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INSTITUT FOR ØKONOMI

AFDELING FOR NATIONALØKONOMI - AARHUS UNIVERSITET - BYGNING 350
8000 AARHUS C - ☎ 89 42 11 33 - TELEFAX 86 13 63 34

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8000 AARHUS C - DENMARK ☎ +45 89 42 11 33 - TELEFAX +45 86 13 63 34

Overinsurance in the welfare state

Alvaro Forteza [*]

Universidad de la República, Uruguay [1]

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Abstract

Excess distortions in the welfare state might result from the government lack of ability to commit not to help unlucky agents. Incentive considerations that are crucial in standard insurance in the presence of moral hazard play no role in this case. A benevolent government that sets transfers after agents have chosen their effort faces a pure risk-sharing problem and provides full insurance, inducing too little effort. The lack of commitment ability might also cause an indeterminancy: the economy might end in any of several equilibria, without the government being able to push it to a particular one.

JEL classification: D60; D82; H10; H30; I30; P16

Keywords: Commitment; Coordination failure; Moral Hazard; Multiple equilibria; Welfare State.

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[1] Departamento de Economía, FCS, José Enrique Rodó 1854, CP 11200, Montevideo, Uruguay. FAX: (5982) 481917. E.Mail: Alvaro@decon.edu.uy .

1. Introduction

There is nowadays a widespread concern about the distortions that the welfare state might be introducing in the system of incentives in modern economies. There seems to be an extended feeling that the welfare state has very often gone too far. Social public programs and tax pressure have risen dramatically during the last decades in many countries. New and larger social benefits have reduced the losses that individual agents must bear in the face of bad outcomes. As a consequence, the welfare states might have reduced the incentives individual agents have in order to take due care of their duties. The increase in distortionary taxation that has accompanied the rise of social programs might also reduce incentives to work (e.g., Barr, 1992). Some other countries have not developed so important welfare programs as to be safely clasified as "welfare states", and yet their governments have been very active in redistributing income and protecting groups of individuals that have fallen in disgrace. The feeling that these policies have caused too many distortions is probably even stronger in these cases than in the former ones.

There is an empirical issue concerning the evaluation of the actual distortions introduced by the welfare state. Even though the social programs introduce some distortions in the economy, they might also provide some benefits, in terms of increased social welfare. The balance between the costs and the benefits of these policies is not a priori obvious. An important contribution in this respect is the recent book edited by Atkinson and Mogensen (1993) that presents a comparative study of the welfare state in four european countries. The balance seems to be more negative in other cases, like Argentina and Uruguay. [2] However, assessing

[2] Nothing comparable to the welfare states of the north of Europe developed in Latin

empirically these experiences is not an easy task, and the issue remains open in the current political debate.

There is also a related theoretical issue. Even if social programs and taxes distorted incentives, it might simply be the unavoidable counterpart of insurance in the presence of moral hazard. In principle, the governments should be aware of these distortions and choose the right amount of social programs. Then, why might they have gone too far? Why might so many governments in different countries have organized social programs to such an extent that the social balance could become negative? It does not seem very likely that the distortions that are currently concerning so many economists and politicians are the result of simple mistakes. The coincidence of the problem in many countries also points out towards deeper causes. The aim of this paper is to provide a definition of what "too far" could mean and to present an explanation of how and why the welfare state might have gone too far.

Governments giving high priority to protection of individuals against social hazards are modelled in this paper by means of the fiction of a "benevolent" government that maximizes the summation of individuals expected utilities. Governments make use of as many tools as possible in order to pursue redistribution and insurance, so that the government is assumed to directly choose individuals' disposable income. [3]

America, but some governments have been very active in redistributing and protecting individuals that have suffered losses, conforming a sort of informal welfare state.

[3] The term "welfare state" is used in this paper to "characterize the economic and social policies of a country that gives high priorities to equality and individual protection against social hazards" (Sandmo, 1995).

The country is populated by a large number of risk averse individuals. They are engaged in economic activities that demand exerting some effort. Individual outcomes are uncertain. Yet, agents know that the probability of getting a good outcome is higher if they choose higher effort. Thus, even though individuals dislike effort, they might decide to work hard in order to raise the probability of enjoying higher consumption. Later, uncertainty is solved and individual outcomes are known. Some turn out to get high outcomes, the "lucky", and others get low outcomes, the "unlucky". For the sake of simplicity, assume that individual outcomes are costlessly observed by everybody.

Individual effort, instead, is known only by each individual. This is a key assumption, implying that risk sharing and insurance will be associated with moral hazard. In these conditions, it is well known that the market solution might be socially suboptimal. Individuals would like to buy insurance services, but they would not be able to do it in as much an amount as they would want. If the insurance companies could impose exclusive contracts by which individuals are compelled to buy insurance from a single provider, the equilibrium would normally entail rationing, incomplete insurance and some positive effort. If the companies could not restrict the amount of insurance that each agent buys, the market equilibrium might not exist. If it still existed, it would involve full insurance, but with minimum effort (Arnott and Stiglitz, 1988).

The government does not know individual effort either, so that, in this respect, it has no advantage over private insurance companies. Moreover, it might have an important disadvantage, namely that **it might not be able to commit not to help unlucky agents ex-post**. Agents are aware of the government's concern about their well-being, and they know it has a whole range of instruments to redistribute income, and to do it quickly. As Dixit and

Londregan (1995a) colorfully put it, "politicians can raise a tariff here, subsidize the price of a crop there, and channel money for highway construction almost anywhere". Formally, this distinctive characteristics of state insurance are captured in the present paper by assuming that the government chooses individual disposable income **after** agents have chosen the level of effort. This assumption is crucial, since it implies that ex-post the government faces a pure risk sharing problem, with no room for incentive considerations. As a consequence, it provides full-insurance. Notice that the government might be perfectly aware of the moral hazard problem, but bygones are bygones. Agents know it, so they choose minimum effort.

There might be overinsurance in this economy, in the sense that the ex-ante optimal policy could be to provide incomplete insurance. However, this policy would not be credible. So agents choose low effort and ex-post the government's best policy is to fully insure them. As in other policy games analyzed in the new political economy, the government tries to move from the second best (high effort plus incomplete insurance) to the first best (high effort plus complete insurance) but ends in the third best (low effort plus complete insurance). If the government could commit to provide incomplete insurance, the second best would be implementable (Persson and Tabellini, 1989).

A related idea has been recently proposed to provide a rationale for social security systems (Summers, 1989). If governments were unable to commit not to help old people if they did not save enough when young, there might be less savings than what is socially optimal. The social security system makes savings compulsory, eliminating the problem. In the present paper, the focus is on activities in which agents' actions are not observable, so that the government cannot directly command agents to perform the desired action.

Welfare states in the real world have performed very differently across countries and along time. One possible explanation explored in this paper is that welfare states are likely to exhibit coordination failures à la Cooper and John (1988). Redistributive policies may cause strategic complementarities: each individual optimal effort level may be increasing in the proportion of individuals in the population that is currently working hard. Multiple equilibria associated with strategic complementarities are Pareto rankable. Hence, if the diversity of the welfare states responded to coordination failures, there would be a precise sense in which it could be said that some countries are performing better than other countries or that some welfare states are currently doing worse than what they used to do.

The paper proceeds as follows. In section 2, it is shown how and why a government lacking the commitment capacity might provide too much insurance. In this section, and for the sake of simplicity, the utility functions are assumed additively separable in consumption and effort. The general case is analyzed in section 3, where it is shown that the overinsurance equilibrium remains, while other equilibria might arise under discretion. Section 4 concludes with some remarks.

2. Time inconsistency and the overprovision of state insurance

Consider an economy populated by a continuum of individuals indexed by 'i', ranging in the real interval [0,1]. All of them produce the same consumption good, incurring in effort (a_i), which, for the sake of simplicity, can take just two values: high (H) and low (L) effort. Each agent gets an amount X with probability $P(a_i)$ and x with probability $(1-P(a_i))$. Just to fix ideas, assume X > x so that $P(a_i)$ is the probability of "being lucky". This probability is a function of the individual's action. The probability of getting the good outcome is higher when the agent chooses to put in high effort (P(H) > P(L)). Probabilities of different individuals are independent. In this environment, there is individual but not aggregate risk. Ex ante, individual output is only probabilistically known while total output is known with certainty.[4]

Individuals seek to maximize expected utility functions, which are increasing and concave in consumption ('C'in the good state and 'c' in the bad state; u'>0, u''<0) and decreasing in effort. For the sake of simplicity, it is assumed in this section that utility functions are additively separable. Non-separable utility functions are introduced in the following section.

Agents dislike effort: H > L > 0.

$$U(a_i,C,c) = P(a_i).u(C) + (1-P(a_i)).u(c) - a_i \qquad \textbf{(1)}$$

It is immediate that there will be some room for insurance in this economy. Without it, i's expected utility is given by (1) with C=X and c=x. If instead, individuals were offered a zero-cost-full-insurance scheme, agent i would get $C = c = P(a_i)X + (1 - P(a_i))x$ in both states of

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[4] The law of large numbers with a continuum of independent identically distributed random variables might not hold. In this paper, this technical problem is bypassed assuming that the probability measure has the desirable properties, as discussed by Kenneth Judd (1985).

nature. Due to risk aversion, expected utility with insurance is higher, for each action. Thus, a benevolent government concerned about citizens' welfare might provide insurance.

To be more specific, assume that the government maximizes a social welfare function that is the summation of individuals' expected utilities. Using taxes and transfers, the government determines consumption allocations in both states of nature. Individual output is observable, so that the government can make consumption allocations contingent on it. Agent 'i' receives W_i when he gets high output and w_i when he gets low output.

Consider now the timing. Unlike private companies, which must set the conditions of the insurance contract before agents choose actions, the government might reoptimize in any moment. Thus, two potentially different optimal policies must be considered: one under commitment and the other under discretion. A government with the ability to commit its policy before agents choose effort solves the following program:

$$a_i = \arg\max_{a_i} \; P(a_i).u(W_i) + (1-P(a_i)).u(w_i) - a_i \;; \quad \textbf{(4)}$$

$$\underset{w_i,a_i}{\text{maximize}} \int_0^1 [P(a_i).u(W_i) + (1-P(a_i)).u(w_i)] - a_i \, di \quad \textbf{(2)}$$

$$\int_0^1 [P(a_i).(X-W_i) + (1-P(a_i)).(x-w_i)] \, di = 0 \quad \textbf{(3)}$$

Equation (3) is the whole economy resource constraint and equations (4) are the incentive compatibility constraints. Notice that the fact that the government is maximizing agent i's utility does not make condition (4) redundant. It says that the action a_i must be **ex-post** optimal for the agents. In game theoretic terms, this condition warrants subgame perfection of the solution.

In a symmetric equilibrium, the government will provide all agents the same consumption pair, without waisting resources. Thus, it follows from the economy resource constraint (3) that:

$$P(a_i).(X-W_i) + (1-P(a_i)).(x-w_i) = 0 \;; \;\forall i \quad \textbf{(5)}$$

Notice, however, that equation (5) holds in equilibrium, and it does not generally hold out of equilibrium. Consider, for instance, the strategy profile in which the government provides full-insurance-high-level consumption and all but one agents work hard. The free rider, the agent that put in low effort, receives more than his expected output, so that equation (5) does not hold. This is precisely what causes that full insurance with high effort is not an equilibrium. Thus, while equation (3) is a constraint that cannot be violated, equation (5) must only hold in equilibrium.

