of wealth $(r(w), v(w))$ such that an individual with wealth w has the incentive to report $r(w) \in [0, w]$, and receives $v(r(w))$ from the social planner after doing so. The social planner solves the program $(\wp)$:

$$\max_{r,v} \int_0^{+\infty} u\left(v(r(w)) + G\left(w, r(w)\right)\right) dF(w)$$

$$s.t. \begin{cases} \int_0^{+\infty} v(r(w))dF(w) \leq \int_0^{+\infty} r(w)dF(w), \\ \forall w, w' \geq 0 \; s.t. \; r(w') \leq w, \\ v(r(w)) + G\left(w, r(w)\right) \geq v(r(w')) + G\left(w, r(w')\right). \end{cases} \quad (2)$$

We show that the solution to this program $(\wp)$ is very simple when the losses from wealth diversion are subadditive:

Proposition 1
Suppose that for all $x \geq y \geq z \geq 0$,

$$G(x, y) + G(y, z) \leq G(x, z). \quad (3)$$

Then the solution to $(\wp)$ is attained with (r^*, v^*) defined as

$$\begin{cases} r^*(w) = w, \\ v^*(w) = G\left(w, 0\right) + \int_0^{+\infty} \left(t - G(t, 0)\right) dF(t), \end{cases} . \quad (4)$$

Proof. See the Appendix.■

Proposition 1 first states that there is no tax avoidance in equilibrium. This is a direct consequence from (3), and was already noted by Grochulski (2007).[1] The intuition is that any incentive-compatible tax scheme that implies some diversion can be replaced by a more efficient one that entails no diversion. To see this, suppose that a mechanism (r, v) implies $\int r(w)dF(w) < \int wdF(w)$. Then the social planner might as well devise a new scheme whereby an individual with wealth w reports w and receives $v(r(w)) + G(w, r(w)) + \varepsilon$ for $\varepsilon > 0$ sufficiently small. We have

$$\begin{aligned} v(r(w)) + G(w, r(w) &\geq v(r(w')) + G(w, r(w')), \\ &\geq v(r(w')) + G(w', r(w')) + G(w, w'). \end{aligned}$$

The first line stems from the incentive-compatibility of (r, v), the second one from (3). This second inequality means that this new mechanism is also incentive-compatible. It is Pareto improving since the wealth destruction induced by tax avoidance disappears. Second, Proposition 1 exhibits the most redistributive scheme among all "avoidance-free" ones.

[1] Grochulski (2007) studies the particular case in which $G(x, y) = \int_y^x \lambda(t)dt$, with $\lambda \in (0, 1)$. That is, the cost of avoiding taxes on a given dollar depends only on the "rank" of this dollar in one's pre-tax wealth, but neither on total wealth nor on the diverted fraction of it.

3.2 Increasing Returns to Tax Avoidance and Risk Taking

This section develops one of the two main building blocks of our model: risk-taking incentives induced by increasing returns to tax avoidance. To do so, we enrich the previous model as follows.

First, we assume that two tax avoidance technologies are available to individuals. The first one dissipates a fixed fraction $\lambda \in (0,1)$ of each diverted unit of consumption. The second one wastes only $\lambda - \Delta\lambda \in (0,\lambda)$ out of each diverted consumption unit, but comes at a fixed cost $c\Delta\lambda > 0$ per individual. In sum, we assume that

$$G(x,y) = g(x-y),$$

with

$$g(x) = (1-\lambda)\,x + \mathbf{1}_{\{x \geq c\}}\Delta\lambda\,(x-c)\,.$$

Second, the economy has now two dates, 0 and 1. Individuals receive their endowment at date 0. They value only consumption at date 1, which is also the date at which the social planner announces the redistribution scheme. Let F_0 denote the date-0 wealth distribution, which is assumed to have full support over $[0,+\infty)$. A risk-free storage technology with unit return is available to all individuals for the transfer of their endowment from date 0 to date 1. A fraction $f \in (0,1)$ of the population may also add to this risk-free return a diversifiable (and thus not rewarded) risky return with any unit-mean distribution. To simplify the discussion, we assume that this fraction has the same initial wealth distribution F_0 as that of the overall population.

At date 1, the social planner observes the realized endowment distribution F_1 and announces a tax scheme. This amounts to assume that the social planner cannot credibly commit to a tax scheme at date 0.[2]

We solve for the subgame perfect equilibria of this economy. An equilibrium is characterized as follows:

- The social planner announces an optimal redistribution scheme after observing the date-1 wealth distribution F_1.

- Rationally anticipating the realization of F_1 and the planner's decision, each individual i with risk-taking ability optimally chooses the risk profile of her storage technology.

- F_1 is consistent with the risk profiles chosen by the individuals.

[2] In the next section, such welfare maximization without commitment will stem from electoral competition, as in Farhi et al. (2011).

Since F_0 has full support over $[0, +\infty)$, then so must F_1. Thus, Proposition 1 applies at date 1. This means that upon observing F_1, the social planner simply implements the scheme

$$v(w) = g(w) + \int_0^{+\infty} (u - g(u))\, dF_1(u). \tag{5}$$

We now need to solve for the optimal risk-taking of an individual who can store with risk at date 0 given her endowment and beliefs about F_1. Such an individual $i \in [0, 1]$ with initial wealth w_i faces the following problem:

$$\begin{aligned} &\sup_{\mu \in B} \int_0^{\infty} u(v(w))d\mu(w) \\ &s.t. \quad \int_0^{\infty} w d\mu(w) = w_i, \end{aligned} \tag{6}$$

where B is the set of Borelian probability measures over $[0, +\infty)$. Notice that F_1 enters in (6) only to determine the constant term in v. Let $S\left(w_i\right)$ denote the solution of this problem, and $S^*\left(w_i\right)$ denote the solution of the dual problem, which given the primal problem (6) takes the following form:

$$\begin{aligned} S^*\left(w_i\right) &\equiv \inf_{(z_1,\, z_2) \in \mathbb{R}^2} z_1 + w_i z_2 \\ s.t. \quad \forall w &\geq 0, z_1 + w z_2 \geq u(v(w)). \end{aligned}$$

In words, the dual problem minimizes the value at w_i of a straight line that is above the graph of $u \circ v$. Proposition 1 in Makarov and Plantin (2011) shows that $S\left(w_i\right) = S^*\left(w_i\right)$. It is then easy to derive graphically the solution to the dual problem for a given arbitrary distribution F_1. Recall that v is linear everywhere except for a convex kink at c. Refer to Figure 1.

Figure 1 here

The concavification of $u \circ v$ - that is, the smallest concave function above $u \circ v$, is equal to $u \circ v$ outside $[\underline{w}, \overline{w}]$, and is the chord between $(\underline{w}, u(v(\underline{w}))$ and $(\overline{w}, u(v(\overline{w}))$ over $[\underline{w}, \overline{w}]$. The dual problem is solved with the tangent of $u \circ v$ outside $[\underline{w}, \overline{w}]$ and with this chord otherwise. Thus,

$$\begin{cases} S\left(w_i\right) = u(v(w_i)) \ if \ w_i \notin \left(\underline{w}, \overline{w}\right), \\ S\left(w_i\right) = \frac{w_i - \underline{w}}{\overline{w} - \underline{w}} u\left(v\left(\overline{w}\right)\right) + \frac{\overline{w} - w_i}{\overline{w} - \underline{w}} u(v(\underline{w})) \ if \ w_i \in \left(\underline{w}, \overline{w}\right). \end{cases}$$

This means that individuals who can add risk to the risk-free return do not do so when $w_i \notin (\underline{w}, \overline{w})$, while the others enter into fair binary bets that pay either $\overline{w}$ or $\underline{w}$ with probabilities that depend on w_i. Refer to Figure 2.

Figure 2 here

This solution to investors' problem given F_1 ensures that a candidate equilibrium F_1 must be such that there exists $\underline{W} < c < \overline{W}$ such that

- F_1 coincides with F_0 over $[0, \underline{W})$ and $\left(\overline{W}, +\infty\right)$;

- F_1 adds a mean preserving spread to F_0 over $\left[\underline{W}, \overline{W}\right]$. Namely, denoting μ_F the measure induced by a c.d.f. F,

$$\mu_{F_1}\left(\left(\underline{W}, \overline{W}\right)\right) = (1-f)\mu_{F_0}\left(\left(\underline{W}, \overline{W}\right)\right),$$

and the residual mass $f\mu_{F_0}\left(\left(\underline{W}, \overline{W}\right)\right)$ is split into two atoms of F_1, in $\underline{W}$ (with mass $f\int_{\left(\underline{W}, \overline{W}\right)} \frac{\overline{W}-w}{\overline{W}-\underline{W}} dF_0(w)$) and $\overline{W}$ (with mass $f\int_{\left(\underline{W}, \overline{W}\right)} \frac{w-\underline{W}}{\overline{W}-\underline{W}} dF_0(w)$).

An equilibrium is then such that $\underline{w} = \underline{W}$ and $\overline{w} = \overline{W}$, where $(\underline{w}, \overline{w})$ is defined above as the interval over which the concavification of $u \circ v$ (for this given F_1) is linear. Standard compacity and continuity arguments ensure that the mapping from a pair $\left(\underline{W}, \overline{W}\right)$ into a pair $(\underline{w}, \overline{w})$ has a fixed point, so that there exists at least one equilibrium. Further, that $u'(0) = +\infty$, $\frac{u(y)}{y} \underset{y \to +\infty}{\longrightarrow} 0$ ensures that all equilibrium pairs $(\underline{w}, \overline{w})$ are included in a compact subset of $(0, +\infty)$. The following proposition collects these results.

Proposition 2

There exists an equilibrium. There exists $m, M > 0$ such that every equilibrium is fully characterized by two wealth levels $\underline{w}$ and $\overline{w}$ satisfying $m < \underline{w} < c < \overline{w} < M$. In this equilibrium, each individual with the ability to take risk does so if and only if its initial wealth w belongs to $(\underline{w}, \overline{w})$. In this case it invests with binary payoffs $\{\underline{w}; \overline{w}\}$. The high payoff has probability $\frac{w-\underline{w}}{\overline{w}-\underline{w}}$. All other individuals invest in the risk-free technology. This implies that F_0 dominates F_1 in the sense of second-order stochastic dominance, and that a fraction f of individuals with initial wealth within $(\underline{w}, \overline{w})$ is transformed into individuals with wealth levels $\underline{w}$ or $\overline{w}$.

