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IFN Working Paper No. 1058, 2015

# **Norms, Incentives and Information in Income Insurance**

Assar Lindbeck and Mats Persson

# Norms, Incentives and Information in Income Insurance\*

by

Assar Lindbeck\* and Mats Persson#

*Abstract:*

In this paper, we ask under what conditions norms can enhance welfare by mitigating moral hazard in income insurance. We point out a particular role of norms, namely to compensate for insurers' difficulties in monitoring the behavior of insured individuals. Thus, the functioning of social norms depends crucially on information, in particular on what norm enforcers are able to observe about an insured individual's behavior. Information is also decisive when distinguishing between social norms and internalized norms. We study how optimal insurance arrangements, the behavior of insured individuals, and welfare are influenced by norms. We also examine the optimal strength of norms. Generally speaking, the paper is a study of the interaction between norms and economic incentives.

*Key words:* Norms, moral hazard, insurance, information

*JEL codes:* D82, H55, H75, I13, J22

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## *1. Introduction*

A century ago, individuals could hardly support themselves without working or receiving support from family members. As a result, parents tried to instill norms in favor of work so that their children would be able to support themselves in the future. Institutions such as the school system and the church also emphasized the individual's responsibility in this respect. About half a century ago, the welfare state, with elaborate social insurance arrangements, was introduced in developed countries. Social insurance, complemented with voluntary insurance contracts, made it possible for an individual to survive even when unable to work, without support from family members. It is, therefore, reasonable to regard the welfare state as an important and welfare-enhancing social innovation. Indeed, the modern welfare state may be considered a triumph of Western civilization.

But as in the case of other types of insurance, income insurance has inherent problems. The most obvious one is negative effects on incentives to work – a result of both the implicit tax wedge in income insurance and the temptation among individuals to overexploit or even cheat the system (moral hazard). At the outset, such unintended effects were not serious in the sense that norms inherited from the past inhibited such consequences. Later on, however, a clash emerged between the new incentive structure and inherited norms. Our hypothesis is that the norm, as a consequence, gradually weakened over time as some “entrepreneurial” individuals began to make a more liberal interpretation of the right to receive benefits, and other individuals gradually followed their lead. Since it took time for such an erosion of inherited norms to take place, there was a considerable lag between the creation of generous systems of income insurance and the emergence of serious moral-hazard problems.

Today we have both a theoretical and an emerging empirical literature on the importance of norms for the functioning of income transfers and income insurance.<sup>1</sup> The purpose of this paper is to ask three basic questions about the role of norms in income insurance. What are the mechanisms by which norms may mitigate moral hazard? How does the strength of the norm

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<sup>1</sup> Examples of theoretical analysis of norms in the context of tax/transfer programs are Lindbeck (1995) and Lindbeck, Nyberg and Weibull (1999). Examples of empirical studies in this field are Hesselius, Johansson and Vikström (2013), Ljunge (2012), Heinemann (2008) and Lindbeck, Palme and Persson (2015).

influence the optimum contract and individual behavior? Finally, under what conditions are norms welfare-enhancing?

The answers to these questions depend crucially not only on what type of behavior the norms are supposed to influence, but also on the assumptions we make about the information held by those who enforce the norms. Information is crucial because limited information makes it difficult to punish norm-breakers without harming others at the same time – a problem of “collateral damage”. So far, however, studies in this field have not dealt with the importance of information among those who enforce the norms. An ambition of our paper is to study this aspect. We examine the interaction between incentives and norms when the information among norm-enforcers is limited, combining sociological and economic mechanisms.

We adhere to the traditional distinction between *social* norms and *internalized* norms (e.g., Parsons, 1952 and Coleman, 1990). Both types of norms are potentially important for the functioning of income insurance and, more generally, for the welfare state. The distinction between social and internalized norms is intimately related to the information that is available to those who enforce the norm – fellow citizens in the case of a social norm, and the individual himself in the case of an internalized norm. The distinction between these two types of norms is therefore not merely a subtle conceptual issue; it also has an informational dimension.

It is also useful to make a distinction between *exogenous* and *endogenous* norms. While the strength of the former type of norm is constant, the strength of the latter type depends on the number of people who violate it. To highlight the issue of information, we abstract from complications associated with endogenous norms – such as multiple equilibria and social multipliers.<sup>2</sup> We therefore deal only with exogenous (parametric) norms, although we allow the strengths of the norms to vary. We derive optimum insurance contracts for different strengths of the norms, and we ask which strength provides the highest expected utility. In this sense, we evaluate the welfare consequences of exogenous norms of different strengths.

Our analysis is formally confined to income insurance in connection with sick leave (temporary disability) – an important type of income insurance in European countries. However, the general

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<sup>2</sup> Cf. Manski (1993), Brock and Durlauf (2001) and Glaeser, Sacerdote and Scheinkman (2003)

principles of the analysis are also relevant for other forms of income insurance, such as early retirement for health reasons (permanent disability) and unemployment.

There is a theoretical possibility that not only individuals, such as neighbors and workmates, impose social norms and hence stigmatize norm-breakers. Institutions, e.g. insurance companies and government insurance administrators, may also do so. However, we abstain from investigating this possibility since we want to examine informal social control, which is enforced by fellow citizens (“neighbors”) rather than by institutions.

Another limitation of this paper is that we only study the simple type of contracts that dominate real-world insurance arrangements, i.e., contracts that grant compensation for full-time work absence. We do not consider more elaborate contracts, for instance those which combine part-time work with part-time benefits. The reason is that such complications do not provide any additional insights into the role of information for the functioning of norms in insurance, which is a central issue in this paper.

## 2. *A Workhorse Model Without Norms*

The simple insurance model in Lindbeck and Persson (2013) – where an individual’s ability and willingness to work are treated as a continuous, stochastic variable – provides a suitable framework for this paper. In that model, the number of people who live on sickness benefits at a given point in time depends continuously on the parameters of the insurance system (i.e., the contribution and benefit rates). By adding a norm to that model, the number of beneficiaries in the case of an optimal insurance contract would in general also be a continuous function of the norm. By contrast, the traditional models of income insurance with moral hazard, following Diamond and Mirrlees (1978), treat the individual’s health as a binary (dichotomous) variable. This means that the number of beneficiaries in optimum is equal to the number of people who are objectively unable to work. Introducing norms into such a model would not affect the number of beneficiaries in the case of an optimal contract; the number would still be equal to the number of people who are objectively sick.

In our continuous-state workhorse model, without norms, the utility of the representative individual is

$$u(1 - p) + \theta \quad \text{when working,} \quad (1)$$

$$u(b) \quad \text{when living on benefits.} \quad (2)$$

Here,  $u(\cdot)$  is a concave consumption utility function, and  $p$  is the insurance premium. Thus  $(1 - p)$  is the net wage earned when working (with the gross wage rate normalized to unity), while  $b$  is the benefit received when the individual stays home from work due to health problems. Further,  $\theta$  is a continuous random variable, representing the individual's pleasure or discomfort from working *per se*. For brevity, we often simply call  $\theta$  the individual's "health", but it, in fact, denotes the comfort or discomfort of working – a much wider concept than health. It is drawn from a cumulative probability distribution  $F(\theta)$ , and we assume that  $\theta$  is observable only by the individual himself.<sup>3</sup> All individuals are assumed to be identical *ex ante*, when the insurance contract is determined, but they differ *ex post* depending on the realization of  $\theta$ .

In the literature on labor economics, work is usually assumed to generate disutility for the individual, which in our context would mean that  $\theta$  could only take negative values. There is, however, no *a priori* reason to assume that individuals always dislike work. It may often be pleasant rather than onerous, partially because of social interaction with workmates. In our model, we therefore allow  $\theta$  to take both negative and positive values.<sup>4</sup> The individual chooses to stay home from work and live on benefits if  $u(1 - p) + \theta \leq u(b)$ , which defines a cutoff

$$\theta^* = u(b) - u(1 - p) \quad (3)$$

at which the individual is indifferent between work and non-work. He thus stays home if  $\theta \leq \theta^*$ . If there is less than full insurance, i.e., if  $b < (1 - p) \leftrightarrow u(b) < u(1 - p)$ , equation (3) implies that the cutoff is a negative number.

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<sup>3</sup> In Lindbeck and Persson (2013) we study three alternative assumptions about information concerning  $\theta$ : full information (i.e., the insurer can observe  $\theta$ ), partial information (i.e., the insurer can observe a noisy signal of  $\theta$ ), and no information (i.e., the standard assumption in the insurance literature).