The government's best policy in period 1 is the pair (w_i,W_i) that, solving the system (4)-(5) for each and all agents, provides maximum expected utility. The incentive compatibility constraint (4) determines a partition of the w_i-W_i space in two regions, the high-effort and the low-effort regions. The maximization of (2) subject to (3) is computed for high and low effort respectively. These programs, that have "well-behaved" convex indifference curves and linear constraints, yield one point for each region. The government finally picks the one that provides the overall maximum utility.

In this simple model with only two actions, there are two possible types of ex-ante equilibria. One with incomplete insurance and high effort and one with full insurance and low effort. A graphical representation of these equilibria is presented in figure 1. [5]

Figure 1

Consider now the government's problem under discretion. Being unable to make a binding commitment, the government picks a consumption allocation after agents have chosen effort. Hence, it faces a pure risk-sharing problem. Actions are given, so the incentive compatibility constraint does not hold. Maximization of (2) subject to (3) yields full-insurance, no matter whether agents have put in low or high effort. The first order conditions of this program imply

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[5] See the appendix for an explanation of the figure.

that:

$$u'(W_i) = u'(w_i) \quad ; \quad \forall i \qquad (6)$$

$$\frac{u'(w_i)}{u'(w_j)} = 1 \quad ; \quad \forall i,j \qquad (7)$$

Equation (6) implies full insurance and equation (7) implies that all agents receive the same. Economic agents are aware of government incentives. They know that the government will provide full insurance, so they choose low effort. With $W_i = w_i$, the solution of (4) is $a_i = L$. These conditions, together with the resource constraint, give the set of consumption allocations in the discretionary equilibrium. [6]

Now compare the optimal ex-ante and ex-post policies. In the case depicted in figure 1a, they coincide. But in the case of figure 1b, the ex-ante optimal policy is no longer optimal after agents have chosen effort. Thus, in the second case, the incomplete insurance policy is non credible, due to time inconsistency. It would be credible only if the government had the ability to commit not to reoptimize ex-post. Without commitment, the government would be ex-post tempted to remove the distortion caused by moral hazard and provide full insurance. In terms of figure 2, the government would try to move from 2[nd] to 1[st], i.e. from the second to the first best. But agents are aware of these incentives, so they choose low effort and the economy ends in 3[rd], which is a third best.

Figure 2

Full insurance and low effort might have completely different meanings in the commitment and the discretionary equilibria. Under commitment, a full-insurance-low-effort equilibrium might be

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[6] If the government weighted individual utilities in a non-uniform fashion in its objective function, the full-insurance result would still hold. The only difference with the uniform weights case considered above would be that individuals with different weights would get different average consumption.

a first best. Under discretion, the full insurance and low effort outcome would arise even if the ex-ante optimal policy involved incomplete insurance, as in figure 2. This discretionary equilibrium would be a third best. In the first case, it is just a matter of preferences. In the second, there is a loss of social welfare. In point 3rd there is overinsurance.

Notice that ex-ante optimization is more demanding for the government, for it requires precise knowledge of the states of nature and their probabilities, while ex-post optimization only requires knowing the amount of output. The government might even ignore which are the possible states of nature and decide after the shocks took place. Indeed, it does not make any difference in this setup whether the government optimizes before or after the shock takes place. Before the shock, the policymaker maximizes (2) subject to (3), picking a contingent consumption allocation. After the shock, it solves the following program:

$$\underset{\{W_i\}}{Maximize} \int_0^1 [u(W_i) - a_i]\, di \qquad \textbf{(8)}$$

$$s.t.: \quad \int_0^1 [P(a_i).X + (1-P(a_i)).x]\, di \geq \int_0^1 W_i\, di \qquad \textbf{(9)}$$

where the resource constraint has been reorganized to make it clear how little information the government needs to solve the ex-post problem. The left hand side in the resource constraint is aggregate output, something that the government observes. But maximization of (2) subject to (3) is the same as maximization of (8) subject to (9), as it becomes clear when the condition $W_i=w_i$, obtained from the FOCs of the first program, is substituted back into (2) and (3).