Proof. See above.■

While we are unable to establish equilibrium uniqueness in general, we offer in Proposition 2 a qualitative description of all equilibria that has interesting empirical content. Refer to Figure 3.

Figure 3 here

In all equilibria, there is an interval of the wealth distribution containing c in which a fraction f of the distribution is relocated at the two boundaries of the interval between dates 0 and 1. We interpret this as a "shrinking middle-class" phenomenon. People belonging to this "middle class" become risk-loving because the prospects from avoiding taxes more efficiently in case of success more than offset increased uncertainty in future consumption. Increasing returns to tax avoidance thus have an impact on *gross* inequality because they induce riskier behavior. Our abstract one-period gambles can be interpreted literally as financial risk-taking, such as taking on mortgages with very high loan-to-value ratios or defered amortization (such as interest only or balloon mortgages). The principal lever available to many individuals willing to add risk to their future consumption consists actually in generating riskier returns to their human capital. Opting for a career in the financial services industry or becoming self-employed generates such risk increases (and may, in addition, yield a risk premium). Such a shift towards finance jobs and self-employment have been observed in the U.S. over the last two decades.

The analysis of the case in which the social planner can announce a tax scheme at date 0 and credibly commit to it at date 1 generates useful insights into the welfare implications of risk taking. Denote F_1 the date-1 distribution associated with the equilibrium that delivers the largest utilitarian welfare among all possible equilibria without planner commitment described in Proposition 1. For this equilibrium, denote $\widetilde{w}$ the random date-1 pre-tax wealth of an individual with date-0 wealth w. If the individual does not gamble in this equilibrium, then $\widetilde{w}$ is deterministic, equal to w. If an individual with initial wealth w gambles, then $\widetilde{w}$ is a binary variable taking values $\{\underline{w}; \overline{w}\}$ with mean w. Suppose that the social planner can credibly commit at date 0 to the date-1 tax scheme:

$$z(w) = u^{-1}\left(E\left(u\left(g(\widetilde{w}) + \int_0^{+\infty} (t - g(t))\, dF_1(t)\right) + \varepsilon\right)\right)$$

with $\varepsilon > 0$ small. We have

Lemma 3

If the social planner can commit to scheme z, individuals do not gamble. The scheme z satisfies constraints (2) with $F = F_0$ and $G(x,y) = g(x-y)$.

Proof. See Appendix.

By construction, scheme z generates a strictly higher welfare per individual than that of any equilibrium with gambling. Thus, commitment power has strictly positive social alue. Further, scheme z satisfies contraints (2), and is thus strictly less efficient than the scheme that would prevail absent any possibility for individuals to gamble $g(w) + \int_0^{+\infty} (u - g(u))\, dF_0(u)$. This readily implies

Proposition 4

Risk taking is (strictly) socially inefficient.

The intuition behind these results is the following. When taking risk, a given individual improves her own situation given the tax scheme, but fails to internalize a negative externality that she creates for other individuals. This externality stems from the fact that a riskier date-1 wealth distribution (in the sense of second order stochastic dominance) implies that the date-1 tax scheme is less redistributive: Gambling reduces the expected fraction of one's date-1 wealth that is available for redistribution. A social planner with commitment power can alleviate this issue by offering a scheme such as z that deters risk taking. The idea behind scheme z is that the social planner implements himself through the tax scheme the concavification of $u \circ v$ that individuals realize themselves through costly gambles absent commitment. This is Pareto improving, but still comes at the cost that the social planner cannot redistribute as much as he would absent gambling.

The case with commitment generates useful insights, but we find such commitment power implausible in countries with frequent electoral competitions that are of interest to us. The next section brings such electoral concerns in the picture.

4 Tax Avoidance, Inequality, and the Political Economy of Risk Taking

This section assumes that date-1 taxation power accrues to the winner of an election. Two politicians, an incumbent and his challenger, face off in a date-1 election. After F_1 is realized, they each announce a platform comprised of a redistribution scheme, and individuals vote according to criteria that we shall describe shortly. At date 0, the incumbent can decide in favor of or against the ban of risk taking.[3] Politicians maximize the probability of winning the election.

An important lever available to governments willing to control risk taking by society is financial regulation, in particular the prudential regulation of financial intermediaries. It consists mainly in fairly technical rules for which "the devil is in the details". These crucial details are typically not subject to parliamentary approval, nor much discussed in the public debate. For example, before the 2008 crisis erupted, how to treat the liquidity options

[3] We discuss a larger space of regulatory choices later.

granted by banks to their SIVs, or how to determine bank capital requirements for AAA structured products were questions discussed mainly among small groups of officials and experts, even though they directly determined the effective leverage of banks. Accordingly, we assume that the incumbent politician has a free hand at making a discretionary regulatory choice at date 0.

Voting Behavior

We adopt a probabilistic voting framework. We index by 1 the incumbent politician and by 2 his challenger, and denote by v_j each redistribution scheme, where $j \in \{1; 2\}$. Individual $i \in [0, 1]$ votes for the incumbent if

$$u(v_1(w_i)) - u(v_2(w_i)) + \widetilde{\delta}_i + \widetilde{\varepsilon} > 0, \tag{7}$$

He votes for the challenger if inequality (7) is reversed, and tosses a fair coin otherwise. The shock $\widetilde{\varepsilon}$ is a popularity shock that is drawn at date 1 from a uniform distribution over $[-\Gamma, \Gamma]$. The shock $\widetilde{\delta}_i$ is individual-specific.

We add a novel component to this otherwise standard probabilistic-voting framework by assuming that $\widetilde{\delta}_i$ is determined retrospectively. First, if an individual i willing to take risk is banned from doing so, then $\widetilde{\delta}_i = -\mu$, where $\mu > 0$. This popularity cost may capture lost campaign financing from the industry that manufactures gambles. Second, in case of gambling, $\widetilde{\delta}_i$ is equal to $\delta > 0$ if i's gross endowment increases between dates 0 and 1, and to $-\delta$ if it decreases.

In other words, we introduce retrospective voting in our probabilistic voting setup. Retrospective voting is an empirical regularity within many electoral contexts, in particular in U.S. national elections (see, e.g., Fiorina, 1978, Kramer, 1971). Here, we posit it as an exogenous behavioral trait, along the lines of Nordhaus (1975) or Lindbeck (1976). In line with our modelling, Healy et al. (2010) or Wolfers (2007) offer recent evidence suggesting that welfare shocks that are unrelated to an incumbent politician's ability or effort affect its probability of reelection. [4]

Suppose that u is bounded above and that

$$\Gamma > \sup u + \sup\{\delta, \mu\}. \tag{8}$$

We study subgame-perfect equilibria. More precisely, an equilibrium can be described backwards as follows:

[4] We could alternatively model retrospective voting as a socially useful disciplining device a la Barro (1973). We conjecture that this would not affect the positive results that we obtain below. But this would of course have different welfare implications.

- At date 1, after observing history (in particular the realization of F_1) politicians announce platforms that constitute a Nash equilibrium, and voting takes place.

- Rationally anticipating these platforms, individuals make risk-taking decisions at date 0 if they are allowed to do so.

- Initially, the incumbent optimally chooses to ban risk taking or not, trading off the expected regulatory costs and the electoral consequences.

Working our way recursively, we have the following results. First, at date 1, after F_1 is determined, condition (8) classically implies that the unique Nash equilibrium is that politicians offer identical platforms that maximize utilitarian welfare. Thus they both propose the same scheme (5). Given this, equilibrium risk-taking decisions are characterized by Proposition 2. It remains to pin down the incumbent's initial regulatory decision. This could be problematic absent uniqueness of the equilibrium outcome of the risk-taking game. The properties of equilibria established in Proposition 2 suffice, however, to generate insights into what drives the deregulation of risk taking. Proposition 5 first illustrates the role of the retrospective voting parameters δ and μ.

Proposition 5

Define m, M as in Proposition 2. Suppose that F_0 is a concave function over $[m, M]$. Then if all else equal $\frac{\mu}{\delta}$ is sufficiently small, the incumbent politician bans risk taking.

Proof. The incumbent bans risk taking if the expected aggregate retrospective vote net of expected regulatory costs is positive. If the incumbent allows risk taking and believes in an equilibrium characterized by $(\underline{w}, \overline{w})$, then he expects a net benefit from allowing risk taking equal to

$$\delta \int_{(\underline{w},\overline{w})} \left(\frac{w - \underline{w}}{\overline{w} - \underline{w}} - \frac{\overline{w} - w}{\overline{w} - \underline{w}} \right) dF_0(w) + \mu \left(F_0(\overline{w}) - F_0(\underline{w}) \right),$$

which is positive iff

$$E \left(\frac{w - \underline{w}}{\overline{w} - \underline{w}} \mid w \in [\underline{w}, \overline{w}] \right) > \frac{1 - \frac{\mu}{\delta}}{2} \tag{9}$$

F_0 is concave and thus absolutely continuous over $[m, M]$. It therefore admits a decreasing density over $[m, M]$. Thus, for all equilibrium $(\underline{w}, \overline{w})$

$$E \left(w \mid w \in [\underline{w}, \overline{w}] \right) < \frac{\underline{w} + \overline{w}}{2},$$

which implies that (9) does not hold if, *ceteris paribus,* $\frac{\mu}{\delta}$ is sufficiently small.■

If, conversely, F_0 was convex over $[m, M]$, then a sufficiently small $\frac{\mu}{\delta}$ would lead the governement to encourage risk taking. We consider the assumption that F_0 is concave over $[m, M]$ to be very plausible. The individuals whose wealth is not too far form the threshold c where sophisticated tax optimization is available must be significantly wealthier than average in practice. They must lie in the region of the wealth distribution where density is decreasing. Risk taking is detrimental to the incumbent politician in this case because it means that a majority of the risk takers would like to take "long-shot" bets. Total failures would outnumber total successes, which overall yields negative retrospective votes. If costs of regulation are sufficiently small compared with the impact of one's wealth fluctuation on one's voting criterion, then the government finds it optimal to ban risk shifting.

Proposition 5 fixes wealth distribution and studies the impact of the voting parameters on the incumbent politician's decision. The next proposition studies the impact of wealth distribution on this decision, holding voting parameters constant. To simply parameterize the problem, we suppose that wealth is distributed according to a power law:

$$1 - F_0(w) = \left(\frac{(\alpha - 1) I}{\alpha w}\right)^{\alpha}, \tag{10}$$

where $\alpha > 1, 0 < I < c$. I is thus average wealth, and $\frac{(\alpha-1)I}{\alpha}$ is the lower bound on endowments.[5] We also suppose that u is continuously differentiable, and that $\mu < \delta$.