<sup>4</sup> For an analysis, and a survey of studies, according to which work *per se* is often pleasant, see Rätzel (2012).

The fraction of time that the representative individual stays home (or the fraction of the population that stays home on a given day) is  $F(\theta^*)$ , and the insurer's budget constraint is

$$[1 - F(\theta^*)] \cdot p = F(\theta^*) \cdot b. \quad (4)$$

The representative individual's expected utility (or the Utilitarian sum of individual utilities) is

$$[1 - F(\theta^*)] \cdot [u(1 - p) + E(\theta|\theta > \theta^*)] + F(\theta^*) \cdot u(b). \quad (5)$$

Maximizing (5) with respect to  $p$  and  $b$ , subject to (3) and (4), yields the optimal insurance contract  $(p, b)$  under non-observability of  $\theta$ ; for details, see Lindbeck and Persson (2013). We may think of this optimum as the result of a perfect political process in the case of a social-insurance monopoly. Another way to regard this optimum is that it reflects the outcome of a perfectly competitive insurance market, where competition will drive  $p$  and  $b$  to the point where expected utility is maximized for the representative individual.

The Lindbeck and Persson (2013) model yields four distinct conclusions:

1. The optimal contract  $(p, b)$  implies less than full insurance:  $b < 1 - p$ , which is a well-known property in the literature on income insurance under non-observability.
2. The model provides two rationales for insurance: income smoothing and pain relief (in the sense that an individual can afford to avoid working when this is particularly onerous). By contrast, in the traditional literature based on Diamond and Mirrlees (1978), income smoothing is the only rationale for income insurance.
3. In the model, concavity of consumption utility  $u(\cdot)$  is not sufficient to warrant insurance. Conditions for insurance to be warranted also involve other properties of the utility function, as well as the shape of the probability distribution  $F(\theta)$ .<sup>5</sup>
4. Due to the implicit tax wedge, income insurance reduces labor supply even under an optimal insurance contract.<sup>6</sup> By contrast, in the Diamond-Mirrlees dichotomous model,

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<sup>5</sup> What is required for insurance to be desirable in this model is that the advantage of income smoothing and pain relief dominate over the loss in consumption utility when labor supply (and hence aggregate consumption) falls as a result of the insurance. For a formal analysis of these conditions, see Lindbeck and Persson (2013, pp 944-945 and 947-948).



labor supply is unaffected by an optimal insurance contract; all healthy individuals work, and all unhealthy individuals live on benefits.

The purpose of this paper is to introduce norms into such a continuous-state framework. This can be achieved in several ways, depending both on what type of behavior the norm refers to, and on what fellow citizens (“neighbors”) can observe. We start with a simple approach where norms are introduced into the model in a rather naïve, *ad hoc* fashion.

### 3. Naïve Norms

To begin with, we simply assume that there is a norm against receiving benefits. Formally, this means that the model (1)-(2) is modified to

$$u(1 - p) + \theta \quad \text{when working,} \quad (1)$$

$$u(b) - \varphi \quad \text{when living on benefits,} \quad (2')$$

where  $\varphi$  is the disutility of violating the norm.  $\varphi$  may be interpreted as either shame (in the case of a social norm) or feelings of guilt (in the case of an internalized norm). Throughout this paper, we assume that  $\varphi$  is a parameter in the sense that it is independent of the number of norm-breakers. For instance, the value of  $\varphi$  may be inherited from history. However, we study the consequences of different (exogenously given) values of  $\varphi$ .<sup>7</sup>

There are at least two reasons for analyzing norms as in (2'). One is that individuals in the real world actually seem to feel shame or guilt when living on benefits. Indeed, there is evidence that guilt and/or shame is associated with being a benefit recipient *per se*, rather than with the size of the benefit; see Moffitt (1983). The other reason for specifying norms as in equation (2') is that they have actually been modeled this way in the literature.<sup>8</sup> The cutoff between living on benefits and living on labor income then becomes

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<sup>6</sup> Let the contribution rate be  $p$ , the benefit rate (replacement rate)  $b$  and the wage rate  $w$ . The difference in income when working and when living on benefits then is  $w(1 - p) - wb = w(1 - (p + b))$ , and hence the implicit tax wedge is  $p + b$ .

<sup>7</sup> We confine the analysis to the case of  $\varphi \geq 0$ . Allowing negative values of  $\varphi$  would render the analysis trivial.

<sup>8</sup> See, for instance, Lindbeck, Nyberg and Weibull (1999) and Lindbeck, Palme and Persson (2015).

$$\theta^* = u(b) - u(1 - p) - \varphi. \quad (3')$$

Comparing (3) and (3'), we note trivially that for a given insurance contract  $(p, b)$ , the cutoff is lower (i.e., more negative) with a norm than without. Hence, *ceteris paribus* the norm makes sickness absence smaller (i.e., labor supply larger) than otherwise. The insurer could therefore raise  $b$  (more income smoothing) or reduce  $p$  (less costly insurance), or a combination – while still maintaining budget balance. Thus the existence of norms makes it possible to have a more generous insurance system. It may therefore be tempting to believe that the representative individual's expected utility increases due to the existence of a norm against living on benefits. However, it turns out that such an inference would not be correct when the norm is introduced as in (2'). This can be shown by maximizing the Lagrangean

$$L = [1 - F(\theta^*)] \cdot [u(1 - p) + E(\theta|\theta > \theta^*)] + F(\theta^*) \cdot [u(b) - \varphi] \\ + \lambda\{[1 - F(\theta^*)]p - F(\theta^*)b\},$$

where  $\theta^*$  is defined by (3'). What is then the optimal contract  $(p, b)$  for a given value of  $\varphi$ ? We have the first-order conditions

$$\text{w.r.t. } p: \quad [\lambda - u'(1 - p)][1 - F(\theta^*)] = \lambda f(\theta^*)(p + b)u'(1 - p), \quad (6)$$

$$\text{w.r.t. } b: \quad [u'(b) - \lambda]F(\theta^*) = \lambda f(\theta^*)(p + b)u'(b). \quad (7)$$

These first-order conditions look in fact the same as in the workhorse model of Section 2.<sup>9</sup> Moreover, the four properties of the workhorse model in Section 2 still apply.<sup>10</sup> But it is also of interest to study the welfare effects of changes in  $\varphi$ . It turns out that the expected utility under an

<sup>9</sup> Although these marginal conditions look the same as in the model without norms (cf. Lindbeck and Persson, 2013, p 947), the optimal contract  $(p, b)$  and the level of expected utility may, of course, be quantitatively different. The reason is that expected utility now depends on  $\varphi$ , and  $\theta^*$  in (3') is different from  $\theta^*$  in (3).

<sup>10</sup> To prove that less than full insurance is optimal, we note that the right-hand sides of both (6) and (7) are positive; thus the left-hand sides must also be positive. This implies  $u'(1 - p) < \lambda < u'(b)$  which, due to concavity of consumption utility, means that  $b < 1 - p$  also in the presence of norms.

optimal contract  $(p, b)$  is decreasing in the strength of the norm. To see this we calculate the derivative of the Lagrangean with respect to  $\varphi$ , taking into account that  $\theta^*$  depends on  $\varphi$  by equation (3')

$$\frac{dL}{d\varphi} = \lambda f(\theta^*)(p + b) - F(\theta^*) = -\frac{F(\theta^*)}{u'(b)} \cdot \lambda < 0, \quad (8)$$

where the second equality exploits the first-order condition (7). Thus, when a norm is introduced as in (2'), welfare unambiguously falls – and when the norm is strengthened, welfare falls even further. The optimal norm is therefore zero. Although this result may seem surprising at first glance, there is an intuitive explanation. It is true that norms make it possible to provide a more generous insurance contract, which is favorable for the individual. However, this is merely an *indirect effect*, caused by the individual's behavioral adjustment (in the form of increased labor supply) to the *direct* utility loss. Since the indirect effect arises as a consequence of the direct utility loss, the former effect mitigates but does not dominate over the direct effect. This is the intuition behind our analytical result that  $dL/d\varphi < 0$ .<sup>11</sup>

To summarize this section: norms as in (2') serve no welfare purpose – rather the opposite. It is true that a paternalistic government which does not fully respect individual preferences may decide to provide greater income smoothing than citizens actually want, and that such a government would be happy with a norm as in (2'). However, if we want to analyze norms that fulfill a welfare purpose, it is necessary to reformulate the model. In the following sections we therefore make a number of alternative modifications of the naïve model.

