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Consumption smoothing and the welfare consequences of social insurance in developing economies

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Abstract

Studies of risk in developing economies have focused on consumption fluctuations as a measure of the value of insurance. A common view in the literature is that the welfare costs of risk and benefits of social insurance are small if income shocks do not cause large consumption fluctuations. We present a simple model showing that this conclusion is incorrect if the consumption path is smooth because individuals are highly risk averse. