The demise of social insurance

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Abstract

The disincentive effects of social insurance have recently become a major point of debate in Western Europe, leading to cuts in benefits and renewed focus on providing incentives. We study the evolution of the welfare state in a context of cultural transmission and endogenous taxes. Insurance allows agents to spread risk between different states of nature, but it creates moral hazard opportunities that some agents take advantage of. This static cost of moral hazard is augmented by a dynamic cost: social insurance tends to reduce the number of productive agents in the population and can lead to its complete unraveling over time. We show that a long period of generous welfare benefits is not sustainable and is usually followed by reduced generosity in order to provide incentives to work. Even when the economy eventually reaches a state without any free riding the transition to this state is costly.

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1 Introduction

Social insurance typically creates moral hazard by distorting the choice between work and benefits. The disincentive effect of welfare state has become in recent years a source of concern in Western Europe. Benefits designed in the heyday of welfare policies tend to be now cut after they appeared to be unsustainable. Lindbeck and Nyberg (2006) notice however that the negative consequences of welfare programs took a long time before becoming real problems. When those were put in place, disincentives did not seem to be a particularly salient issue. These authors argue that parents instill working norms in their children. These norms ensure that they work hard and decrease the probability of being unemployed, such that parents are unlikely to support them materially. Social insurance weakens the incentives for instilling norms, and loosens the work norm of the next generation, hence the delay between policies and their effects. This article acknowledges the lag between policies and their consequences but uses a different transmission channel between generations and let agents vote over social insurance characteristics.

It uses the cultural transmission framework developed by Bisin and Verdier (2001) where parents try to socialize their children to their own preferences, but also take into account the material payoffs attached to the choices induced by these preferences. In the model parents can be of two types, depending on how they value leisure. Individuals decide, at the cost of some effort in terms of leisure, whether to enter a risky project that bears high payoffs only with some positive probability. On the other hand they can decide to stay aside of the risky project and get a low payoff with certainty. An interpretation is that success on the labor market requires some effort, and that the outcome is uncertain. Alternatively, one can take up a low paid job that can be combined with benefits, or invest in education and get a high paid jobs if successful, but without being entitled to welfare support. Parents who value leisure highly are reluctant to start the project, and do so only if its expected payoffs are high enough. Moral hazard arises in this setting because only outcomes, and not decisions, are observable. An individual with a low income may have put in effort and failed, or may not have tried anyway. Since preferences are private information it is not possible to condition benefits on choices. The desire for social insurance originates from the risk associated to the project, but on the other hand it is limited by the free riding it induces. Benefits and taxes are chosen by majority voting and take this tradeoff into account.

The main results can be briefly summarized. The first conclusions are similar to those of Lindbeck and Nyberg (2006) (though it occurs for different reasons, as exposed below). Social insurance reduces the incentives for parents to transmit "working hard" preferences because it decreases the difference between the payoffs in the good and bad states. Second the mere presence of social insurance affects the steady state properties. While different scenarios are possible, I show that under suitable assumptions the steady state distribution of preferences exhibits a larger population of agents with a high value of leisure than the steady state without insurance. More interestingly, the model easily generates dynamics similar to what has been observed in Western Europe. Individuals vote for the establishment of social insurance initially, even though moral hazard may be an issue, but the welfare state slowly unravels, with free riding dampening the financial sustainability of social insurance. At some point a majority of voters may decide to scrap altogether social insurance, or at least to reduce it to a minimal value. The model underlines the costs potentially associated with social insurance. Even if eventually the economy reaches a steady state where everyone engages in the productive activity, the transition from the initial state may be characterized by a period of increasing free riding, and high taxes in order to finance the generous benefits that a majority of voter prefers. This transition is costly and in the steady state social insurance has poor properties as it must keep individuals with a high preference for leisure productive. The conclusion is that over-generous social insurance is usually not sustainable in the long run, but that it can be sustained for a few generations, unfortunately at a high cost.

Lindbeck and Nyberg (2006) provide evidence of delayed negative incentive effects of welfare state. As explained above, their argument relies on the support parents give to their children in case of a bad outcome on the labor market. The only reason for instilling the work norm is the fear that support may have to be provided. Evidence of such transfers is however quite scarce, and Arrondel and Laferrère (2001) actually show with French data that parents tend to favor the best endowed child, as transfers increase with the current income of the child, and increase or are unaffected by its permanent income. Similarly Altonji et al. (1997) reject the altruism hypothesis for inter vivos transfers from parents to children in the US, and find that transfers are very inelastic with the child permanent or current income. This paper makes a different assumption, namely that parents differ in their preferences, have different views about what one should do in life, and that they educate their children accordingly. However they also respond to material incentives and for this reason their education choices are affected by social insurance.

A further insight of the paper lies in the evolution of taxation. Lindbeck and Nyberg (2006) document cases where the introduction of benefits led to an increase in the number of beneficiaries over many years. We complement this result by arguing that this trend is accompanied by rising taxes, but only up to a certain point where they are suddenly cut. As an illustration we provide the case of sick leave benefits in Sweden. OECD (2005) shows that they are amongst the most generous in Europe, both in terms of benefits and duration. Sickness benefits can be granted for an unlimited period and the replacement rate is high when compared to other developed countries. Henrekson and Persson (2004) document that many reforms were implemented during the last 50 years. Generosity was always increased until the 1991 reform that cut benefits for the first time since the start of the scheme in 1955. In the 1990s benefits were repetitively reduced. Sick leave is, according to OECD (2005), Sweden's single biggest economic problem. A high number of workers are absent from work due to sickness and on an average day around 14% of Sweden's potential workforce is on sick leave or receiving disability benefits. Fraud is thought to be widespread and half of all Swedes who are receiving some form of sickness or disability payment do not actually regard themselves as disabled (these examples are taken from OECD (2005) and so refer to this period). The government pledged to halve the number of sick days taken between 2002 and 2008. It reinforced controls to combat fraud, made sick leave more difficult to obtain and helped people back to work. The target is unlikely to be reached but last trends show significant improvements (see OECD (2007) for further details). The important observation for

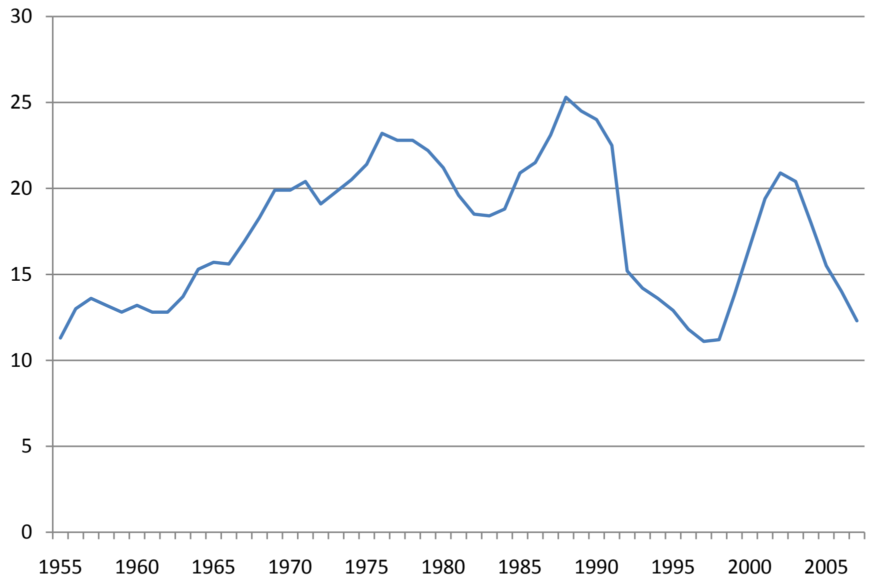


Figure 1: Days of paid sick leave per person per year, 1955-2007. Source: Försäkringskassan

our work is that benefits were made more generous during many years, increasing the number of people taking advantage of the welfare system. However from 1991 reforms decreased generosity and made more stringent the conditions to qualify for and to stay on sick leave. Figure 1 shows the evolution of days of paid sick leaves per employee for the period 1955-2007.