#### 4. *A Workhorse Model with Three Activities*

In the workhorse model of Section 3, the individual had only two ways of supporting himself: to work in the regular labor market, or to stay home and live on benefits. We now modify the model

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<sup>11</sup> The intuition is similar to the reason why increased government spending on goods and services results in higher real income in a Keynesian IS-LM model. The indirect contractive effect of the induced increase in the interest rate cannot dominate over the direct expansionary effect of the higher government spending on aggregate income, since the interest rate increases only as a result of higher aggregate income (via an increased transactions demand for money).

by introducing a third alternative, namely work outside of the regular labor market – either at home or in the shadow economy. We continue to assume that the insurer cannot observe the individual's  $\theta$  – but now we also assume that the insurer cannot observe whether the individual works outside of the regular labor market. In the next two sections, as well as in Appendix 2, we investigate different ways of including a norm term in the analysis when such a third alternative is available.

We assume that working outside of the regular market yields a reward  $w$ . This reward may be a monetary wage (if working in the shadow economy) or an imputed income in kind (if working at home). Throughout, we assume that  $w < 1$ , since productivity is likely to be lower for work at home and in the shadow economy than in the regular economy.

While the disutility of work in the regular economy is  $\theta$ , we set the disutility of work outside of the regular economy to  $\alpha\theta$ . Whether  $\alpha$  is larger or smaller than unity is not obvious. If the individual works at home, it is natural to assume that  $\alpha < 1$ , since he/she can then choose both type and intensity of work. In the case of work in the shadow economy,  $\alpha$  may be smaller or larger than unity.

For the sake of brevity, we confine the analysis to the case where  $\alpha < 1$ , and as shorthand we refer to work outside of the regular economy as “work at home”. This type of work could be interpreted not only as, for instance, repairing one's own house or working in the garden, but also as leisure activities such as sports and entertainment. This interpretation of “leisure” is in conformity with Gary Becker's view that households produce different kinds of services for themselves by using time and intermediate inputs;  $w$  would then represent the reward from such services.<sup>12</sup>

With such a third activity, the individual has four options: (i) working in the regular economy earning a net wage  $1 - p$ , (ii) working outside of the regular economy living only on the wage  $w$ , (iii) receiving benefits when simultaneously working outside of the regular economy, and (iv) living solely on benefits. The utilities for these alternatives are

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<sup>12</sup> See Becker (1965).

$$u(1 - p) + \theta \quad (1)$$

$$u(w) + \alpha\theta \quad (9)$$

$$u(w + b) + \alpha\theta \quad (10)$$

$$u(b) \quad (2)$$

This is our new workhorse model (without norms). When introducing norms into this model, ideally one might want to attach the norm term  $\varphi$  to (10) only, i.e., to those who cheat the system by collecting “double income” ( $w + b$ ). However, due to limited information, it is not obvious that neighbors in the real world are able to observe exactly who cheats and who does not. Thus, a high-precision norm attached only to (10) may not emerge in reality. Therefore, we also analyze “blunt” norms that are based on less precise information among neighbors.

## 5. *Blunt Norms*

### 5.1 Theory

We now assume that neighbors can only observe whether an individual works in the regular economy or not. They cannot distinguish between the alternatives (9), (10), and (2). Individuals who belong to any of these three groups are therefore observationally equivalent in the eyes of their neighbors. Although neighbors may want to limit their disapproval to the cheaters, they have to treat all three groups in the same way.<sup>13</sup> The alternatives open to the individual then are

$$u(1 - p) + \theta \quad (1)$$

$$[u(w) + \alpha\theta - \varphi] \quad (9')$$

$$u(w + b) + \alpha\theta - \varphi \quad (10')$$

$$u(b) - \varphi \quad (2')$$

Note that (10') always dominates over (9') – indicated by the square brackets for (9'). Thus, with the information assumed in this section, there are only three relevant alternatives to the

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<sup>13</sup> This way of modeling norms is not relevant in the case of internalized norms, since the individual himself can distinguish between all four alternatives.

individual: (1), (10') and (2'). This means that the norm, in fact, harms everyone who receives benefits – cheaters as well as honest beneficiaries. Superficially, it may seem as if this model functions in the same way as the “naïve” model in Section 3. There is, however, an important difference. The norm in Section 3 was designed to stigmatize beneficiaries, while the norm here is meant to harm cheaters – although information deficiencies create collateral damage for honest beneficiaries. The basic properties of this model are illustrated in Figure 5.1, where we depict the three utility levels as functions of  $\theta$ .

If the individual chooses to call in sick, and honestly live on benefits, the relevant utility level is (2'), represented by the (dashed) horizontal line in the figure. If instead the individual chooses to work in the regular economy, his utility – given by (1) – is represented in the figure by the dashed line with unit slope. Finally, if the individual chooses to work at home at the same time as he receives benefits, his utility is given by (10') which is also increasing in  $\theta$ , although with slope  $\alpha < 1$ .<sup>14</sup> For any given realization of  $\theta$ , the individual chooses the alternative that yields the highest utility, as illustrated by the solid (envelope) curve in the figure.

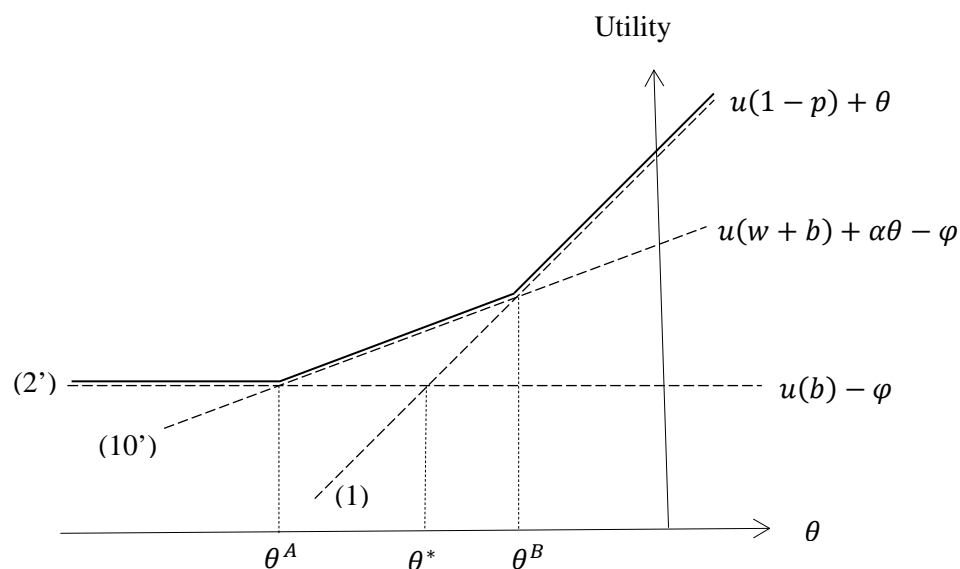


Figure 5.1: Alternative utility levels for different values of  $\theta$ .

<sup>14</sup> A similar analysis could also be pursued for the case where  $\alpha > 1$ ; then the group with double income ( $w + b$ ) would be located on the right-hand side of  $\theta^B$  in Figure 5.1. This may be realistic for some types of work in the shadow economy.

There are two cutoff points in this model. One is between living on benefits  $b$  and living on double income  $w + b$ ; we denote this cutoff by  $\theta^A$ . The other cutoff is between living on double income  $w + b$  and living on a regular net wage  $1 - p$ ; we denote this by  $\theta^B$ . The two cutoffs are

$$\theta^A = \frac{u(b) - u(w + b)}{\alpha},$$

$$\theta^B = \frac{u(w + b) - u(1 - p) - \varphi}{1 - \alpha}.$$

In the figure we assumed that  $\theta^B > \theta^A$ . In other words, we drew the line representing utility level (10') high enough to generate three activities (regions) in the model. If we had drawn the line further down (for instance, if  $w$  had been small), there would be no intermediate region, and we would wind up with only two activities – just as in the “naïve” model of Section 3. A sufficiently high  $\varphi$  would have the same consequences:  $\theta^B$  would coincide with  $\theta^A$ , there would be no cheaters left, and we would again be back to the model of Section 3.