Proposition 6

The incumbent politician authorizes risk taking if, ceteris paribus, α and $\Delta\lambda$ are sufficiently small. Conversely he bans risk taking for α sufficiently large other things being equal.

Proof. Specification (10) for F_0 implies that one can rewrite (9) as

$$\frac{1}{x-1}\left(\frac{\alpha}{\alpha-1}\frac{x^{\alpha}-x}{x^{\alpha}-1}-1\right) > \frac{1-\frac{\mu}{\delta}}{2} \tag{11}$$

where $x = \frac{\overline{w}}{\underline{w}}$.

[5]Introducing a positive lower bound for wealth distribution does not affect any of the previous results, except for the fact that there might now be gambling equilibria where $\underline{w} = \frac{(\alpha-1)I}{\alpha}$.

Thus, if all else equal $\alpha \to +\infty$, then the left-hand side of (11) tends to 0, uniformly over any closed subset of $(1, +\infty)$. This implies that the incumbent bans risk shifting when α is sufficiently large.

If all else equal $\alpha \to 1$, then

$$E\left(\frac{w - \underline{w}}{\overline{w} - \underline{w}} \mid w \in [\underline{w}, \overline{w}]\right) \to \frac{1}{x-1}\left(\frac{x \ln x}{x-1} - 1\right),$$

which decreases from $\frac{1}{2}$ to 0 over $[1, +\infty)$. To prove the result, it then suffices to show that all equilibrium thresholds $(\underline{w}, \overline{w})$ are such that x can be made arbitrarily close to 1 for $\Delta\lambda$ sufficiently small regardless of the value of α. To see this, notice that all equilibrium thresholds $(\underline{w}, \overline{w})$ satisfy by definition

$$\begin{aligned} & (1-\lambda)\, u'\left(g(\underline{w}) + \int_0^{+\infty} (u - g(u))\, dF_1(u)\right) \\ = \; & (1 - \lambda + \Delta\lambda)\, u'\left(g(\overline{w}) + \int_0^{+\infty} (u - g(u))\, dF_1(u)\right), \end{aligned}$$

or

$$\begin{aligned} & (1-\lambda)\left(\begin{array}{c} u'\left(g(\underline{w}) + \int_0^{+\infty} (u - g(u))\, dF_1(u)\right) \\ -u'\left(g(\overline{w}) + \int_0^{+\infty} (u - g(u))\, dF_1(u)\right) \end{array}\right) \\ = \; & \Delta\lambda u'\left(g(\overline{w}) + \int_0^{+\infty} (u - g(u))\, dF_1(u)\right) \end{aligned} \tag{12}$$

The right-hand side is smaller than $\Delta\lambda u'((1-\lambda)c)$ and thus tends to 0 as $\Delta\lambda \to 0$ uniformly over all α and all equilibria $(\underline{w}, \overline{w})$. Since $\underline{w} < c < \overline{w}$ and u'^{-1} is continuous, equality (12) implies that x can be made arbitrarily close to 1 for all α and all equilibria $(\underline{w}, \overline{w})$ provided $\Delta\lambda$ is sufficiently small. This concludes the proof.■

Proposition 6 may be viewed as a political-economy version of the risk-shifting problem introduced by Jensen and Meckling (1976) in corporate finance. This seminal paper shows that overly leveraged firms may undertake value-destroying projects provided these are sufficiently risky. Here, an incumbent politician is willing to endorse excessive risk taking only if he faces sufficiently high inequalities. In this case, the aggregate fractions of successful and unsuccessful risk takers are sufficiently close that savings on regulatory costs offset the aggregate electoral costs. Inequality coupled with retrospective voting spurs inefficient political risk seeking.

5 Extensions

Asymmetric Retrospective Voting

In order to assess simply how our results depend on our particular specification of the retrospective component of the vote, consider the case in which the individual-specific shock is equal to δ_+ $(-\delta_-)$ in case of positive (negative) wealth change. It is easy to check that ((9) becomes in this case:

$$E\left(\frac{w-\underline{w}}{\overline{w}-\underline{w}} \mid w \in [\underline{w}, \overline{w}]\right) > \frac{\delta_- - \mu}{\delta_+ + \delta_-}.$$

We have established that the left-hand side gets close to 1/2 when the right tail of wealth distribution is fat, to 0 when it is thin. This implies that if

$$2\mu > \delta_- - \delta_+, \tag{13}$$

then the incumbent politician never encourages inefficient risk taking, while he does so for a sufficiently fat wealth tail when the inequality is reversed. Overall, it means that risk taking is all the more likely to be promoted when retrospective voters reward good outcomes more than they punish bad ones, in line with our interpretation of the model as a political-economy version of the Jensen-Meckling asset substitution problem.