Henrekson and Persson (2004) identify reforms over the period 1955-1999. Generosity increased in 1963, 1967, 1974, 1987 and 1998. 1991 marked the beginning of a series of reforms cutting benefits. OECD (2005) indicates that in 2003 sick leave compensation was reduced, before being increased again in 2005. The trend before 1991 is clearly increasing, even between the reforms, which agrees with the norm evolution explanation proposed by Lindbeck and Nyberg (2006) and this paper. The number of sick days per insured worker doubled between 1955 and the peak in 1988. Our contribution provides an explanation for why benefits rose many times before being cut. The reversal in 1991 is striking. We argue that it was an optimal choice in a political economy setting after years of increasing yet at the time sustainable fraud.

Differences in cultural attitudes across countries motivated recent papers in economics. The literature usually explains the differences in these attitudes by using models with multiple equilibria. Bénabou and Tirole (2006) argue that mere beliefs (optimistic or pessimistic) about whether effort pays can lead to these self-enforcing equilibria (see also Alesina and Angeletos (2005), and Hassler et al. (2003)). Lindbeck and Nyberg (2006) notice how the level of benefits in a country is correlated with cultural attitudes towards cheating for benefits, or the importance of educating children to a work attitude. They find that countries with higher tax rates also have less stringent work norms. However in their model Lindbeck and Nyberg do not introduce any voting mechanism and so there is no coevolution of institutions and cultural attitudes.[1] The model presented here focuses particularly on this point in order to illustrate the mechanisms at work during the past decades in Europe. Bisin and Verdier (2004) also study cultural transmission and its implications for welfare state and my work benefits from theirs. The motives for redistribution are however different. Agents do not insure themselves against any risk in Bisin and Verdier (2004) but design taxation in order to extract as much income as they can from the political minority. I assume that productive agents follow a different logic and only want to get insured against shocks. An important result of my paper is how free riding evolves with institutions, and how social insurance brings benefits, but also costs to society. Finally their analysis of the sustainability of the welfare state focuses on productivity shocks that may bring society on a path converging to less redistribution. This paper instead studies sustainability by checking the conditions for social insurance to exist in the steady state, and its insurance properties. Social insurance may disappear, or have poor properties because of the distortions it induces. The two points of view are both instructive and relevant but are different.

There is some evidence that work attitudes are transmitted from parents to children. Mulligan (1997) and Beaulieu et al. (2005) show that parents' behaviors in-

[1] Lindbeck et al. (1999) study the evolution of social stigma associated with living off benefits when individuals vote. We do not introduce any social disapproval in the model.

fluence their children in terms of benefits collection and labor market participation. Dohmen et al. (2006) study risk and trust attitudes and uncover high correlations between indicators for parents and children. When it comes to labor market participation individuals with high risk aversion are expected to be more reluctant to participate in risky projects with potentially high but uncertain payoffs. The model could also be interpreted along these lines.

The paper is organized as follows. In Section 2 we lay out a model of endogenous social insurance where agents vote over the level of taxation that finances insurance. Section 3 presents the transmission of preferences. Section 4 brings those two models together and investigates the simultaneous evolution of preferences and welfare state. Section 5 discusses the implications of the results for social insurance. Section 6 concludes.

2 A model of social insurance

2.1 Work decision

In each generation, individuals have to make a decision about whether to enter a risky project or not. If they do, they either succeed and earn a high wage w_h, or fail and earn a low wage w_l smaller than w_h. If they do not, they earn the wage w_l with certainty. The probability of success in the risky project is fixed and equal to q. There is a sunk cost that the individual has to bear in order to start the risky project. It can be interpreted as a decision about entering the labor market and searching actively for a job, or investing in education. One has to put in effort and spend time, and this can be rewarding. However, and despite the effort, one can still be unemployed or get only a low wage (or fail one's exams). In the sick leave benefits, one can choose to call in sick for some time or always go to work and be possibly promoted. On the other hand individuals can avoid investing in the project, and save on time with the drawback of having a low income with certainty. This decision is of course affected by the existence of social insurance. Incomes are taxed proportionately at the rate t and benefits b are redistributed to those who earn a low wage. Moral hazard issue arises because only the outcome of the decision process is observable: wages are public information, but it is not possible to know whether a low wage is the result of a failed project, or of the decision to not enter the project.

There are two types of individuals in the population, with different preferences. Agents can be either of type a or b. These differ on how they evaluate the sunk cost of entering the project. Type b agents are interpreted to have a larger preference for leisure, and so resent fiercely the effort and time required, but we may think of them as disliking being in a risky situation. In any case, going for the safe option gives them an extra utility of μ, compared to the risky one. It is normalized to zero for type a agents.[2]

Utility of an individual with preferences of type $i \in \{a, b\}$ when he starts the risky project is

$$U_i(c) = \begin{cases} \ln c_h & \text{with probability } q \\ \ln c_l & \text{with probability } 1-q \end{cases} \tag{1}$$

Consumption depends on the outcome of the project and on social insurance parameters t and b: $c_h = (1-t)\, w_h$ and $c_l = (1-t)\, w_l + b$.

Utility of an individual who chooses instead the safe option is

$$U_i(c) = \ln c_l + \mu_i \tag{2}$$

where $\mu_a = 0$ and $\mu_b = \mu > 0$. An individual with type i preferences chooses to start a risky project if and only if the sunk cost is not too large

$$q \ln c_h + (1-q) \ln c_l \geq \ln c_l + \mu_i \Longleftrightarrow q \ln \left(\frac{c_h}{c_l} \right) \geq \mu_i \tag{3}$$

In particular individuals with type a preferences work as long as consumption in the high state is higher than in the low state. Type b individuals require a higher $\frac{c_h}{c_l}$ ratio to work.

[2] We use this extra utility rather than subtracting a cost when agents choose the risky option. This is of course perfectly symmetric and is only a matter of interpretation.

2.2 Social insurance

Social insurance is characterized by the set of parameters $\{t, b\}$. I restrict the attention to balanced budget insurance schemes that satisfy

$$(1 - xq)b = t\left[xqw_h + (1 - xq)\, w_l\right] \tag{4}$$

Benefits b are directly linked to tax rates and to the proportion x of agents that invest in the risky project: $b = t\left[\frac{xq}{1-xq}w_h + w_l\right]$. Higher tax rates and higher labor market participation xq yield higher benefits. Given the balanced budget condition, social insurance is a one dimensional policy and utility functions can be written only as a function of t.

The policy is chosen before individuals decide between the risky and safe options. Similarly to Lindbeck et al. (1999) a political equilibrium is a balanced policy such that no other balanced policy is preferred by a majority of the population. Of course the policy parameters must also be feasible, i.e. they must be incentive compatible. The set of possible policies is therefore characterized by the following conditions

$$xqc_h + (1 - xq)c_l = xqw_h + (1 - xq)w_l \tag{5}$$

$$\text{and} \begin{cases} x = 0 & \text{if } c_h < c_l \\ 0 \le x \le p & \text{if } c_h = c_l \\ x = p & \text{if } \mu \ge q \ln\left(\frac{c_h}{c_l}\right) \text{ and } c_h \ge c_l \\ p \le x \le 1 & \text{if } \mu = q \ln\left(\frac{c_h}{c_l}\right) \\ x = 1 & \text{if } \mu < q \ln\left(\frac{c_h}{c_l}\right) \\ 0 \le c_h \le w_h & \end{cases} \tag{6}$$

Constraint (5) is the balanced budget property of the insurance scheme, and equations (6) stipulate the consistency of beliefs (it can be also seen as incentive compatibility constraints). From condition (3) we know that every time $c_h < c_l$ no one is willing to start a risky project and so $x = 0$. When consumptions in the two states are equal, agents with type a preferences are indifferent between the safe and risky options, while type b agents strictly prefer the safe option, and so x can take any value between 0 and p. When c_h becomes larger than c_l, type b individuals may still not find it worthwhile to work hard, and x stays equal to p until c_h becomes large enough to compensate for the cost of starting the risky project. The last condition says that consumption in the good state cannot exceed the wage, in other words we do not allow for regressive redistribution with negative tax rate.

Agents with different preferences face somewhat different issues when voting. Type a agents are willing to start the risky project as long as c_h is larger than c_l. Given that there is no social insurance scheme such that they choose to live off benefits while type b agents work, the social insurance system has only insurance properties for them (as opposed to free riding opportunities). They only want to be insured against a bad shock. The issue is that type b agents may free ride on the insurance, stay away from the risky project, and enjoy leisure and benefits. Therefore type a agents face a tradeoff between an insurance scheme that covers risk optimally, and the free riding behavior it necessarily induces in type b agents. The tax rate that maximizes their expected utility has to balance these two effects, by providing less insurance than would otherwise be optimal. If moral hazard becomes too important, they can even decide to scrap social insurance and to bear the risk fully.

Agents with type b preferences, on the other hand, are usually prone to free riding, and extract benefits from type a agents. They prefer the tax rate to be as high as possible, providing over insurance, in order to get maximum benefits. However this is costly if there are a lot of type b agents in the population, and so a large welfare dependency ratio. When there are very few type a individuals, agents with type b preferences may choose to lower the tax rate such that they enter the labor market and get a higher expected utility from the risky prospect. The tax base is then so small that generous benefits are not a viable option any more.

Proposition 1 describes the political equilibrium when type a individuals represent a majority of the population. We formally show in the Appendix that the majority has to choose between two alternatives: either no type b agent is engaged in the risky activity, or all of them. Any intermediate proportion between these extremes is dominated by one of them. The balance between these two policies depend on the number of type b agents in the population. If they are very few then it may be better to let them free ride and have a high tax rate that provides good coverage against risk; otherwise a low tax rate is optimal in order to force type b individuals to enter the productive activity.

Proposition 1 *When individuals of type a represent a majority in the population:*

- *If* $\mu > q \ln\left(\frac{w_h}{w_l}\right)$ *then the tax rate is* $t^* = \max\left(0, 1 - q - \frac{1-pq}{p}\frac{w_l}{w_h}\right)$*, and individuals with type b preferences never start a risky project.*
- *If* $\mu \leq q \ln\left(\frac{w_h}{w_l}\right)$ *then there exists* $K_a \in (0,1)$ *such that if* $p > K_a$ *the tax rate is* $t^* = 1 - q - \frac{1-pq}{p}\frac{w_l}{w_h}$*, and* $t^* = \frac{\left(w_h - e^{\frac{\mu}{q}} w_l\right)(1-q)}{w_h\left(1-q+qe^{\frac{\mu}{q}}\right)}$ *otherwise. All individuals with type b preferences start a risky project if and only if* $t^* = \frac{\left(w_h - e^{\frac{\mu}{q}} w_l\right)(1-q)}{w_h\left(1-q+qe^{\frac{\mu}{q}}\right)}$.

The first part of Proposition 1 refers to the case where type b individuals have such a high preference for leisure that they never choose to start a risky project. When p is small social insurance becomes very costly because of the rising importance of free riding. In that case a majority of individuals prefers to scrap social insurance arrangements and to bear fully the risk. Any positive tax rate would lead to many benefits claims that would make insurance unsustainable.[3]

The second part of the proposition considers that type b individuals would rather work when there is no social insurance. They find it worth paying the sunk cost as the payoff is large compared to μ. Individuals with type a preferences can always choose a tax rate such that a positive proportion of type b agents work. There is an infinite number of these equilibria, with various numbers of agents entering the labor market. However the equilibrium where all the agents do is always preferred by type a agents. The drawback of having a large active population is that benefits must be kept way below their optimal level in order to limit free riding behavior.

[3] A negative tax rate would be optimal in this case, in order to extract income from idle people to finance social insurance.

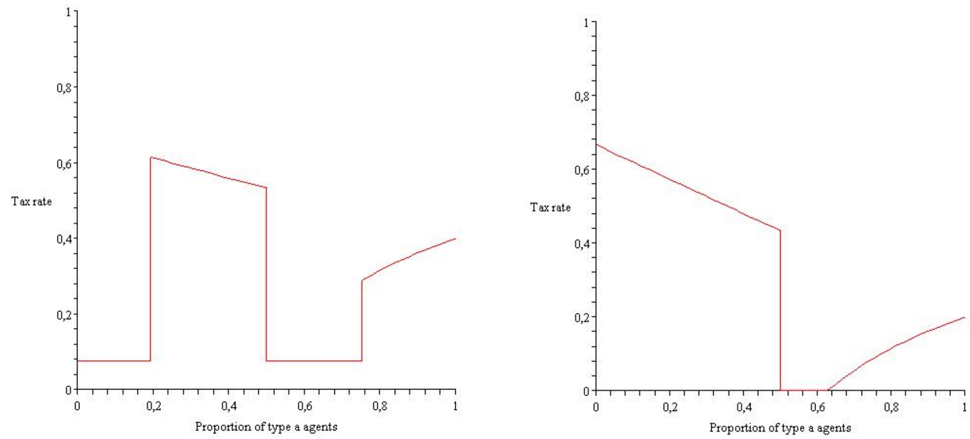
It makes income when the project fails much lower than when it succeeds. Besides these equilibria, there is one where type b agents live off benefits. Free riding is widespread but this is optimal when there are not too many type b agents in the population. The focus can then be on the insurance properties of taxes and benefits, rather than on moral hazard.

When the fraction p of type a agents is smaller than 1/2, individuals with type b preferences are in charge of choosing the tax rate. They similarly decide either to have only type a agents in the risky activity, or the whole population. Proposition 2 presents the political equilibrium.

Proposition 2 *When individuals of type b represent a majority in the population:*

- *If* $\mu > q \ln\left(\frac{w_h}{w_l}\right)$ *then the tax rate is* $t^* = \frac{w_h - w_l}{w_h}(1-pq)$, *and individuals with type b preferences never enter the labor market.*
- *If* $\mu \leq q \ln\left(\frac{w_h}{w_l}\right)$ *then there exists* $K_b \in (0,1)$ *such that if* $p > K_b$ *the optimal tax rate is* $t^* = \frac{w_h - w_l}{w_h}(1-pq)$, *and* $t^* = \frac{\left(w_h - e^{\frac{\mu}{q}} w_l\right)(1-q)}{w_h\left(1-q+qe^{\frac{\mu}{q}}\right)}$ *otherwise. All individuals with type b preferences enter the labor market if and only if* $t^* = \frac{\left(w_h - e^{\frac{\mu}{q}} w_l\right)(1-q)}{w_h\left(1-q+qe^{\frac{\mu}{q}}\right)}$.

Individuals of type b know that as long as $c_h \geq c_l$ individuals of type a undertake the risky project. Income can be extracted from them and redistributed to individuals with low income. If type b individuals decide to avoid risk then they pick up the highest possible tax rate, in order to receive the largest possible benefits. They choose the tax $\frac{w_h - w_l}{w_h}(1-pq)$ that makes type a agents just indifferent between the two choices. If their taste for leisure is high, then no matter how low the benefits are this is always optimal. The first part of Proposition 2 describes this situation. In the second part, the taste for leisure is such that it is better to work when the income earned in the good state is large compare to income in the low state. In that case individuals of type b prefer the tax rate that makes all of them work, in order to get higher incomes. Type b individuals have to weigh up these two options: either a



(a) Low taste for leisure (b) High taste for leisure

Figure 2: Political equilibrium tax rate.

high tax, that extracts the maximum benefits from agents with high wages, or a low tax that makes everyone start the risky project. Clearly the second option becomes optimal when there are very few type a agents in the population. In that case it becomes very difficult to finance social insurance through taxes and type b agents are forced to enter the labor market. Free riding is an issue for type b agents as well. It is an expensive behavior and in a population with very few type a agents it may not be worth financing it.

Figure 2 presents tax rates as a function of the fraction of individuals of type a. The political equilibrium tax rate t^* is increasing for high values of p. A larger type a population relaxes the budget constraint and allows a better risk spreading among the good and bad states. Insurance is closer to be actuarially fair. When $p = 1$ the insurance is first best for the risk averse agents and consumption is equal in both states. On the left hand side diagram the taste for leisure μ is low, meaning that for low enough benefits type b agents decide to try their luck at the risky project. This requires a much lower tax rate, but expands the tax base and increases the expected utility above the utility of living off low benefits. On the right hand side diagram, as it is impossible to make b agents start the risky project, the majority prefers to set a zero tax rate to avoid costly free riding. In both cases the tax rate is always below its first best level for type a individuals (reached at $p = 1$). There is under insurance because of free riding.