Thus, in the case of "true uncertainty", in which probabilities or even the states of nature are not known (Knight, 1921), ex-post optimization might be the only thing the government can do. Furthermore, if ignorance were shared by private companies, private insurance would not exist. Thus, ex-post insurance would be the only available option, and it might still be welfare improving.

The overinsurance result extends to the continuous effort case. First, the government's ex-post problem is the same as before: maximization of (2) subject to (3). Thus, in the discretionary equilibrium, the government provides full insurance and agents choose minimum effort. Second, ex-ante optimization usually implies incomplete insurance and a level of effort above the minimum. This is a standard result from agency theory (see, for instance, Holmstrom, 1979; Grossman and Hart, 1983; and Rogerson, 1985). Thus, even though the ex-ante optimal policy would generally be to provide some but not full insurance, a government that is not able to commit not to reoptimize ex-post would always provide full insurance.

3. Non-separable utility functions and multiple equilibria

The model presented in the previous section is special in that utility functions are assumed to be additively separable in consumption and effort. In this section, the analysis is extended to allow for non-separable preferences. For the sake of simplicity, just two effort levels are formally considered. The main results are as follows. First, there is one equilibrium under commitment. As before, it could involve either full insurance and low effort or incomplete insurance and high effort. Second, the discretionary policy may exhibit multiple equilibria. There always exist an equilibrium in pure strategies with full insurance and low effort (point 3rd in figure 2). There could also be other equilibria in mixed strategies with incomplete insurance and some, but not all, agents working hard. Third, the commitment equilibrium (weakly) Pareto dominates the discretionary equilibria.

With non-separable utility functions, the discretionary policy is not as simple as it was under the assumption of separability. The new issue is that the government now cares about effort. Even though in the second period effort is a given, it matters because the marginal utility of consumption depends on it. But the government does not observe effort. Still, it might infer something from observing output, for a high level of output is more likely if the agent worked harder than otherwise. Thus, the government can maximize the sum of expected utilities conditional on observed outcomes:

$$ze \int_0^1 [Prob(H/x_i).u(w_i,H) + (1-Prob(H/x_i)).u(w_i,L \qquad \textbf{(10)}$$

$$x^A = \int_0^1 [Prob(X/a_i).X + (1-Prob(X/a_i)).x]\, di \geq \int_0^1 \qquad \textbf{(11)}$$

where:

i) **Prob(H/x_i)** is the probability that the government attaches to the event that agent i has worked hard, after having observed agent i's output (which can be either X or x).

ii) $\mathbf{x^A}$ is aggregate output. (Notice that the government does not need to know a_i in equation (11), for it directly observes aggregate output).

The first order conditions of this program yield:

$$rob(H/X).u_1(W,H) + (1-Prob(H/X)).u_1(W,L) = Prob(H/x).u_1(w,H) + (1-Prob(H/x)).u_1(w,L \quad \textbf{(12)}$$

where $u_1(.)$ stands for the first derivative in the first argument. The subindex in (w,W) has been dropped, because the same condition holds for all agents.

The government can appeal to Baye's rule to determine the conditional probabilities:

$$/x_i) = \frac{Prob(x_i/H).Prob(H)}{Prob(x_i/H).Prob(H) + Prob(x_i/L).(1-Pr} \quad \textbf{(13)}$$

The probabilities of high and low output, conditional on effort, are common knowledge. The unconditional probability that someone has worked hard (Prob(H)) is also the proportion of individuals that has worked hard. [7] This variable is not observable, but it can be computed from the number of individuals that got high output (N):

$$= Prob(X/H).Prob(H) + Prob(X/L).(1-Prob(H) \quad \textbf{(14)}$$

The discretionary policy or the government reaction function can be computed solving the system (11) to (14), with (11) holding as an equality. It is a mapping from the number of individuals that got high output to the set of feasible consumption allocations.