With three activities, the budget constraint for the insurer is

$$[1 - F(\theta^B)]p = F(\theta^B)b \quad (11)$$

and the Lagrangean reads

$$\begin{aligned} L = & [1 - F(\theta^B)][u(1 - p) + E(\theta|\theta > \theta^B)] + \\ & + [F(\theta^B) - F(\theta^A)][u(w + b) + \alpha \cdot E(\theta|\theta^A \leq \theta \leq \theta^B) - \varphi] + \\ & + F(\theta^A)[u(b) - \varphi] + \lambda \cdot \{[1 - F(\theta^B)]p - F(\theta^B)b\}. \end{aligned}$$

To study the optimal contract  $(p, b)$  for a given value of  $\varphi$ , we derive the first-order conditions

$$[\lambda - u'(1 - p)][1 - F(\theta^B)] = \lambda f(\theta^B)(p + b) \frac{u'(1 - p)}{1 - \alpha}, \quad (12)$$

$$F(\theta^A)u'(b) - F(\theta^B)\lambda = \lambda f(\theta^B)(p + b) \frac{u'(w + b)}{1 - \alpha}. \quad (13)$$

In addition to the tax-wedge problem in the model of Section 3, we now encounter a moral-hazard problem, namely that individuals may cheat the system by living on double income ( $w + b$ ). For a given  $\varphi$ , the insurer counteracts these consequences by not providing full insurance, i.e.,  $b < 1 - p$ .<sup>15</sup>

The moral-hazard problem in this model creates a stronger case for norms than in the “naïve” model of Section 3 (where the optimal norm  $\varphi$  is zero). To investigate whether a non-zero norm now is warranted, we take the derivative of the Lagrangean with respect to  $\varphi$ :

$$\frac{dL}{d\varphi} = \lambda f(\theta^B) \frac{1}{1 - \alpha} (p + b) - F(\theta^B) = \frac{F(\theta^A)u'(b) - F(\theta^B)\lambda}{u'(w + b)} - F(\theta^B), \quad (14)$$

where the last expression is obtained by using (13). In contrast to the model in Section 3, the sign of the derivative  $dL/d\varphi$  is ambiguous in the present model with three regions (i.e., when  $\theta^B > \theta^A$ ). This opens the possibility that a norm may serve a welfare purpose.

The ambiguity of the sign of  $dL/d\varphi$  reflects the fact that there are both advantages and disadvantages of a norm of this type. The advantage is that the norm discourages cheating, i.e., living on double income ( $w + b$ ). Hence, the norm protects the financial base of the insurance system. Moreover, people with double income have a relatively low marginal utility of income; the benefits paid to them could be put to better use. The advantage of avoiding cheating comes at a cost, however. The most striking cost of the norm is that it harms not only cheaters, but also honest beneficiaries. In addition, there is a more subtle cost. Work outside the regular labor market does generate output, and hence consumption, at a relatively low utility cost  $\alpha\theta$ . This consumption is diminished because of the norm.

We can obtain more information about the optimal norm by differentiating (14) with respect to  $\varphi$ :

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<sup>15</sup> It is easy to show, with a reasoning similar to that in footnote 10, that (12) and (13) imply  $b < 1 - p$ .



$$\frac{d^2L}{d\varphi^2} = \frac{f(\theta^B)}{1-\alpha} \left[ \frac{\lambda}{u'(w+b)} + 1 \right] > 0,$$

i.e., the Lagrangean is convex in  $\varphi$ . Hence, there cannot be an interior maximum with respect to  $\varphi$ ; if there is an interior extremum, it has to be a minimum. Thus, the maximum can only be a corner solution. There are two possible corner solutions in this model. One is  $\varphi = 0$ , and the other is the value of  $\varphi$  that makes cutoffs  $\theta^B$  and  $\theta^A$  coincide (see the discussion above in connection with Figure 5.1). The conclusion is that either there should be no norms at all, or the norms should be so strong that all cheaters disappear. In the latter case, a further increase in the strength of the norm will unambiguously reduce welfare; the model will then function just like the model with only two activities in Section 3.

To illustrate these mechanisms of the model, we have carried out quantitative simulations. In particular, we study the consequences of (exogenous) variations in the strength of the norms – variations that we may interpret, for instance, as differences across countries or changes over time in an individual country. (See Appendix 1 for a brief technical account of the simulation procedure.)

## 5.2 Numerical Simulations

We have used the following functional forms in our simulations. Consumption utility displays constant relative risk aversion:  $u(c) = \frac{1}{1-\rho}c^{1-\rho}$ . In order to avoid problems associated with  $c = 0$ , we assume that the individual always has a constant non-wage income,  $k$ ; it could be regarded, for instance, as a modest capital income, or income assistance from relatives. Thus  $c = k + 1 - p$  in the case of market work;  $c = k + b$  for a person who lives on benefits; and  $c = k + w + b$  for a cheater. The distribution of the random health variable is normal:

$$\theta \sim N(\mu, \sigma).$$

The simulations are based on the following parameter values. For the utility function, we have set  $\rho = 3$ , and for the non-wage income we assume  $k = 0.1$ . For the probability distribution, we have set  $\mu = 2$ ,  $\sigma = 4$ . Thus, we assume that individuals enjoy working for most realizations of

$\theta$ . If we had instead assumed that individuals usually prefer non-work *per se* (i.e., that  $\mu$  had been negative), the qualitative properties of the numerical simulations would have been the same – but for some parameterizations only a minority would work in the regular economy, which would be counterfactual. For the non-regular economy, we use a large number of alternative combinations of the strategic parameters  $\alpha$  and  $w$ . It is instructive, however, to start with a particular “baseline” parameterization  $\alpha = 0.6$  and  $w = 0.3$  – not because we regard these values as more realistic than several other values, but because they serve the purpose of illustrating some typical features of our model.

Using this specific parameterization, we have computed the optimal insurance contract  $(p, b)$  for different values of  $\varphi$ . For each  $\varphi$ , the optimal contract implies a particular distribution of the population across the three activities (working in the regular economy, cheating, and living solely on benefits), as well as a corresponding level of expected utility. The upper panel of Figure 5.2 shows how the population is distributed across alternative activities as  $\varphi$  varies. When  $\varphi$  is small, a considerable fraction of the population consists of cheaters. If the strength of the norm increases, the number of cheaters gradually falls, and at a certain norm strength ( $\varphi = 0.44$ ) all cheaters have chosen to become either honest workers or honest beneficiaries. (Of course, in the real world, norms are never so strong that there are no cheaters around.) The explanation as to why a stronger norm leads to an increase in the number of honest beneficiaries – in spite of the fact that they do not escape stigmatization – is straightforward. The cutoff,  $\theta^A$ , between cheaters and honest beneficiaries is independent of  $\varphi$  but increasing in  $b$ . As  $\varphi$  grows larger, the system can afford a higher  $b$  (cf. the middle panel of Figure 5.2). As a result,  $\theta^A$  increases and hence the number of beneficiaries grows.

(Figure 5.2)

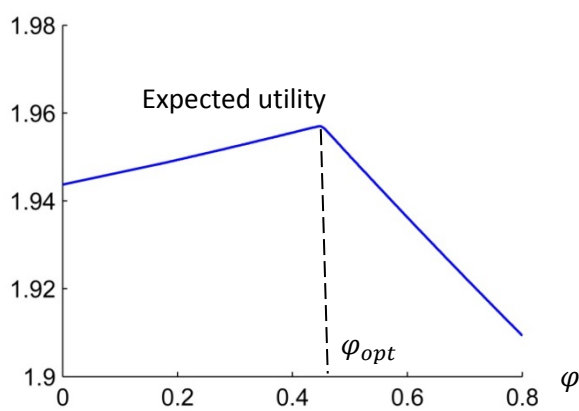
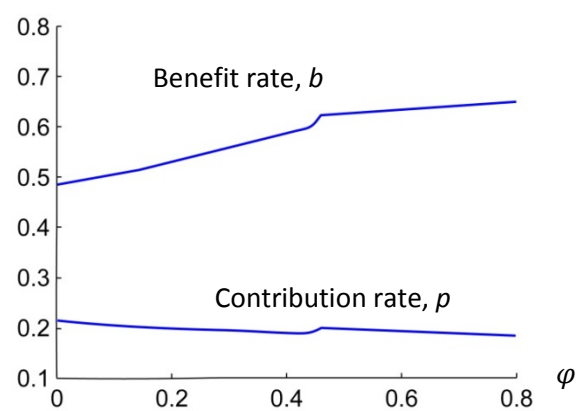
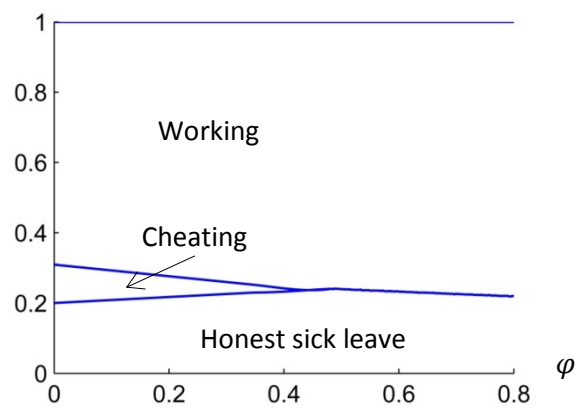