Below $p = 1/2$ taxation keeps type a individuals indifferent between entering or not the risky project. In other words, it ensures that c_h is equal to c_l. When there are very few type a agents, tax revenue is spread over many individuals. Benefits and c_l are low, and so the tax rate such that $c_h = (1 - t)w_h$ is equal to c_l decreases with p. The tax rate for p smaller than 1/2 is larger than what is optimal from a social insurance point of view. There is over-insurance. Individuals with type b preferences take full advantage of the moral hazard induced by insurance. For a low taste for leisure and few type a agents, the tax base is small and yields low benefits. It is then optimal to switch back to a regime with full participation in the risky activity. This is feasible only at the cost of under-insurance.

This section shows that individuals have to balance the different consequences of social insurance. First best insurance is not feasible because of moral hazard, and free riding has to be traded off with full participation in the risky activity, at the cost of under-insurance.

3 Cultural transmission

Following Bisin and Verdier (2001), in each generation t a parent has one child. He cares about his child's welfare and consequently tries to maximize it through education. However he uses his own preferences to evaluate the child's welfare. He considers his child's actions through the lens of his own preferences. This assumption, that Bisin and Verdier (2001) call imperfect empathy, is key to the dynamics of preferences. Parents educate their children by choosing some effort τ. Successful education occurs with probability τ and means that the child is of the same type than his parent. If education fails, with probability $1 - \tau$ the child is matched to a random individual in the population and automatically adopts his preferences. He therefore becomes a type a individual with probability p.

Consider a type a parent that invests effort τ_a in educating his child. P^{ij} is the probability that a child of parent i is of type j.

$$\begin{aligned} P^{aa} &= \tau_a + (1-\tau_a)p \qquad (7) \\ P^{ab} &= (1-\tau_a)(1-p) \\ P^{bb} &= \tau_b + (1-\tau_b)(1-p) \\ P^{ba} &= (1-\tau_b)p \end{aligned}$$

Given these probabilities, the evolution of p_t follows the equation

$$p_{t+1} - p_t = p_t(1-p_t)(\tau_a - \tau_b) \qquad (8)$$

The cost of education effort τ is $C(\tau)$ where $C'(\tau) > 0$ for every $\tau \in (0,1]$, $C(0) = C'(0) = 0$, and $C''(\tau) > 0$. Parents, following imperfect empathy, maximize their child's welfare using their own preferences. V^{ij} represents the utility for a type i parent of behaving like a type j individual. Assume for instance that type b agents live off benefits then $V^{ab} = \ln(c_l)$, while $V^{bb} = \mu + \ln(c_l)$. The expected welfare of the child is

$$P^{ii}V^{ii} + P^{ij}V^{ij} - C(\tau_i) \qquad (9)$$

Parents choose their efforts based on their expectations p^e_{t+1}, the fraction of individuals of type a in the population next period. Maximization of their utility given by equation (9) yields

$$\begin{aligned} C'(\tau_a(p^e_{t+1})) &= (1-p_t)\Delta_a(p^e_{t+1}) \qquad (10) \\ C'(\tau_b(p^e_{t+1})) &= p_t\Delta_b(p^e_{t+1}) \qquad (11) \end{aligned}$$

where $\Delta_i = V^{ii} - V^{ij}$. The more parents disregard the behavior of individuals with different preferences, the higher their effort. The proportion of types in the population follows the dynamics

$$p_{t+1} - p_t = p_t(1-p_t)\left[C'^{-1}\left(\tau_a(p^e_{t+1})\right) - C'^{-1}(\tau_b(p^e_{t+1}))\right] \qquad (12)$$

4 Dynamics

4.1 Socialization efforts

We need to specify the functions Δ_a and Δ_b to find the education efforts that determine the evolution of p_t. There are three potential thresholds: K_b, $\frac{1}{2}$, and K_a that define different regimes. These thresholds are not necessarily reached: K_b may not be between 0 and 1/2, or K_a between 1/2 and 1.

Lemma 1 *If* $\mu > q \ln\left(\frac{w_h}{w_l}\right)$*:*

For $p > \frac{1}{2}$, $\Delta_a(p) = q \ln\left[\min\left(\frac{1-pq}{p}\frac{1}{1-q}, \frac{w_h}{w_l}\right)\right]$
and $\Delta_b(p) = \mu - q \ln\left[\min\left(\frac{1-pq}{p}\frac{1}{1-q}, \frac{w_h}{w_l}\right)\right]$.
For $p < \frac{1}{2}$, $\Delta_a(p) = 0$ *and* $\Delta_b(p) = \mu$.

Lemma 2 *If* $\mu < q \ln\left(\frac{w_h}{w_l}\right)$*:*

For $p > \max\left(\frac{1}{2}, K_a\right)$, $\Delta_a(p) = q \ln\left[\frac{1-pq}{p}\frac{1}{1-q}\right]$ *and* $\Delta_b(p) = \mu - q \ln\left[\frac{1-pq}{p}\frac{1}{1-q}\right]$.
For $\frac{1}{2} < p < \max(K_a, \frac{1}{2})$, $\Delta_a(p) = 0$ *and* $\Delta_b(p) = 0$.
For $K_b < p < \frac{1}{2}$, $\Delta_a(p) = 0$ *and* $\Delta_b(p) = \mu$.
For $p < K_b$, $\Delta_a(p) = 0$ *and* $\Delta_b(p) = 0$.

When the preference for leisure is high, dynamics are rather simple. When individuals of type a are majoritarian, they choose a tax rate that trades off fair insurance and free riding cost. It is such that $\frac{c_h}{c_l} = \frac{1-pq}{p}\frac{1}{1-q}$ when it is positive, or $\frac{c_h}{c_l} = \frac{w_h}{w_l}$ when it is zero. Both types of individuals have incentives to socialize their children. This is the first part of Lemma 1. The second part of the lemma describes the situation where type b agents are majoritarian. They design social insurance such that $c_h = c_l$, and so individuals of type a are indifferent between having children of either type. In both cases they have the same consumption level. Type b parents, on the other hand, enjoy leisure and do not want their children to engage in costly and risky projects that do not pay off.

For a lower taste of leisure, choices are less straightforward. For a population with a large fraction of type a individuals, taxes are such that type b individuals do not work. This is identical to the the first part of Lemma 1. However for values of p below K_a, but still above $\frac{1}{2}$, the tax rate is such that everyone enters the labor market. All the agents have the same behavior, and so are identical from parents' point of view. They do not have any incentives to socialize their children to their cultural trait. Similarly for low values of p below K_b, free riding becomes too costly and type b agents implement the same tax rate that makes everyone enter the labor market. This is the last part of Lemma 2. For the intermediate case, the situation is identical to Lemma 1.

From Lemma 1 and 2 we can derive the socialization efforts, given by equations (10) and (11). For instance if agents expect that next generation type a individuals will be minoritarian, parents with these preferences do not try to socialize their children. They know that next period it will not pay off to enter the risky project and so are indifferent between having children of either type. This follows from the design of social insurance by the majority of type b agents. By extracting the maximum they can from type a agents, they make their participation constraint in the labor market bind. On the other hand, if type a parents expect to be majoritarian next period, they know the tax rate will not discourage investment in the risky project, and from their point of view, it pays off to be a type a and they are willing to invest resources in socialization.

4.2 Stationary states

They are characterized by $p_{t+1} = p_t$, or equivalently using equation (12) by $\tau_a = \tau_b$. In steady states parents of both types invest the same effort in the transmission of preferences. The next propositions characterize all the stationary states.

Proposition 3 *For $\mu > q \ln\left(\frac{w_h}{w_l}\right)$, the stationary states are:*

- *Either $p^* \in [\frac{1}{2}, 1)$ such that the tax rate is strictly positive, and 0;*
- *or $p^{**} \in [\frac{1}{2}, 1)$ such that the tax rate is zero, and 0;*
- *or 0.*

When the taste for leisure is high, the system has either two or one stationary state. There is always an equilibrium at $p = 0$. It follows directly from Lemma 1 when $p < \frac{1}{2}$. The other equilibrium, if it exists, can be in one of the two possible regimes for $p > \frac{1}{2}$, either with positive or zero tax rates.