Partial Risk Regulation

Wealth-contingent regulation

De facto, financial regulation conditions the amount of risk that an individual can take on his wealth. For example, hedge funds can tap high net worth individuals without restriction, but have no direct access to the general public. Investments that benefit from tax subsidies such as retirement savings are typically intermediated by institutions subject to some prudential regulation. The common justification for this pertains to consumer protection: Investors who are not financially sophisticated nor can afford sophisticated advice must be shielded from taking risks that they do not fully understand nor measure. In our setup, the incumbent politician would find such wealth-contingent regulation highly valuable. Since the probability of success of a gamble increases with the gambler's wealth, the incumbent could use such a regulation to rule out politically costly long-shot gambles, and allow only those that have a high probability of success. This "Machiavellian" motive for wealth-contingent investor protection is novel, to our knowledge.

Favoring "fake alpha" strategies

The incumbent likes voters to undertake gambles that have a low probability of failure. Specifically, it benefits strictly from any gamble that has a probability of success higher that its probability of failure. If it has the technology to do so, the incumbent will thus forbid gambles with high probability of failure (those that the relatively poorer want to undertake) and will encourage gambles that have a high probability of small gains and a low probability of a large loss. These risk-profiles, labelled by Rajan (2010) as "fake alpha" strategies, are produced when collecting an insurance risk-premium against the exposure to a large disaster risk (e.g. carry trade strategies) or when "riding a bubble". Such strategies might have been encouraged through indirect public subsidies such as the implicit guarantee of the GSAs.

Idiosyncratic Versus Systematic Risk Taking

We focus on an environment without aggregate uncertainty for simplicity. In practice, the occupational or financial risk-seeking behaviors that we have in mind involve exposure to systematic risk. This exposure may not be entirely deliberate. Large bets involve leverage (mortgages, student loans,...). With limited liability, leverage is cheaper with collateral, which may expose unwitting agents to the systematic component of collateral value fluctuations. In our environment, individuals should actually value bets that are negatively correlated with systematic risk. It is preferable to be wealthy when redistribution is small because of a negative aggregate shock than when it is more generous.

Endogenous Tax Avoidance Technology and Multiple Equilibria

Another possible extension consists in endogenizing the tax-avoidance technology. Suppose that the introduction of the costlier and more efficient avoidance technology $\lambda - \Delta\lambda$ comes at an overall fixed cost K. Such a fixed cost can be interpreted as the cost of political influence. It may also be the domestic taxes lost by a competing country that reduces its tax rates to induce high-net wealth individuals to relocate. In this case, the risk-taking decisions would become strategic complements. If a sufficiently high fraction of the middle class takes risks, then the fixed cost K is spread among sufficiently many individuals that the sophisticated avoidance technology becomes viable. This vindicates taking risk in the first place. This could lead to multiple Pareto-ranked equilibria. In the worst equilibria, maximal risk-taking would generate important gross inequality, and efficient tax avoidance would in turn imply that net inequality be important as well.

6 Appendix

Proof of Proposition 1

Step 1. We first show that a tax scheme that satisfies constraints (2) and such that

$$\int r(w)dF(w) < \int wdF(w) \tag{14}$$

cannot be optimal. From such a scheme (r, v), fix $\varepsilon > 0$ and define the scheme (r^*, v^*) as

$$\begin{aligned} r^*(w) &= w, \\ v^*(w) &= v(r(w)) + G(w, r(w)) + \varepsilon. \end{aligned}$$

Clearly, this new scheme is strictly preferable to (r, v) because it delivers more consumption at any income level. This new scheme is incentive-compatible: for all $w \geq w'$, we have

$$\begin{aligned} v(r(w)) + G(w, r(w)) + \varepsilon &\geq v(r(w')) + G(w, r(w')) + \varepsilon, \\ &\geq v(r(w')) + G(w', r(w')) + G(w, w') + \varepsilon. \end{aligned}$$

The first inequality stems from the fact that (r, v) is incentive-compatible, and the second one follows from (3). Further, this new scheme (r^*, v^*) is feasible for ε sufficiently small because it does not waste resources through tax avoidance while (r, v) does from (14). Thus, (r^*, v^*) satisfies (2) for ε sufficiently small and strictly dominates (r, v), which establishes the result. Thus, one can assume $r(w) = w$ w.l.o.g.

Step 2. Consider the following auxiliary program $(\wp')$:

$$\max_v \int_0^{+\infty} u\left(v(w)\right) dF(w)$$
$$s.t. \begin{cases} \int_0^{+\infty} v(w)dF(w) \leq \int_0^{+\infty} wdF(w), \\ \forall w \geq 0,\ v(w) \leq G\left(w, 0\right) + v(0). \end{cases} \tag{15}$$

We will show that

$$V(w) = G\left(w, 0\right) + \int_0^{+\infty} \left(t - G(t, 0)\right) dF(t)$$

attains the solution of ($\wp'$). Notice that V satisfies (15).

Consider a function v that attains the solution of ($\wp'$). Clearly, v must be (weakly) increasing. Thus, v admits a right limit $v(x^-)$ and a left limit $v(x^+)$ at each point $x \in (0, +\infty)$. Suppose that for some $x_0 \in (0, +\infty)$, $v(x_0^-) < v(x_0^+)$. Then one could slightly increase v in the left neighborhood of x, slightly decrease it in the right neighborhood, and thus strictly increase social welfare while still satisfying constraints (15). Thus v must be continuous over $(0, +\infty)$ (and with a similar argument also right-continuous in 0).