In the first period, agents choose effort to maximize expected utility (program (4)). They know the government reaction function, so that they can, in principle, anticipate the government's policy. However, as it was argued above, the discretionary policy depends on what private

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[7] In the previous section, the probability of getting high output for an agent that worked hard was denoted by **P(H)**. In this section, the same probability is denoted by **Prob(X/H)**, to avoid any possible confusion with the unconditional probability that someone has worked hard.

agents do. Thus, in order to make a rational choice, each agent has to foresee other agents decisions.

Agents' actions have been constrained to be high or low effort, by assumption. But even in this very simple setup, agents might decide on a continuum of strategies, since they can randomize. Thus, in general, each agent can pick up a certain probability of putting in high effort. If they choose 0 or 1, they play pure strategies, otherwise they play non-degenerate-mixed strategies.

A **discretionary equilibrium** of the welfare policy game is a set of consumption allocations, individual probabilities of working hard and beliefs such that: i) in the second period, the government has beliefs about individual effort, determined by using Baye's law and what it does know with certainty: individual output and the proportion of individuals that worked hard; ii) the government chooses a consumption pair that maximizes the summation of individual expected utilities, given its beliefs about individual effort; iii) in the first period, each private agent chooses effort in order to maximize his expected utility, given his beliefs, given the government's policy in equilibrium and given the other equilibrium effort levels.

Proposition 1: The discretionary policy game always exhibit an equilibrium with full insurance and low effort (zero probability of working hard). Moreover, this is the only equilibrium in pure strategies.

Proof: First notice that output conveys no information in a pure-strategies-symmetric equilibrium. If agents chose high effort with certainty, the government's prior in (13) would be one, so that the posterior would also be one for all agents, independently of realized individual output. Conversely, if agents chose low effort with certainty, the posterior would be zero. In both cases, equation (12) implies that the government provides full insurance. As a consequence, agents put in low effort. QED.

The intuition behind this result is straightforward. If agents chose pure strategies, realized output would be completely uninformative about effort (Prob(H/X) = Prob(H/x)). Thus, the government would have no reason to make any difference between individuals.

Proposition 2: The discretionary policy game might exhibit mixed-strategies equilibria with incomplete insurance and some, but not all, agents working hard.

Proof: In a non-degenerate-mixed-strategies equilibrium, private agents randomize, choosing high effort with probability strictly larger than zero and lower than one. These strategies would not be optimal if agents were not indifferent between high and low effort. Thus, these equilibria must lie on the incentive compatibility line: [8]

$$Prob(X/H).u(W,H) + (1-Prob(X/H).u(w,H) = Prob(X/L).u(W,L) + (1-Prob(X/L)).u(w,L) \quad \textbf{(15)}$$

Equation (15) implies that a non-degenerate-mixed-strategies equilibrium must involve incomplete insurance, i.e. W > w. Any set **{W*, w*, Prob(H)*}** that satisfies the system (11) to (15) is a mixed-strategies equilibrium of the discretionary policy game. [9] QED.

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[8] In the previous section, it was assumed that on the incentive compatibility line agents choose high effort. This assumption, standard in agency theory, helps in getting rid of an economically non-substantive existence problem. Now the assumption is modified to allow for mixed strategies.

[9] Notice that "Prob(H)*" in this game stands for both private agents' strategies and players' beliefs

These equilibria do not need to exist, and if they do, they might not be unique. The corollary of the following proposition establishes a necessary condition for the existence of mixed-strategies equilibria.

Proposition 3: In a mixed-strategies equilibrium, the marginal utility of consumption, in both states of nature, must be strictly larger for an agent that put in high effort than for an agent that put in low effort. Formally:

$$(w^*,L) < u_1(w^*,H) \quad ; \quad u_1(W^*,L) < u_1(W^*, \qquad \textbf{(16)}$$

Proof: From equation (12):

$$(W^*,H) - u_1(w^*,H)] + (1-P_1).[u_1(W^*,L) - u_1(w^*,L$$

$$= (P_1 - P_2).[u_1(w^*,L) - u_1(w^*,H)]$$

$$(W^*,H) - u_1(w^*,H)] + (1-P_2).[u_1(W^*,L) - u_1(w^*, \qquad \textbf{(17)}$$

$$= (P_1 - P_2).[u_1(W^*,L) - u_1(W^*,H)]$$

where: P_1 = Prob(H/X), and P_2 = Prob(H/x).