Proposition 4 *For $\mu < q \ln\left(\frac{w_h}{w_l}\right)$, the stationary states are:*

- *Either $p^* \in (K_a, 1)$, the interval $[\frac{1}{2}, K_a]$, and the interval $[0, K_b]$;*
- *or $p^* \in (K_a, 1)$, and the interval $[0, K_b]$;*
- *or the interval $[\frac{1}{2}, K_a]$, and the interval $[0, K_b]$;*
- *or the interval $[0, K_b]$.*

With a lower taste for leisure, the whole interval $[0, K_b]$ is always a steady state because all the agents participate to the risky activity for these proportions. If $K_a > \frac{1}{2}$ then every point of $[\frac{1}{2}, K_a]$ is also a steady state. Finally there may be a steady state at $p^* > \max(K_a, \frac{1}{2})$; taxes are strictly positive in this state. To summarize, there are always steady states where all the agents try the risky project, and there may be one where only type a agents do, with type b agents free riding. In both Propositions 3 and 4, the stationary states closely depend on the social insurance implemented by the majority group. Given that the two cultural groups have different interests in choosing social insurance parameters, they induce different dynamics. By extracting as much as they can from type a agents, individuals with type b preferences create a severe hindrance to the propagation of cultural trait a in the population. In the long run it may completely disappear, or the dynamics lead to a low state where the b-majority has to re-enter the labor market as free riding has become too costly in terms of consumption.

We showed that many stationary states exist. In the next section we summarize graphically the conditions for their respective existence. It is also interesting to understand a few dynamic properties of the model, and we briefly underline important ones for our study of social insurance.

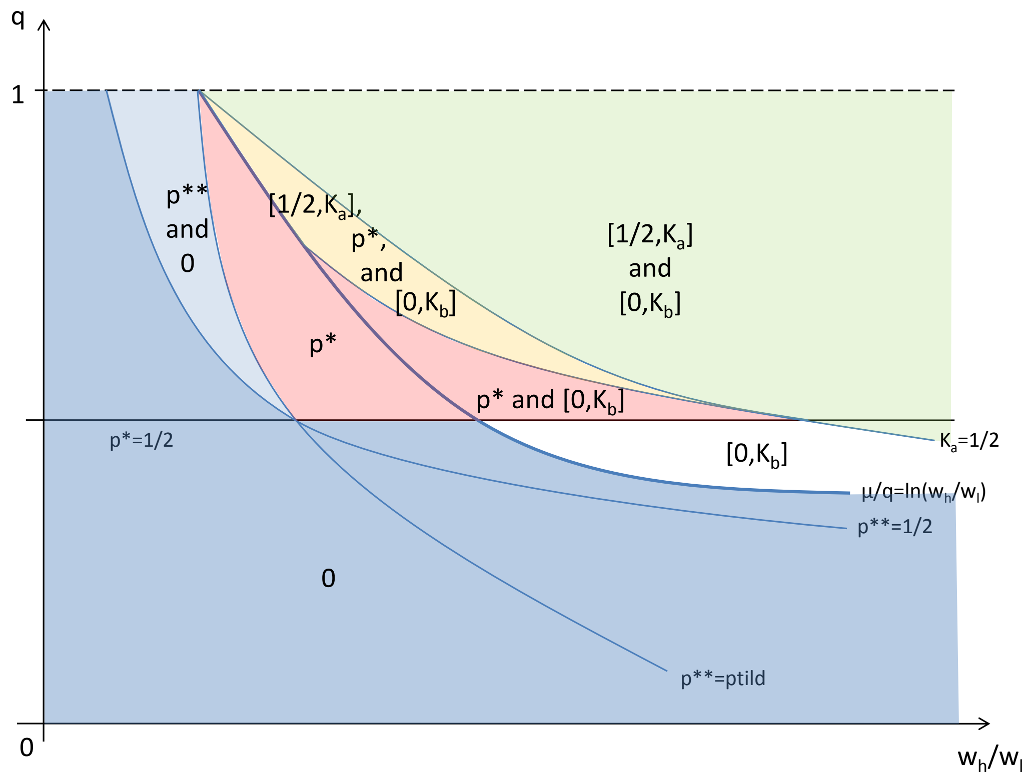


Figure 3: Stationary states as a function of the probability of success q and of the wage ratio $\frac{w_h}{w_l}$

4.3 Paths to stationary states

The high and low taste for leisure specifications can be put together on one graph where we can read stationary states for any set of given parameters. There are three to consider: the probability of success q, the wage ratio $\frac{w_h}{w_l}$, and the taste for leisure μ. We choose to keep μ fixed as this is not a real constraint. The taste for leisure is measured only relatively to the other two parameters, such that a given μ can always be seen as high or low, depending on q and $\frac{w_h}{w_l}$.

Figure 3 indicates the possible stationary states for each set of parameters. It must be reminded that 0 and 1 are always stationary states, but that 1 is always unstable. Areas delimited by curves characterize set of parameters that correspond to different sets of stationary states. A full explanation of these curves is given in the Appendix. For our purpose, the most important one is the curve where $\mu = q \ln \left(\frac{w_h}{w_l} \right)$. It is in bold on the figure. Any point above this line corresponds to the "low taste for leisure" case, any point below to the "high taste for leisure". For low values of q the only possible steady states are at $p = 0$ (or on the interval $[0, K_b]$ when we are in the "low taste for leisure" region). A small probability of success implies that the material benefits of being of type a are rather small, such that no stationary state with a majority of type a agents exists. Note that this may also hold when it is possible to force everyone to enter the risky project. Although full participation can be implemented, a type a majority may not find it optimal. A low q means that agents are quite likely to receive benefits, and so they are reluctant to cut them.

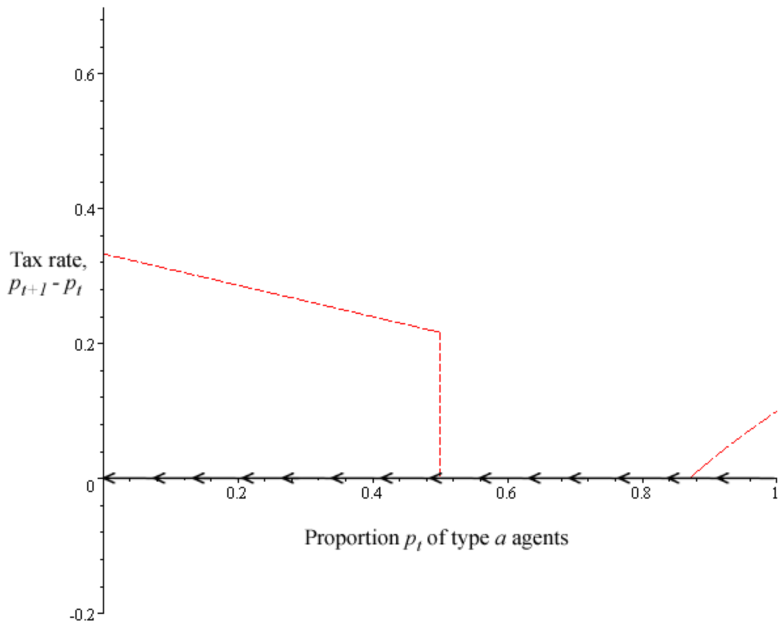
Higher values of q and $\frac{w_h}{w_l}$ yield interior stationary states. Remember however that when p^{**} is a stationary state, there is actually no social insurance, and that when it is $\left[\frac{1}{2}, K_a\right]$ benefits are cut to a minimal value that avoids any free riding. In these two cases social insurance is kept to its minimum. In the high taste for leisure specification p^{**} is a stationary state for intermediate values of the wage ratio. This ensures that it pays off to be a type a individual and so that these preferences can survive, but not well enough to afford some insurance in the steady state. Higher values of the wage ratio allow higher benefits to be paid in case of failure such that type a preferences and positive benefits can coexist in the stationary state p^*. In the low taste for leisure specification, a minimum level of support can always be provided. High wage ratios imply that it must be so in any stationary state where type a agents are majoritarian. They switch easily to the regime that ensures full participation in the risky project because it allows rather high benefits, thanks to the high wage. For intermediate values of $\frac{w_h}{w_l}$ stationary states p^* and on $\left[\frac{1}{2}, K_a\right]$ coexist.

While Figure 3 is a map of all possible stationary states, it does not say which of these are reached in a dynamic process. We assume that agents have rational expectations but given the tax discontinuities induced by voting, many rational expectations paths, converging or not, coexist. Instead of imposing refinements on expectations, I emphasize some simple results useful for the analysis.