Suppose now that for some $x_1 \in (0, +\infty)$,

$$v(x_1) > G(x_1, 0) + v(0). \tag{16}$$

Since v and G are continuous, inequality (16) actually holds over some neighborhood Ω of x_1. Consider a bounded measurable function h with support within Ω s.t. $\int hdF = 0$. The function

$$w \to v(w) + th(w)$$

satisfies constraints (15) for t sufficiently small. Thus it must be that

$$\Phi(t) = \int_0^{+\infty} u\left(v(w) + th(w)\right) dF(w)$$

has a local maximum in 0, or that

$$\Phi'(0) = \int_0^{+\infty} u'\left(v(w)\right) h(w) dF(w) = 0.$$

since it holds for any function h, it must be that v is constant over Ω. Clearly this implies that v must be constant over $[0, x_1)$, which cannot be unless $G(., 0)$ is equal to 0 over this interval. In any case, this contradicts (16). Thus $v = V$.

Since constraints (15) are necessary conditions for constraints (2) and V happens to satisfy (2) from (3), this concludes the proof. ■

Proof of Lemma 3

We have

$$z(w) = u^{-1}\left(E\left(u\left(g(\widetilde{w}) + \int_0^{+\infty} (t - g(t))\, dF_1(t)\right) + \varepsilon\right)\right).$$

By construction, $u \circ z$ is concave and thus does not induce gambling at date 0 by individuals who have the ability to do so. To see that z satisfies the resource contraint for ε sufficiently small, notice that for all w,

$$u^{-1}E\left(u\left(g(\widetilde{w})+\int_0^{+\infty}(t-g(t))\,dF_1(t)\right)\right)\leq E\left(g(\widetilde{w})+\int_0^{+\infty}(t-g(t))\,dF_1(t)\right)$$

by convexity of u^{-1}, with strict inequality whenever $\widetilde{w} \neq w$. Thus for ε sufficiently small,

$$\begin{aligned}\int_0^{+\infty} z(w)dF_0(w) &\leq \int_0^{+\infty} E\left(g(\widetilde{w})+\int_0^{+\infty}(t-g(t))\,dF_1(t)\right)dF_0(w)\\ &= \int_0^{+\infty} E\left(g(\widetilde{w})\right)dF_0(w)+\int_0^{+\infty}(t-g(t))\,dF_1(t)\\ &= \int_0^{+\infty} g(w)dF_1(w)+\int_0^{+\infty}(t-g(t))\,dF_1(t)\\ &= \int_0^{+\infty} tdF_1(t)=\int_0^{+\infty} tdF_0(t).\end{aligned}$$

Finally it remains to show that z does not induce tax avoidance at date 1. This is because the function $z(w)-z(0)$ is increasing, convex, and larger than g. Thus

$$\begin{aligned} z(w)-z(0) &\geq z(w-w')-z(0)+z(w')-z(0),\\ &\geq g(w-w')+z(w')-z(0).\blacksquare\end{aligned}$$

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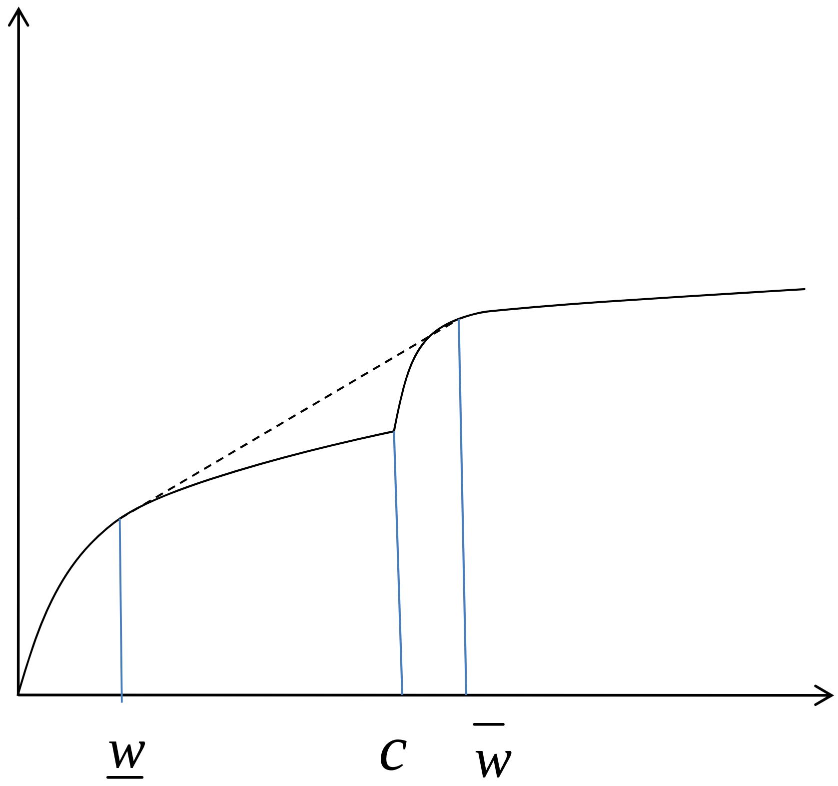

Figure 1. The function *uov* and its concavification.