Figure 5.2: Division of the population across activities (upper panel), optimal insurance contract (middle panel) and expected utility (lower panel) for different values of  $\varphi$ . Baseline parameterization with  $\alpha = 0.6, w = 0.3$ .

The optimal  $(p, b)$  vector for alternative values of  $\varphi$  is shown in the middle panel of Figure 5.2. If  $\varphi = 0$ , the optimal insurance system is rather unfavorable, with a replacement rate  $b$  that is only twice as high as the contribution rate  $p$  – thus illustrating the difficulty of providing generous income insurance in a society without norms. As  $\varphi$  grows, it is possible to raise benefits and, at the same time, reduce the contribution rate.<sup>16</sup>

For our baseline parameters, we have also calculated the relation between  $\varphi$  and expected utility – for short, the “utility curve”. This is illustrated in the bottom panel of Figure 5.2, which shows welfare under an optimal contract  $(p, b)$  for alternative values of the norm term. With this particular parameterization, the utility curve turns out to be upward-sloping and convex (although it looks almost linear in the figure) for low and modest values of  $\varphi$ . The intuition behind the positive slope in this interval is that the advantage of more generous insurance dominates over the disadvantage of increased stigmatization. The curve reaches a corner maximum where all cheaters have disappeared at  $\varphi = 0.44$ , which we denote  $\varphi_{opt}$ . For higher values of the norm term, the model behaves as the model of Section 3 with only two groups (workers and honest beneficiaries). The intuition is that the disadvantage of collateral damage then dominates over the advantage of more generous insurance, and thus welfare is monotonically decreasing in  $\varphi$  for values above  $\varphi_{opt}$ .<sup>17</sup>

Figure 5.2 applies to one particular combination of  $\alpha$  and  $w$ . The two upper panels of the figure are quite robust to variations in these parameters. It is, however, easy to find combinations of  $\alpha$  and  $w$  for which the utility curve looks qualitatively different. Indeed, the relation between norms and welfare can be rather intricate, probably as a consequence of the second-best nature of the optimum insurance contract. For instance, the utility curve could be monotonically decreasing for all values of  $\varphi$ , which means that welfare is maximized when there is no norm at all (i.e.,  $\varphi_{opt} = 0$ ).

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<sup>16</sup> There could, however, also be a value of  $\varphi$  so high that it is not optimal to have any insurance at all. If  $\varphi$  is very large, the expected disutility of stigmatizing honest beneficiaries will outweigh the welfare gain of enjoying income smoothing and pain relief, and thus the optimal contract is  $(p = 0, b = 0)$ . With the baseline parameterization, this will occur for  $\varphi > 5$ . With different parameter configurations, the insurance system becomes unwarranted for other values of  $\varphi$ .

<sup>17</sup> One might argue that since there are no cheaters left when  $\varphi > 0.44$ , but only honest beneficiaries, it would be advantageous to get rid of the stigma. However, this reasoning is incorrect. If no stigma existed, the cheaters would re-enter; in fact,  $\varphi > 0.44$  is a necessary condition for ruling out cheating.

In Table 5.1 we summarize how the optimal norm  $\varphi_{opt}$  varies with different combinations of  $\alpha$  and  $w$ . First, we note that the optimal norm is zero for a large number of parameter configurations – in fact, for all  $\alpha < 0.6$ . The background is that norms have both direct (negative) and indirect (positive) effects on welfare, and that the direct effects dominate for such values of  $\alpha$ . The combination of  $\alpha$  and  $w$  underlying the simulation in Figure 5.2 is marked with a solid ellipse.

		$\alpha$								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
$w$	0.1	0	0	0	0	0	0	0	0	0
	0.2	0	0	0	0	0	0.24	0.11	0.03	0.00
	0.3	0	0	0	0	0	0.44	0.32	0.22	0.12
	0.4	0	0	0	0	0	0.57	0.44	0.32	0.23
	0.5	0	0	0	0	0	0.66	0.53	0.42	0.32
	0.6	0	0	0	0	0	0.73	0.60	0.48	0.37
	0.7	0	0	0	0	0	0.78	0.65	0.53	0.43
	0.8	0	0	0	0	0	0.83	0.69	0.56	0.46
	0.9	0	0	0	0	0	0.86	0.72	0.60	0.49

Table 5.1: Optimal value of the norm term ( $\varphi$ ) for different combinations of  $\alpha$  and  $w$  when there is a norm against not working in the regular economy.

For  $\alpha \geq 0.6$  there are two patterns worth observing. First, it turns out that the optimal size of the norm term falls with increasing  $\alpha$ . When work at home is onerous, a strong norm is not needed to discourage such work. Second, the optimal value of  $\varphi$  increases monotonically with  $w$  (for  $\alpha \geq 0.6$ ). A stronger norm is required when  $w$  increases, in order to encourage people to work in the formal sector rather than at home.

Summarizing Section 5, a norm against not working in the regular economy may mitigate moral hazard in the form of cheating. It is a blunt instrument, however, since it stigmatizes everyone who receives benefit. For some constellations of  $\alpha$  and  $w$  the norm will increase welfare; for others, welfare is reduced. In the next section, we consider a more precise norm, which does not harm those living honestly on benefits – hence, a norm without collateral damage.

An interesting feature of the model in this section is that for each given value of  $\varphi$ , there will in general be moral hazard with an optimal contract  $(p, b)$ : some individuals working outside the regular economy will simultaneously collect benefits. There may even be cheating in the “grand optimum”, when  $\varphi = \varphi_{opt}$ . This occurs when the parameters  $\alpha$  and  $w$  are such that the utility curve is monotonically downward-sloping and  $\varphi_{opt} = 0$ . The fact that there may be cheating in optimum raises some ethical issues, which we discuss in the Concluding Remarks.

### 6. Norms Against Cheating

We now assume that neighbors have much better information than in the model of Section 5. They are able to observe whether an individual cheats the system by claiming benefits at the same time as he/she works in the non-regular sector. With this information, it is feasible to have a high-precision norm that only affects cheaters. The alternative utility levels for the individual then are

$$u(1 - p) + \theta \tag{1}$$

$$u(w) + \alpha\theta \tag{9}$$

$$u(w + b) + \alpha\theta - \varphi \tag{10'}$$

$$u(b). \tag{2}$$

With such a setup, neighbors’ information is just as good as that of the individual himself/herself. The model is therefore relevant for both social and internalized norms. (By contrast, the model in Section 5 only applied to social norms.) The norm now counteracts moral hazard more efficiently than in Section 5, since collateral damage is avoided.

Note that in this model, cheating dominates over honest work at home only if  $\varphi$  is sufficiently small, while for larger values of  $\varphi$ , the opposite holds.<sup>18</sup> It is therefore useful to discuss these two cases separately.