4.3.1 High taste for leisure

Three cases are to be considered. First, the only stationary state is 0, and any rational expectations path leads to this point. Second, the only interior stationary state is p^{**} where no insurance is provided. Even though it is easy to build paths converging to this point, it is also possible to end up in the 0 stationary state. There must exist an interval where different expectations are rational. Consider a point with a proportion p_t of type a agents larger but close to $\frac{1}{2}$. The expectation that p_{t+1} be also larger than $\frac{1}{2}$ is rational, and if this expectation is repeated in all subsequent periods it will lead to the stationary state p^{**}. But assume on the contrary that agents expect p_{t+1} to be smaller than $\frac{1}{2}$. In that case, it may indeed rationally lead to a change of majority. If this expectation is held repetitively the economy converges to the 0 steady state. This interval of proportions where multiple expectations are rational must exist. It is not specifically of interest to focus more on the properties on this interval. What matters is that though p^{**} is a stationary state many paths do not converge to it. It must be noted that the same property exists for proportions smaller but close to $\frac{1}{2}$, whereby it is possible to move on a path leading to p^{**}. As in Bisin and Verdier (2000) dynamics generate indeterminacies in cultural change and politics. The key role of expectations opens up possibilities for political leaders, or communities, to act on these expectations in order to durably influence the economy. In the last and third case there is a unique interior stationary state with positive benefits and the above discussion about the role of expectations is still valid. These two cases are actually quite similar in terms of dynamics.

Figure 4 superimposes the dashed graph of the political equilibrium tax rate already presented in Figure 2 and the phase diagram of $p_{t+1} - p_t$ as a function of p_t. Arrows on the horizontal axis give the direction of change for p_t. On Figure 4a the only stationary state is 0, and the dynamics are such that $p_{t+1} < p_t$. We omit the phase diagram, the curve would always be below the horizontal axis. On Figure 4b the proportion p^* is also a stationary state. The dotted curves extend the phase



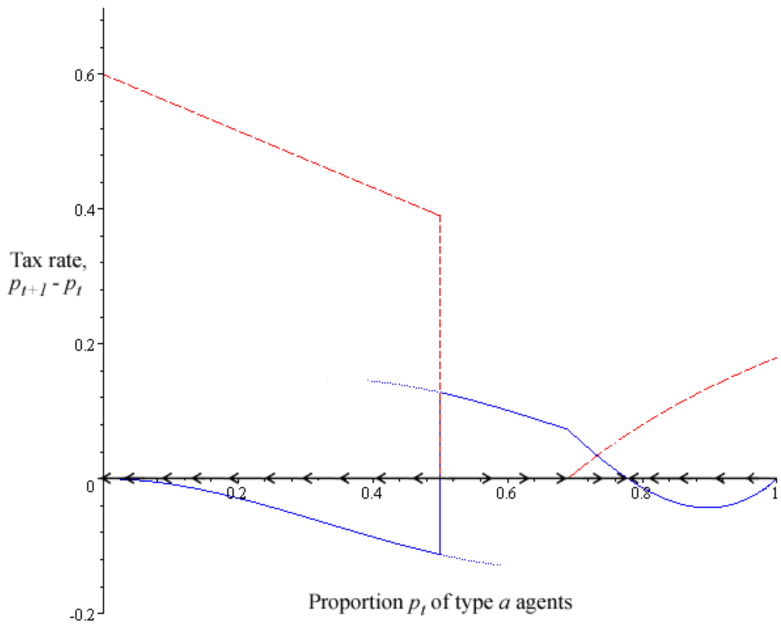
(a) No interior stationary state

Figure 4: Dynamics with high taste for leisure

diagram up to the point where rational expectations can lead to a regime reversal. For proportions above but close enough to $p_t = \frac{1}{2}$, the belief that next generation majority will be made of type b agents is self-fulfilling as it implies $p_{t+1} < \frac{1}{2} < p_t$.

4.3.2 Low taste for leisure

When type b agents work in the absence of social insurance, more possibilities have to be considered but the results are similar. In the first case, only proportions in the intervals $[0, K_b]$ and $\left[\frac{1}{2}, K_a\right]$ are stationary states. The latter is easily subject to the same instability due to multiple rational expectations paths. Beliefs that next period will be characterized by a minority of type a agents may be (and must be for



(b) p^* interior stationary state

Figure 4: Dynamics with high taste for leisure (cont'd)

proportions close enough to $\frac{1}{2}$) self-fulfilling. We cannot strictly rule out that the same argument applies to stationary states in $[0, K_b]$. Individuals might rationally expect a majority of type a agents next period and high benefits (i.e. $p_{t+1} \in [K_a, 1]$). However this would require a dramatic change in the distribution of preferences. Second possibility, p^* is also a stationary state. Its basin of attraction must include points on $\left[\frac{1}{2}, K_a\right]$, and expectations play again an important role. Note that in these first two cases there may be rational expectations paths leading directly from $[K_a, 1]$ to $\left[K_b, \frac{1}{2}\right]$, and skip the stationary states in $\left[\frac{1}{2}, K_a\right]$. Thus the economy can be on a path starting from an initial point in $[K_a, p^*]$ and end up trapped in the interval $[0, K_b]$. Figure 5 illustrates this possibility. Parameters are chosen such that p^* is not a stationary state. Finally, it can be that the only stationary states are on $[0, K_b]$, and p^*. This situation is similar to the high taste for leisure case with either p^* or p^{**} being stationary states.

Implications of the dynamics are discussed in the next section.

5 Implications for social insurance

Social insurance modifies the dynamics of preferences in that it affects behaviors. In order to assess its impact on the distribution of types in the population, I draw comparisons between a society without and with social insurance, in the cases of high and low taste for leisure.

5.1 High taste for leisure

Without social insurance there is a unique stationary state at p^{**}. Assume that society is in this steady state and that it has the opportunity to set up social insurance. Different scenarios are possible (remember that regardless of the social insurance parameters individuals of type b are never willing to work). First, p^w is still an equilibrium. In that case, there are no modifications. Social insurance is too costly because it implies too much redistribution. The political equilibrium does not allow social insurance to be implemented. Second, it is not a stationary state any more but there is still one at $p^* > \frac{1}{2}$. At this point the tax rate is positive, and type b agents do not work, as they used not to. From a certain point of view, this is efficient: type b agents are never willing to work anyway, and in the new equilibrium type a agents enjoy some insurance, though less than what would be optimal without moral hazard. However social insurance coupled to cultural transmission has a cost. It can be shown that there are fewer type a agents than initially, and so fewer people receive a high wage in the economy. Total income is smaller in the economy. The situation has somewhat deteriorated, with moral hazard gaining importance and dampening insurance properties.

Third possibility, there is no equilibrium above $p = \frac{1}{2}$. In that case the only stationary state is at 0. Social insurance unravels over time. Type b individuals will be majoritarian, if not from the beginning then after a few generations, and they vote for an insurance scheme that ensures perfect equality of consumption between types, and over-insurance. In the long run there are no type a agents any more and social insurance breaks down. Individuals of type b enjoyed benefits for some generations, but eventually they come back to their initial state, earning w_l and getting no benefits. There is a cost in terms of total income. It has dramatically fallen along the paths $\{p_t\}_t$. For all these cases, it is important to note that people are happy to vote for social insurance in the first place. It is always welfare improving, and chosen accordingly, but in the long run it may not be sustainable.

When leisure oriented individuals put a high value on leisure, consequences can be dramatic, with no productive agents in the economy any more. Even in the "good" scenario where convergence to a steady state with productive agents occurs there is a dynamic cost to social insurance. Aggregate income is smaller in the new steady state.

5.2 Low taste for leisure

With a low taste for leisure and in the absence of social insurance, all the individuals work. Any initial point is a steady state. A "good" scenario is possible: establishment of social insurance actually increases the proportion of individuals of type a, that converges to $p^* > \frac{1}{2}$. It happens because type a individuals do not tolerate the free riding behavior of b-types and so invest in cultural transmission. This equilibrium is characterized by a pretty generous insurance scheme, with type b agents staying out of the labor market and free riding. There is also a bad scenario where we move from an initial point characterized by a large proportion of type a individuals and everyone working to an equilibrium with a low proportion of type a individuals, everyone working, and low benefits. Even though this stationary state still makes individuals better off than the initial point without any insurance, the transition between these is costly, and eventually yields an insurance far from being actuarially fair. There is also a period where consumption levels in both states are equalized, up to the point where there are so few agents in the risky activity that this is not sustainable any more. Type b agents then decide to lower taxes in order to make this activity more attractive. One can say that they have killed the goose that laid the golden eggs. There is potentially a double cost to social insurance. In a static sense, as it may push type b agents out of the risky, and more productive, activity where they used to work. In a dynamic sense as it reduces the proportion of productive agents in the steady state. Figure 5 illustrates this possibility. Any point in the interval $\left[\frac{1}{2}, K_a\right]$ is a stationary state but dynamics do not necessarily lead to any of these points. Even if they do, it may be temporary before moving on to the regime of high taxes that is eventually not sustainable. We can see how political platforms may emerge from these different expectations. An economy may have two options: either move to a point in $\left[\frac{1}{2}, K_a\right]$, or jump to a point in $\left[K_b, \frac{1}{2}\right]$. That means either a minimal level of social insurance that does not allow any free riding, with low taxes and low benefits, or an over-generous insurance scheme that taxes heavily individuals that bear some risk in their activity.