In a mixed-strategies equilibrium, the unconditional probability of high effort (Prob(H)) is strictly larger than zero and lower than one. It follows that the probability of high effort conditional on realized output is higher when realized output is high and it is strictly larger than zero and lower than one $(0 < P_2 < P_1 < 1)$.[10] In proposition 2, it was shown that in mixed-strategies equilibria the government chooses incomplete insurance: $W^* > w^*$. These two strict inequalities imply that the left hand sides in equations (17) are negative. For the right hand sides to be negative, proposition 3 must be true. QED.

(correct guesses for private agents and priors that are updated in each case following Baye's rule for the government).

[10] Realized output is, for the government, a signal of effort. In the present context, high output is said to be *more favorable* than low output, for the posterior probability of H conditional on X is larger than the posterior of H conditional on x. In a more general framework, with many effort levels, the distribution of a_i conditional on high effort dominates the corresponding distribution conditional on low effort, in the sense of first order stochastic dominance (see Milgrom, 1981).

Corollary of proposition 3: (necessary condition for the existence of mixed-strategies equilibria). For mixed-strategies equilibria to exist, there must be at least one pair (w,W) for which condition (16) holds.

This corollary shows that equilibria in mixed strategies might not exist. That would be the case if, for instance, the marginal utility of consumption were for any consumption level higher when the agent put in low effort than when he put in high effort.

The intuition behind these results is as follows. Agents might be willing to work hard with non-zero probability, if they got more consumption when output is high. Without commitment, the government will associate a higher consumption to high output if and only if two conditions are fulfilled: i) high output must be a signal that high effort is more likely; and ii) the government must find it optimal to give more output to those that have worked hard. Condition i) implies that there cannot be a pure-strategies equilibrium with high effort in the discretionary policy game. Thus, if an equilibrium with non-zero probability of high effort existed, it should be in mixed strategies. Condition ii) might not be fulfilled. This is the case, for example, of separable utility functions. In this case, the low-effort-pure-strategy equilibrium is the only equilibrium of the discretionary policy game.

Proposition 4: (Welfare comparisons). i) The discretionary equilibria are Pareto rankable. ii) The commitment equilibrium weakly Pareto dominates all the discretionary equilibria.

Proof: i) The first part is trivial, for the population has been assumed homogeneous. ii) The government's option set in the discretionary game is properly contained by the government's option set in the commitment policy game. It follows that if the government picks a different consumption allocation in both regimes, it must be because the one chosen in the commitment regime provides higher utility. QED.

An example may help to get the intuition behind the multiple discretionary equilibria. The results of a numerical simulation are summarized in figure 3 (see the appendix for the details). The "government policy" line is the projection of the tridimensional government's reaction function on the w-W space. It is the locus of (w,W) such that the government is maximizing, conditional to an observed aggregate outcome. It touches the full-insurance line twice: the low (high) one corresponds to the lowest (highest) aggregate output, that occurs when everybody put in low (high) effort. In neither of these extreme cases, corresponding to agents playing pure strategies, the government has any reason to make differences between agents, so it provides full insurance. Being on the full-insurance line, both points are in the low effort region. Thus, only the low one is an equilibrium. In this example, the government line crosses the incentive compatibility line twice. These points are mixed strategy equilibria, provided agents choose the "right" randomization.

Figure 3

Multiple equilibria necessitate strategic complementarity (Cooper and John, 1988). In the present game, the change in expected utility that each agent get by working hard might be an increasing function of other agents' own probabilities of working hard. This complementarity is introduced by the government's Bayesian inference about effort.

4. Concluding remarks

Full insurance and low effort might respond to at least three different reasons. The first is just that agents prefer this life style (case of figure 1a). The second one is that the lack of the ability to commit by the government causes overinsurance (case of figure 2). The third reason is that there is "true uncertainty", so that it is not possible to design a formal insurance scheme ex-ante.