### 6.1 Cheating Dominates Honest Work at Home

When  $\varphi$  is small enough to make (10') dominate over (9), only (1), (10') and (2) are the relevant alternatives. The properties of this model could be illustrated by a diagram similar to Figure 5.1, if the horizontal line representing the utility level (2') in that figure were replaced by the somewhat higher line representing the utility level (2). The cutoff between living solely on benefits and cheating by living on "double" income ( $w + b$ ) is now

$$\theta^C = \frac{u(b) - u(w + b) + \varphi}{\alpha},$$

while the cutoff between cheaters and honest workers is

$$\theta^D = \frac{u(w + b) - u(1 - p) - \varphi}{1 - \alpha}.$$

The budget constraint for the insurer is

$$[1 - F(\theta^D)]p = F(\theta^D)b, \quad (15)$$

and the Lagrangean reads<sup>19</sup>

$$\begin{aligned} L = & [1 - F(\theta^D)][u(1 - p) + E(\theta|\theta > \theta^D)] \\ & + [F(\theta^D) - F(\theta^C)][u(w + b) + \alpha \cdot E(\theta|\theta^C \leq \theta \leq \theta^D) - \varphi] \\ & + F(\theta^C)u(b) + \lambda \cdot \{[1 - F(\theta^D)]p - F(\theta^D)b\}. \end{aligned} \quad (16)$$

<sup>18</sup> In Section 5, cheating dominates over honest work at home for all values of  $\varphi$ .

<sup>19</sup> As in the model of Section 5 there could, for certain parameter constellations, be two regions instead of three. This would occur if  $\varphi$  is so high that the cutoffs  $\theta^C$  and  $\theta^D$  coincide at the cutoff (3):  $\theta^* = u(b) - u(1 - p)$ . We would then wind up in the work-horse model of Section 2, without norms.

It follows from the first-order conditions w.r.t.  $p$  and  $b$  that less-than-full insurance is optimal:  $b < 1 - p$ .<sup>20</sup> It can also be shown that the sign of  $dL/d\varphi$  is ambiguous, just as in Section 5. Further, it can be shown that  $d^2L/d\varphi^2 > 0$ ; thus an interior extremum with respect to  $\varphi$ , if it exists, is always a minimum. The optimal norm  $\varphi$  is therefore either zero (no norm at all), or large enough to eliminate all cheaters – again, just as in Section 5. However, once all cheaters are gone, a further increase in the strength of the norm has no consequences since no one is now harmed by the norm. This is in contrast to the model in Section 5 where a further increase in  $\varphi$  result in collateral damage on honest beneficiaries.

## 6.2 Honest Work at Home Dominates Cheating

When  $\varphi$  is so large that (9) dominates over (10'), the norm is so strong that cheaters switch to honest work at home. The three relevant utility levels then are (1), (9) and (2). As in Section 6.1, the utility curve is horizontal when all cheaters are gone. While the relative sizes of the three groups in such a regime are independent of  $\varphi$ , they do depend on the values of  $\alpha$  and  $w$ . For instance, a large value of  $w$  tends to boost the group of honest workers at home, as does a low value of  $\alpha$ . This is easily shown in the context of a diagram similar to Figure 5.1. In other words, a higher  $w$  makes honest work at home more rewarding, and a lower  $\alpha$  makes it less painful.

This is as far as we get with the theoretical analysis in this section. Therefore, we again turn to simulations.

## 6.3 Numerical Simulations

We start by simulating the model with the same baseline parameters as in Section 5:  $\alpha = 0.6$  and  $w = 0.3$ . The results are reported in Figure 6.1. The two upper panels in the figure show that both the distribution of individuals across activities and the optimal insurance contract have roughly the same shape as the corresponding relations in Figure 5.2. However, as clarified theoretically

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<sup>20</sup> The proof follows the same lines as the corresponding proofs in Sections 3 and 5, but is somewhat more tedious.



above, the utility curve (bottom panel of Figure 6.1) looks quite different from the corresponding curve in Section 5, since it becomes horizontal once all cheaters are gone. This illustrates the theoretical conclusion that welfare is more robust to variations in the strength of norms in this model than in the model of Section 5.

(Figure 6.1)

In the theoretical section we also pointed out that a sufficiently high productivity of work at home (i.e., a sufficiently high  $w$ ) turns cheaters into honest workers at home, provided  $\varphi$  is high enough. To illustrate such a case, we have chosen a parameter combination with higher  $w$  than in the baseline case, namely  $\alpha = 0.6, w = 0.8$ . The results from such a simulation are reported in Figure 6.2.

(Figure 6.2)

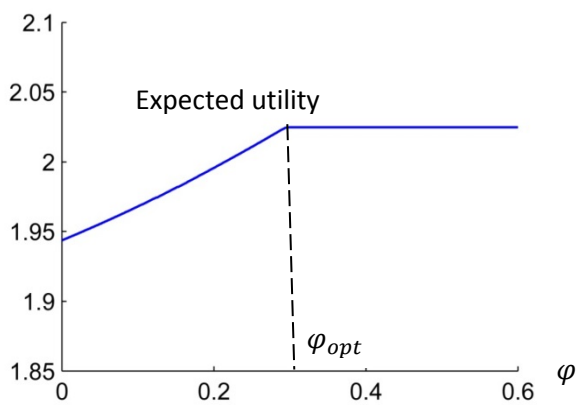
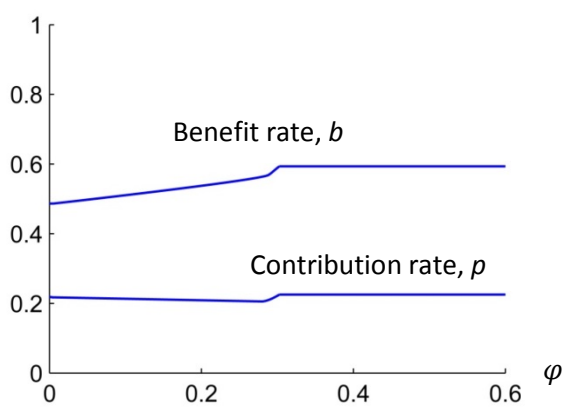
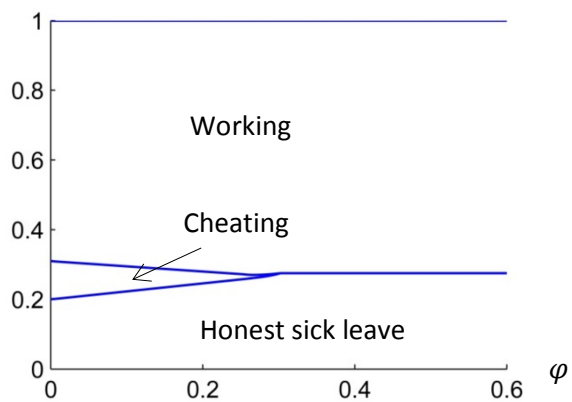


Figure 6.1: Division of the population across activities (upper panel), optimal insurance contract (middle panel) and expected utility (lower panel) for different values of  $\varphi$ . Baseline parameterization with  $\alpha = 0.6, w = 0.3$ .