The mechanism involved in the model is not only through taxes that distort labor supply: in the short run type a agents still participate to the labor market and social insurance is viable. It is rather that there is no point being a productive agent when it does not pay off, and that this affects preferences transmission. This scenario actually matches the past decades of welfare state in Europe. The generous schemes have progressively become too costly and some countries have started to

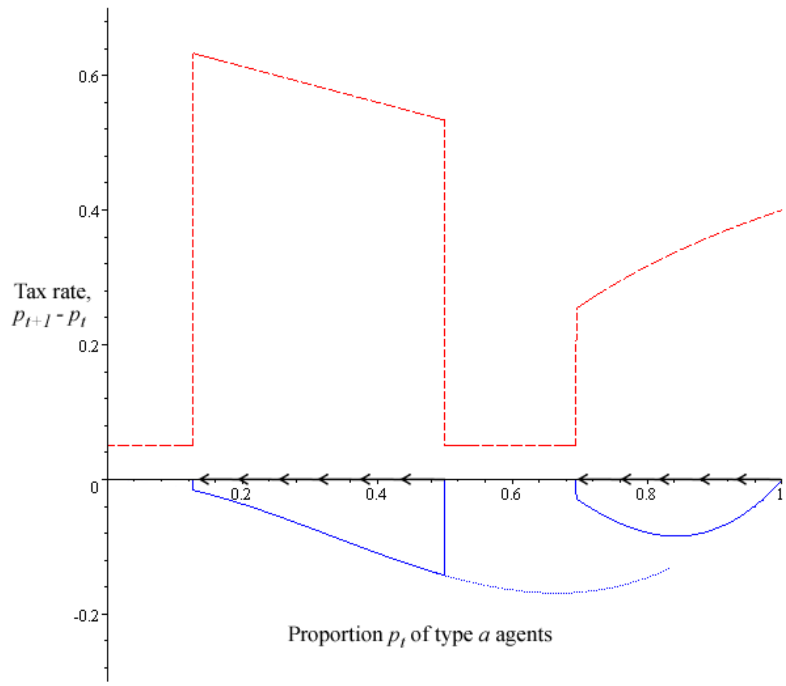


Figure 5: Dynamics with low taste for leisure and p^* not being a stationary state

cut benefits and put policies in place to make productive activities more attractive. The transition has been costly because it depleted the stock of agents willing to start risky projects, and so to generate high incomes to finance redistribution.

6 Conclusion

The key conclusion of this paper is that social insurance may crowd itself out. The institution "cultivates the seeds of its demise", as put by Greif (2006). By equalizing outcomes it blurs the distinction between people engaging in potentially rewarding activities and those living off benefits. It modifies the incentives for parents to socialize their children to hard working preferences. On a "demise of social insurance" path that has two consequences: first the economy, initially characterized by a majority of agents trying to earn a high income and by social insurance that trades off risk coverage and free riding, becomes characterized by a majority of agents valuing leisure and voting for high taxes. Second the tax base becomes so small that the same majority decides to implement a minimal insurance scheme that gets rid of free riding. This comes at the cost of insurance properties. We have already argued how expectations played an important part in picking up the stationary state. There is a role in this model for institutions (political parties, schools, religion) to coordinate beliefs in order to put the economy on a given dynamic path. Although we have left this possibility mainly unexplored in this article, it is an important feature that requires attention for future research.

Finally the welfare implications of the model are not clear. Welfare increases initially if social insurance has some political support, but the total change in welfare is not trivial. The fall in the proportion of productive agents in the economy reduces the benefits attached to social insurance and so welfare. Although numerical examples show that welfare may fall between the non-insurance and insurance steady states, a more complete analysis is required in order to provide some tangible results. This is also left for future research.

Appendix. Proofs

Proof of Proposition 1

We should state first that the winning policy is the one preferred by type a agents. Since preferences are homogeneous in each group this policy is unbeatable as no majority would ever choose an alternative. It is easier to think that agents choose the proportion x of agents entering the laboour market, then to derive the consumptions levels consistent with this value of x and then the tax rate consistent with these consumption levels. We therefore obtain U_a as a function of the tax rate t.

- $x = 0$

No one enters the labour market. This occurs if and only if $c_h < c_l$, as otherwise type a agents would start the risky project. Using the definitions of c_h and c_l it implies that $1 - t < \frac{w_l}{w_h}$. When $x = 0$ agents earn the basic income and do not get any redistribution, so $c_l = w_l$ and $U_a = \ln w_l$.

- $0 < x < p$

Some, but not all type a agents enter the labour market (we know that type b agents do not, if some were then all type a agents would and so x would be larger than p). This is feasible if and only if $c_h = c_l$, these individuals must be indifferent between entering or not in order to have an interior equilibrium. This condition, using the budget constraint (5) implies that $t = \frac{w_h - w_l}{w_h}(1 - xq)$. Given that x takes values between 0 and p it implies that t must be between $\frac{w_h - w_l}{w_h}(1 - pq)$ and $1 - \frac{w_l}{w_h}$. In this case $U_a = \ln[(1-t)w_h]$.

- $x = p$

Exactly all type a agents enter the labour market. It requires that type b agents do not, and so that $\mu \geq q \ln \frac{c_h}{c_l}$, but also that type a agents find it profitable and so that $c_h \geq c_l$. These two conditions imply $\frac{w_h - y w_l}{w_h} \frac{1}{1 + \frac{pq}{1-pq} y} \leq t \leq \frac{w_h - w_l}{w_h}(1 - pq)$ and $U_a = q \ln[(1-t)w_h] + (1-q) \ln\left(w_l + t \frac{pq}{1-pq} w_h\right)$.

- $p < x < 1$

All type a agents and some type b agents enter the labour market. It requires the latter to be indifferent between the two options, and so that $\mu = q \ln \frac{c_h}{c_l}$. It also requires $c_h \geq c_l$ but this is automatically satisfied if some type b agents work. The condition on μ is equivalent to $t = \frac{w_h - yw_l}{w_h} \frac{1}{1+\frac{xq}{1-xq}y}$ from which we can derive $\frac{w_h - yw_l}{w_h} \frac{1}{1+\frac{q}{1-q}y} < t < \frac{w_h - yw_l}{w_h} \frac{1}{1+\frac{pq}{1-pq}y}$ and $U_a = \ln\left[(1-t)w_h\right] - \frac{1-q}{q}\mu$.

- $x = 1$

Every individual enters the labour market. It is feasible if and only if $\mu \leq q \ln \frac{c_h}{c_l}$. Combined with $x = 1$ it yields $t \leq \frac{w_h - yw_l}{w_h} \frac{1}{1+\frac{q}{1-q}y}$ and $U_a = q \ln\left[(1-t)w_h\right] + (1 - q) \ln\left(w_l + t\frac{q}{1-q}w_h\right)$.

When $\mu > q \ln\left(\frac{w_h}{w_l}\right)$ type b individuals never enter the labour market and the last two cases are not feasible, as they would imply negative tax rates. Clearly no majority would ever choose to implement $x = 0$, as it minimizes income. The a-majority has to make a choice between full or partial employment in its community. Full employment increases incomes and so they must choose this option. Formally $U_a(t)$ is continuous on $[0, 1]$ and strictly decreasing when $0 < x \leq p$, so $x = p$ is always preferred. Voters have to choose between different tax rates that all correspond to $x = p$. They choose the tax rate that maximizes their utility $U_a = q \ln\left[(1-t)w_h\right] + (1-q) \ln\left(w_l + t\frac{pq}{1-pq}w_h\right)$. Maximization under the constraint that t is positive shows that the maximum is reached at $t^* = \max\left(0, 1 - q - \frac{1-pq}{p}\frac{w_l}{w_h}\right)$.