The policy implications are very different in each case. In the first one, nothing should be done. There is no motive for concern. Under true uncertainty, it might be convenient to invest in gathering more information. Only in the second case, institutional reforms to reduce the government's discretion would be advisable. This is the case in which the welfare state might have gone "too far". Still, simply dismounting formal welfare institutions might not be the solution. It should be carefully assessed whether the new institutions would help to raise the government ability to commit. Otherwise, they might not induce changes in private agents behavior.

When agents simply prefer full insurance and low effort, a reduction of the welfare state might do no harm if the private sector could do the job. But if any of the many possible causes of market failure were present (Arnott and Stiglitz, 1988; Barr, 1992), the government would not be substituted by the private sector, and welfare would decrease.

In the case of true uncertainty, ex-post state insurance is the only thing that it could be done to deal with uncertainty. It is not possible to say in general whether this intervention would be welfare improving or not. Agents might be better off with no insurance at all. But nobody would know it in advance, due to the extreme lack of information. Thus, even if institutional reforms to reduce ex-post state insurance were available, it would be difficult to say whether they should be implemented.

Ex-post optimization does not mean that the discretionary regime cannot exhibit formal welfare institutions. In the presence of formal institutions, the rules of state insurance would be explicit before current generations took their decision about effort. Still, it might not mean that the government is optimizing ex-ante. Lasting welfare institutions might simply be the result of a lasting unsolved time inconsistency problem.

The welfare state might be very informal, in the sense that no typical welfare institutions might exist and still the government might be very active in insurance activities. This would be specially the case under "true uncertainty". The policy would look unpredictable and casuistic. There would be a "lack of clear rules of the game". But the government would have strong social welfare reasons to do what it does. It seems more likely that the welfare state takes this informal and rather chaotic form in LDCs, in which states are usually weak and information is scarce.

The government's inability to commit might not only reduce welfare but it could also introduce a basic indeterminacy in the economy. The economic performance might be any of several possible levels, being the government unable to drive the economy to any of them.

Appendix

Derivation of figure 1

Full insurance is represented by the 45º line, since W_i=w_i on that line. Any point out of this line implies incomplete insurance. The incentive compatibility constraint is binding when the following condition holds:

$$u(W_i) - u(w_i) = \frac{H - L}{P(H) - P(L)} \qquad (18)$$

This condition defines an **incentive compatibility line** in the w_i-W_i space, located to the west of the full insurance line and with slope larger than 1. Consumption allocations to the west (east) of the incentives line induce agents to put in high (low) effort.

Agents' preferences are represented by a map of **indifference curves** in the w_i-W_i space, with slope given by:

$$\frac{dW_i}{dw_i}\bigg|_{indiff.c} = -\frac{1-P(a_i)}{P(a_i)} \cdot \frac{u'(w_i)}{u'(W_i)} \qquad (19)$$

The indifference curves exhibit a discontinuity in slope (not in level) on the incentive compatibility line: they are steeper in the low effort region. Thus, the indifference map is non-convex, even with "well behaved" utility functions.

The **resource constraint**, equation (3), defines two straight lines, one for each effort region. They cross each other in the point (x,X). The slope of the resources line is higher in absolute value to the east of the incentives line. If (x,X) lies on the incentives line, the resources constraint exhibit no discontinuity in level. Otherwise, the resources constraint exhibit a discrete jump when it reaches the incentives line. The set of feasible consumption allocations becomes non-convex.

The indifference curves are steeper than the resource lines everywhere, save on the full-insurance line, where they have the same slope.

<u>The example in figure 3</u>

The example was built on the following assumptions:

and parameter values: H = 2.0 ; L = 1.0 ; P(H) = 0.9 ; P(L) = 0.2 X = 1.0 ; x = 0.0 ; β = -0.01072 .

$$u(w,H) = H.Ln\, w \qquad u(w,L) = L.Ln\, w + \$ \tag{20}$$

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