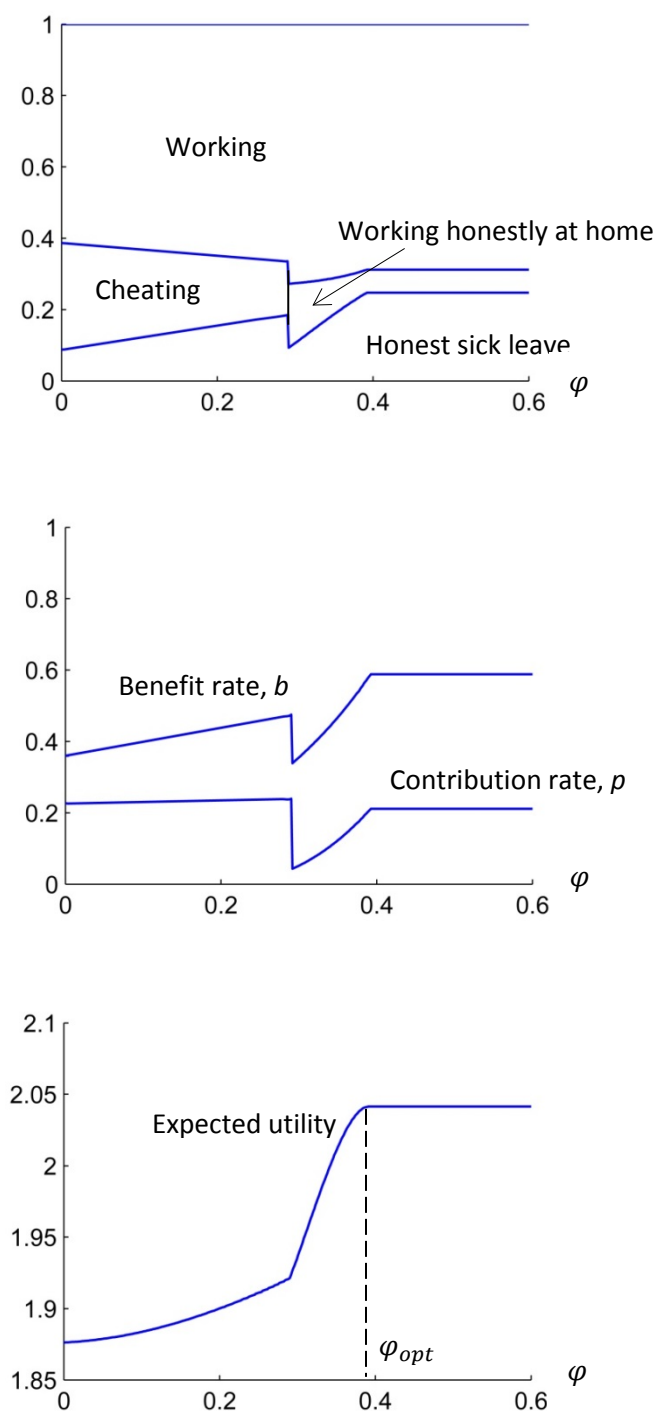


Figure 6.2: Division of the population across activities (upper panel), optimal insurance contract (middle panel) and expected utility (lower panel) for different values of  $\varphi$ . Parameter values:  $\alpha = 0.6$  and  $w = 0.8$ .

The figure shows how our model functions when the return to work at home is large. With weak norms (or no norms at all), there are many cheaters around, and the optimal contract  $(p, b)$  is rather unfavorable. But with sufficiently strong norms, all cheaters are transformed into honest workers at home; there will thus be fewer individuals who receive benefits, and the insurance contract can be made more favorable. The diagrams in the two upper panels of Figure 6.2 also show a marked discontinuity at  $\varphi_{opt}$ , where all cheaters turn into honest workers at home. This discontinuity, however, is a model-specific artifact as a result of the fact that all individuals are assumed to be identical ex ante, and that all remaining cheaters switch to becoming honest home-workers at the same  $\varphi$ ; see our discussion in Appendix 2.

Both the baseline scenario ( $\alpha = 0.6, w = 0.3$ ) and the scenario with honest workers at home ( $\alpha = 0.6, w = 0.8$ ) generate utility curves monotonically increasing in  $\varphi$  up to the value  $\varphi_{opt}$ . However, just like in Section 5, it is easy to find parameter configurations that result in other shapes of the utility curve. For instance, the utility curve could be monotonically decreasing until it becomes horizontal, when all cheaters are eliminated. It could alternatively be U-shaped, with either a maximum at  $\varphi = 0$ , or a maximum at a positive value of  $\varphi$  where all cheaters are gone.

As in Section 5, we have computed optimum values of  $\varphi$  for a large number of constellations of the parameters  $\alpha$  and  $w$ . We report the results in Table 6.1. The baseline parameters of Figure 6.1 are marked by a solid ellipse, while the parameters of Figure 6.2 are marked by a dashed ellipse.

It is useful to compare the role of norms in this model and the model in Section 5. First, there are much fewer combinations of  $\alpha$  and  $w$  in the current model than in the model of Section 5 for which it is optimal to have no norm at all. This is intuitively reasonable, since the norm in this section is more precise in the sense that there is no collateral damage. Second, the optimal norm varies with  $\alpha$  and  $w$  in a somewhat more complex way than in Table 5.1. Third, as we pointed out in the preceding subsection, cheaters may be replaced by honest workers at home if  $\varphi$  is so large that (9) dominates over (10'). This may happen if the reward from work at home is high

and the disutility of such work is small. The combinations of  $\alpha$  and  $w$  for which this occurs are marked by the shaded area in Table 6.1.

		$\alpha$								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
$w$	0.1	0.21	0.16	0.12	0.08	0.04	0	0	0	0
	0.2	0	0.33	0.29	0.25	0.21	0.17	0.13	0.09	0.06
	0.3	0	0.33	0.40	0.37	0.33	0.29	0.26	0.22	0.18
	0.4	0	0	0.50	0.46	0.42	0.38	0.35	0.30	0.27
	0.5	0	0	0.57	0.53	0.49	0.45	0.42	0.37	0.33
	0.6	0	0	0	0.58	0.54	0.50	0.47	0.42	0.39
	0.7	0	0	0.49	0.51	0.52	0.52	0.51	0.47	0.43
	0.8	0	0	0.37	0.38	0.39	0.39	0.39	0.39	0.38
	0.9	0	0	0.29	0.30	0.30	0.30	0.30	0.30	0.28

Table 6.1: Optimal value of the norm term ( $\varphi$ ) for different combinations of  $\alpha$  and  $w$  when there is a norm against cheating. Shaded area: combinations of  $\alpha$  and  $w$  for which honest work at home is optimal.

## 7. Concluding Remarks

Let us summarize the role of norms in the models discussed in this paper. In the model of Section 3, we assumed that there are only two alternatives open to an individual – working in the regular labor market or living on benefits. Assuming that fellow citizens (“neighbors”) can observe which alternative an individual has chosen, we simply deducted the norm term from consumption utility when the individual lives on benefits. It turned out that a “naïve” norm of this kind is unambiguously detrimental to welfare. We argued that a more realistic analysis of norms can be achieved by introducing an alternative to working or living on benefits, namely, working in an informal sector (“work at home”).

In the model of Section 5, we assumed that neighbors can only observe whether or not an individual works in the formal sector. The advantage of a norm in such a setting is that it counteracts cheating in the form of living on double income. Less cheating facilitates the financing of generous insurance benefits. Such a gain, however, is not without costs. One is the emergence of collateral damage, in the sense that honest beneficiaries are also harmed by the norm. Another cost is that consumption of home-produced goods and services (at modest disutility of work) is reduced. However, in our simulations, it turns out that a blunt norm of this type has a positive net effect on welfare for a large number of combinations of  $\alpha$  and  $w$ .

In the model of Section 6, we assumed that neighbors have better information than in Section 5. They are able to observe whether an individual cheats in the sense of living on double income. A norm in this case can be targeted directly against cheating, thereby avoiding collateral damage. Our simulations show that such a norm is welfare-enhancing for more combinations of  $\alpha$  and  $w$  than in the model of Section 5.

Sections 5 and 6 provide two polar cases of information. In Appendix 2 we investigate the consequences of two intermediate assumptions. It turns out that models based on these assumptions do, in fact, converge to the models in Sections 3, 5 or 6.

The conclusion is that the effects on labor supply of moral hazard and tax wedges may be mitigated by norms for individual behavior. However, even with such norms, there may be cheaters around. This is illustrated in the upper panels of Figures 5.2 and 6.1: for a large set of exogenously given values of  $\varphi$ , the optimal  $(p, b)$  vector does not eliminate all cheating.<sup>21</sup> This observation brings out an ethical question, namely that there is clash between utility maximization and the ethical principle, “Thou shalt not cheat”. Such a conflict is unavoidable in our model as well as in reality, and it arises since health is a matter of degree, rather than a dichotomous phenomenon.

Perhaps more surprisingly, cheating may also exist in the “grand optimum”  $\varphi = \varphi_{opt}$ , namely if the parameters  $\alpha$  and  $w$  are such that  $\varphi_{opt} = 0$ . In fact, as is shown by the zeros in Tables 5.1 and 6.1, this occurs for a fair number of parameter configurations – in particular, when  $\alpha$  is

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<sup>21</sup> Alger and Ma (2003) analyze sick-care insurance when consumers and providers (i.e., doctors) may cheat by colluding against the insurer. They derive conditions under which there will be such collusion in equilibrium.

small. For such configurations, an insurance system without norms, and thus with a large amount of cheating, is optimal.<sup>22</sup>

A conceivable extension of our paper could be to allow for a richer menu of insurance contracts. For instance, in addition to the type of contract we have discussed here, individuals could be offered a contract with lower benefits, combined with less onerous work at a lower wage than in the regular economy. A related type of contract could be to allow part-time sickness benefits combined with part-time work.

A more fundamental change in our analysis might involve making the norm  $\varphi$  endogenous in the sense that stigmatization from breaking the norm falls by the number of people who violate it. Although such an approach does not add anything to the informational aspect of norms, as emphasized in the present paper, it would introduce dynamics into the analysis.