When $\mu \leq q \ln\left(\frac{w_h}{w_l}\right)$ the feasible policies include the last two cases. It is possible to lower the tax rate such that type b agents work. Consider the solution $p < x < 1$. $U_a(t)$ is strictly decreasing on this interval and so $x = 1$ dominates any x between p and 1. We also know that $0 < x < p$ and $x = 0$ are never optimal. When $x = 1$ it is always better to have the highest feasible tax rate in order to get better insurance, and so $t = \frac{w_h - yw_l}{w_h} \frac{1}{1+\frac{q}{1-q}y}$. Not that when $x = p$ the optimal tax rate is $1 - q - \frac{1-pq}{p}\frac{w_l}{w_h}$ as a zero tax does not satisfy the condition on t that ensures $x = p$. When type b agents are willing to work for some tax rate, $t = 0$ cannot be optimal.

There are two choices left: either all type a agents work, or everyone. In the first case utility is $U_p \equiv U_a\left(1-q-\frac{1-pq}{p}\frac{w_l}{w_h}\right) = \ln\left[qw_h + w_l\frac{1-pq}{p}\right] + (1-q)\ln\left[\frac{p}{1-pq}(1-q)\right]$. In the second case it $U_1 \equiv U_a\left(\frac{w_h-yw_l}{w_h}\frac{1}{1+\frac{q}{1-q}y}\right) = \mu + \ln\left[\frac{w_h\frac{q}{1-q}+w_l}{1+y\frac{q}{1-q}}\right]$. U_p is an increasing function of p and must be strictly greater than U_1 when $p=1$ as it cannot be optimal to implement the low tax rate that forces type b agents to work when there are no type b agents in the population. Therefore $U_p > U_1$ is equivalent to p greater than some constant $K_a \in (0,1)$. Note that K_a is not necessarily greater than 1/2 and so it may not be a political equilibrium because of the majority rule.

Proof of Proposition 2

The proof is very similar in this case. We review the different cases.

- $x = 0$ implies $U_b = \mu + \ln w_l$
- $0 < x < p$ implies $U_b = \mu + \ln[(1-t)w_h]$
- $x = p$ implies $U_b = \mu + \ln\left[w_l + t\frac{pq}{1-pq}w_h\right]$
- $p < x < 1$ implies $U_b = \ln[(1-t)\,w_h] - \frac{1-q}{q}\mu$
- $x = 1$ implies $U_b = q\ln[(1-t)w_h] + (1-q)\ln\left(w_l + t\frac{q}{1-q}w_h\right)$

Using similar arguments than in the proof of Proposition 1, it is never optimal to implement $0 < x < p$ or $p < x < 1$. The solution $x = 0$ is not chosen at it is always better for type b agents to choose a tax rate that ensures that type a agents wotk, in order to extract income from them.

When $\mu > q\ln\left(\frac{w_h}{w_l}\right)$ the policy $x = 1$ is not feasible and so the optimum is such that $x = p$. It corresponds to the range of tax rates $\frac{w_h-yw_l}{w_h}\frac{1}{1+\frac{pq}{1-pq}y} \leq t \leq \frac{w_h-w_l}{w_h}(1-pq)$. b agents do not enter the labour market and a higher t implies only higher benefits. Their goal is to extract as much possible income from type a agents as they can. Therefore they choose a tax rate equal to $\frac{w_h-w_l}{w_h}(1-pq)$ that makes type a agents indifferent between working or not.

When $\mu \leq q \ln\left(\frac{w_h}{w_l}\right)$, there are two possibilities: either all type a agents work, or everyone. $x = 1$ is again consistent with any tax rate below $\frac{w_h - y w_l}{w_h} \frac{1}{1+\frac{q}{1-q}y}$. When type b agents work, they choose the level of taxation that provides the best insurance, i.e. the highest feasible one, and so implement $\frac{w_h - y w_l}{w_h} \frac{1}{1+\frac{q}{1-q}y}$. In this case the preferences of both types are identical. Simple comparison between the utlity levels corresponding to these two regimes show that whenever $p > \frac{w_h - y w_l}{(w_h - w_l)(1-q+qy)}$ the policy resulting in $x = p$ is preferred to $x = 1$. Intuitively, when there are enough type a agents to tax, type b agents can free ride on the benefits. $K_b \equiv \frac{w_h - y w_l}{(w_h - w_l)(1-q+qy)}$ is strictly smaller than 1 and strictly positive.

Proof of Lemma 1 and 2

Using the utility functions defined in the two preceding proofs and plugging in the corresponding tax rates provides the expression found in both lemmas.

Proof of Proposition 3

We know that interior stationary states satisfy $\tau_a = \tau_b$, or equivalently $(1-p^*)\,\Delta_a = p^* \Delta_b$. First we look for a stationary state such that $p^* > \frac{1}{2}$. From Lemma 1 it is such that $(1-p^*)\,q \ln\left[\min\left(\frac{1-p^*q}{p^*}\frac{1}{1-q}, \frac{w_h}{w_l}\right)\right] = p^*\left[\mu - q\ln\left[\min\left(\frac{1-p^*q}{p^*}\frac{1}{1-q}, \frac{w_h}{w_l}\right)\right]\right]$, or equivalently $p^* = \frac{q}{\mu}\ln\left[\min\left(\frac{1-p^*q}{p^*}\frac{1}{1-q}, \frac{w_h}{w_l}\right)\right]$. The stationary state with no taxes is $p_1 = \frac{q}{\mu}\ln\left(\frac{w_h}{w_l}\right)$, the one with taxes is implicitly defined by $p_2 = \frac{q}{\mu}\ln\left(\frac{1-p_2 q}{p_2}\frac{1}{1-q}\right)$. Assume that at least one of these exist. We show that there is at most one. The high taste for leisure assumption implies that the political equilibrium tax rate is a continuous function of p on $(\frac{1}{2}, 1]$. Define $\hat{p}$ as the proportion where the tax rate under the $x = p$ regime becomes equal to zero, it satisfies $1 - q - \frac{1-\hat{p}q}{\hat{p}}\frac{w_l}{w_h} = 0$. Also define $\Phi(p) = \frac{q}{\mu}\ln\left(\frac{1-pq}{p}\frac{1}{1-q}\right)$, and $F(p) = \Phi(p) - p$. The functions Φ and F are continous on $(0, 1]$, strictly decreasing and $F(1) = -1$, $\lim_{p\to 0} F(p) = +\infty$, $\Phi(\hat{p}) = p_1$. As a consequence there exists a unique $p^* \in (0, 1)$ such that $F(p^*) = p^*$.

Consider first the case where $F(\hat{p}) \geq 0$. By definition $F(p_2) = 0$ and it is a stationary state only if $p_2 \geq \hat{p}$ or equivalently $0 \leq F(\hat{p})$. Hence p_2 is a stationary state. We also have $F(\hat{p}) = \Phi(\hat{p}) - \hat{p} = p_1 - \hat{p} > 0$, and so $p_1 > \hat{p}$ cannot be a stationary state. Now if $F(\hat{p}) < 0$, then $p_1 < \hat{p}$ and so it is a stationary state. p_2 is if $0 < F(\hat{p})$, which is not true. Hence p_1 is the only stationary state. We have shown that there is at most one stationary state on $\left[\frac{1}{2}, 1\right]$, however existence is not necessary because p_1 is not necessarily greater than $\frac{1}{2}$. The general result is that there is either one or no stationary state on $\left[\frac{1}{2}, 1\right]$.

Is there any stationary state on the interval $\left[0, \frac{1}{2}\right]$? Using Lemma 1 we know that only type b agents make a strictly positive socialization effort on this interval, and so that the only stationary state is at $p = 0$.

Proof of Proposition 4

When the taste for leisure is low, p_2 is a stationary state if it exists, i.e. if $p_2 > \max(K_a, \frac{1}{2})$. On the intervals $\left[\frac{1}{2}, \max(K_a, \frac{1}{2})\right]$ and $[0, K_b]$ parents make no effort and so any point in the interval is a stationary state. Finally on the interval $\left[K_b, \frac{1}{2}\right]$ $\Delta_b > 0$ and $\Delta_a = 0$ so there is no stationary state.

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