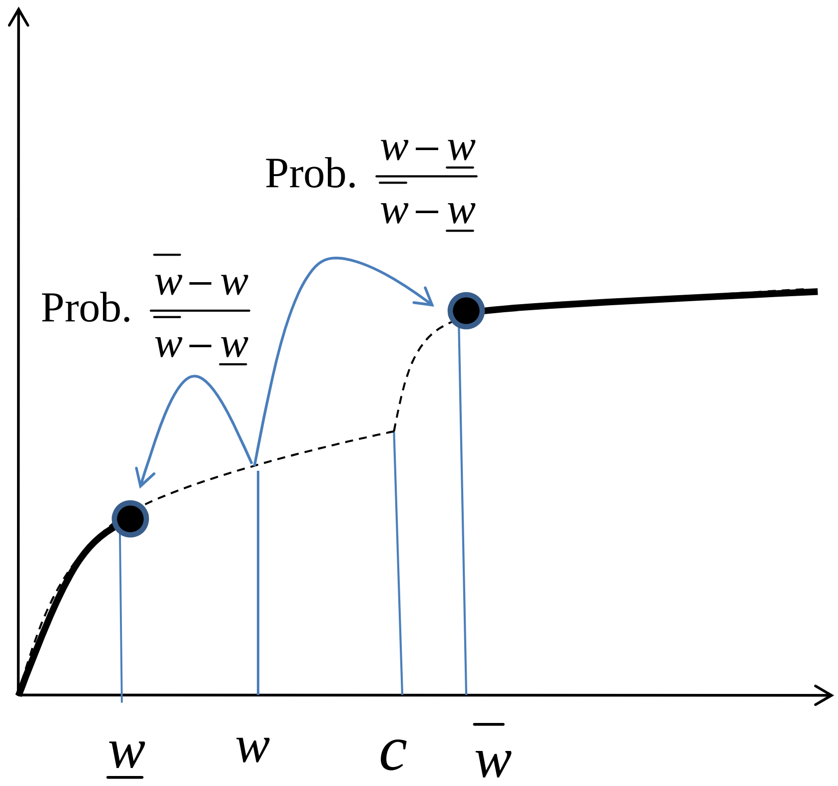

Figure 2. Risk taking.

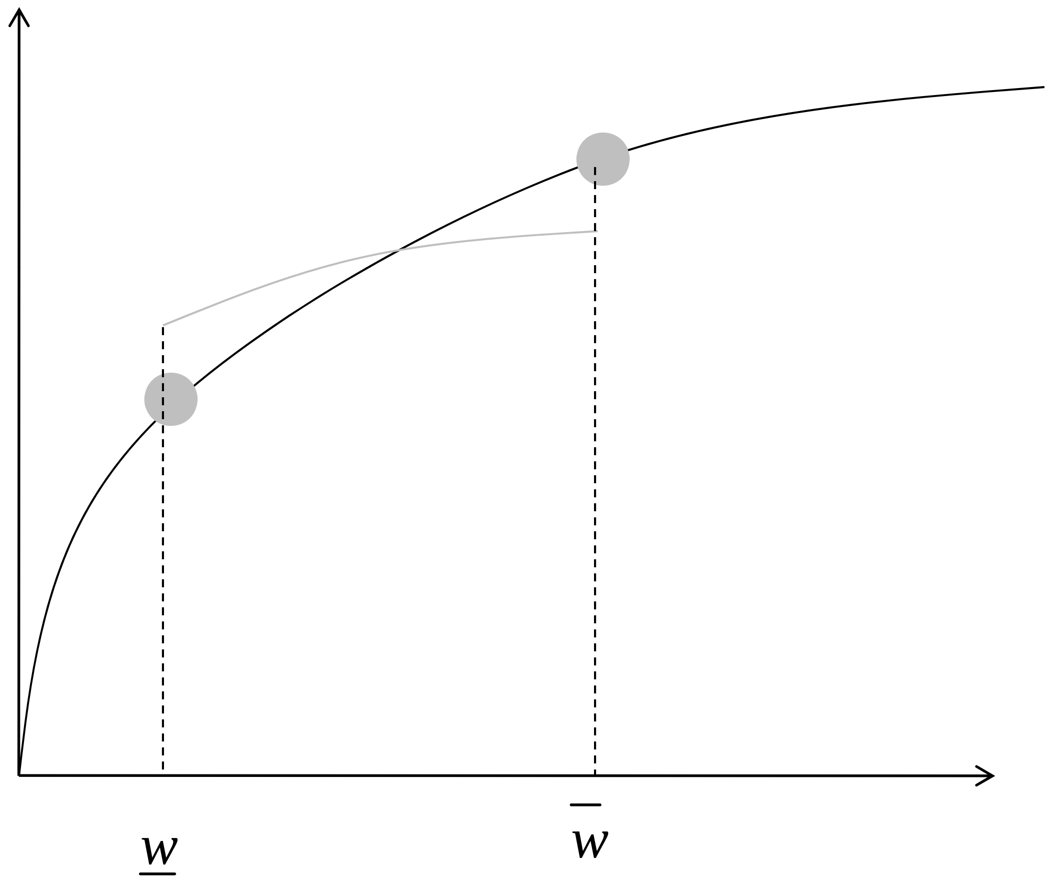

Figure 3. The shrinking middle class.

The distribution F_0 is in black, the distribution F_1 over $[\underline{w}, \overline{w}]$ is in grey.