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<sup>22</sup> One may perhaps claim that the configurations of  $\alpha$  and  $w$  for which  $\varphi_{opt} = 0$  refer to particular types of light work at home (for instance, cleaning one's house or doing some gardening) that are not considered as cheating. With this interpretation of cheating, the clash between utility maximization and the ethical principle of not to cheat would be resolved: there would then be no "cheating" in the grand optimum.

## Appendix 1: Numerical Simulation of the Model

When simulating the models in Sections 5 and 6, we start by suggesting an arbitrary  $(p, b)$  vector. We then ask which of the three (or four) utility levels – (1), (2'), (10') in Section 5, and (1), (2), (9) and (10') in Section 6 – is most favorable for each realization of  $\theta$ . We compute how many individuals will choose to live honestly on benefits, how many will cheat the system, and how many will choose to work in the regular labor market. We then check whether the suggested  $(p, b)$  vector satisfies the insurer's zero-profit constraint. If this vector does not satisfy the constraint, we adjust  $b$ , and recalculate the individual's choice using the new value of  $b$ , until the constraint is satisfied. We then change  $p$ , and find the value of  $b$  that satisfies the budget constraint for the new value of  $p$ . This implies tracing the opportunity locus in  $(p, b)$  space, i.e., all  $(p, b)$  values that satisfy the budget constraint, while respecting the individual's choice between the available alternatives for supporting oneself.<sup>23</sup> Along this locus, we then select the  $(p, b)$  vector that maximizes the representative individual's expected utility.

So far, the norm term  $\varphi$  has been assumed to be fixed. The next step is to recalculate the optimal  $(p, b)$  vector for different values of  $\varphi$ . For any given  $\varphi$ , and the corresponding optimal  $(p, b)$  vector, there is a distribution of individuals across the three (or two) regions. For each distribution, we compute the level of expected utility. We thus obtain a relation between  $\varphi$  and expected utility, which enables us to find the value of  $\varphi$  that is associated with the highest expected utility. If the maximum utility occurs at  $\varphi = 0$ , a norm would be counterproductive. If, instead, utility turns out to be highest for some  $\varphi > 0$ , there is a welfare case for a norm.

## Appendix 2: Comments on Figure 6.2

For “small” values of  $\varphi$  (i.e., for  $\varphi < 0.29$ ) the model of Figure 6.2 behaves much like the model with the baseline parameterization shown in Figure 6.1. The number of cheaters falls with increasing  $\varphi$  (top panel in Figure 6.2), and the optimal  $(p, b)$  vector (middle panel) becomes more generous as  $\varphi$  grows. Moreover, the convex utility function is monotonically increasing in  $\varphi$  (bottom panel) up to a point, as in the baseline case.

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<sup>23</sup> The contract  $(0, 0)$ , i.e., no insurance at all, belongs to that locus since it trivially satisfies the insurer's zero-profit constraint.



For “large” values of  $\varphi$  (in this case,  $\varphi > 0.39$ ) the endogenous variables are not affected by further increases in the norm term. The numbers of workers, honest home workers, and beneficiaries remain constant (top panel of Figure 6.2), as does the optimal  $(p, b)$  vector (middle panel) and the expected utility (bottom panel).

The intermediate region for  $\varphi$  ( $0.29 < \varphi < 0.39$ ) is more complex. Above  $\varphi = 0.29$ , all remaining cheaters choose to be honest home workers. This sudden change causes a discontinuity in the variables of the two upper panels of Figure 6.2. This discontinuity, however, is a model-specific artifact in the sense that all individuals are assumed to be identical *ex ante*, which explains why all remaining cheaters switch to becoming honest home workers at the same value of  $\varphi$ . (If we had instead assumed that individuals are heterogeneous with respect to, for example, their sensitivity to  $\varphi$ , those with the highest sensitivity would be the first to shift from cheating to honest work at home, and others would gradually follow.)

The intuition as to why the discontinuity takes the form of a *fall* in  $b$  (the middle panel of Figure 6.2) is somewhat intricate. When the cheaters disappear due to a higher  $\varphi$ , the system will *ceteris paribus* run a surplus. Budget balance could in principle be restored by a higher  $b$ , but that would make the cheaters re-appear. Thus  $b$  has to remain constant, or fall. An explanation for why  $b$  would fall, rather than remain constant, is that after the shift, individuals who choose honest work at home are no longer interested in benefits. Whereas before the shift there were two groups that wanted high benefits (cheaters and honest beneficiaries), there is only one group remaining that asks for benefits after the shift.

The endogenous variables cannot reach their steady-state values immediately after the discontinuity. There is thus a region of gradual recovery of the  $(p, b)$  vector for intermediate values of  $\varphi$ , namely  $0.29 < \varphi < 0.39$ . The reason is that the cheaters would re-appear if  $p$  and  $b$  were abruptly adjusted to their steady-state values. A norm  $\varphi$  strictly larger than the critical value at which the shift takes place is necessary to counteract such a re-appearance.

### Appendix 3: Two Intermediate Cases

In Sections 5 and 6 we made two polar assumptions about the information available to norm-enforcers. We now briefly discuss two intermediate cases.

#### A3.1 A Norm Against Receiving Benefits (3 Sectors)

Assume now that neighbors can observe whether an individual receives benefits, but not whether he cheats the system by simultaneously working at home. The norm therefore has to be tied to receiving benefits, and the alternative utility levels are

$$u(1 - p) + \theta \tag{1}$$

$$u(w) + \alpha\theta \tag{9}$$

$$u(w + b) + \alpha\theta - \varphi \tag{10'}$$

$$u(b) - \varphi \tag{2'}$$

Only three of these alternatives are relevant for the individual, depending on the size of  $\varphi$ .

Assume first that  $\varphi$  is low in the sense that (10') dominates over (9). Thus only (1), (10') and (2') are the relevant alternatives. We are then back to the model of Section 5, and all properties of that model also holds for the model here.

Assume instead that  $\varphi$  is so large that (9) dominates over (10') and hence that there will be no cheaters. The model then consists of expressions (1), (9) and (2'). The model is then the same as the "naïve" model in Section 3, except that non-stigmatized work at home is a new alternative for the individual. We have the cutoffs

$$\theta^E = \frac{u(b) - u(w) - \varphi}{\alpha},$$

$$\theta^F = \frac{u(w) - u(1 - p)}{1 - \alpha}.$$

With three regions, i.e., when  $\theta^E < \theta^F$ , the Lagrangean is

$$\begin{aligned}
L = & [1 - F(\theta^F)][u(1 - p) + E(\theta|\theta > \theta^F)] + \\
& + [F(\theta^F) - F(\theta^E)][u(w) + \alpha \cdot E(\theta|\theta^E \leq \theta \leq \theta^F)] + F(\theta^E)[u(b) - \varphi] + \\
& + \lambda \cdot \{[1 - F(\theta^F)]p - F(\theta^E)b\}.
\end{aligned}$$

It can be shown that  $dL/d\varphi < 0$ , i.e., the norm is unambiguously detrimental to welfare. This is not surprising, since the model here can be regarded as a modification of the model of Section 3, where work has been disaggregated into formal and informal work.

To summarize: the model here turns into the model of Section 5 if  $\varphi$  is relatively small, while it becomes similar to the model of Section 3 if  $\varphi$  is instead relatively large.

### *A3.2 A Norm Against Working in the Informal Economy*

In Appendix A3.1 we assumed that neighbors can observe whether an individual receives benefits or not. We now assume that neighbors are able to observe whether an individual works in the informal sector (“at home”) but not whether he receives benefits. The individual can then choose among the following utility levels:

$$u(1 - p) + \theta \tag{1}$$

$$[u(w) + \alpha\theta - \varphi] \tag{9'}$$

$$u(w + b) + \alpha\theta - \varphi \tag{10'}$$

$$u(b) \tag{2}$$

Clearly, (10') always dominates over (9') and the individual therefore has only three effective alternatives (regions). For small values of  $\varphi$ , the model in this subsection is identical to the model in Section 6. However, for large values of  $\varphi$ , there is a difference: in the model of Section 6, honest home workers may appear, which is not the case in the model in this subsection. Thus the “panhandle” to the right in the upper panel of Figure 6.2 can never occur in this model. This means that only alternatives (1) and (2) remain when  $\varphi$  is large. We then wind up in the original workhorse model of Section 2, with no norms.

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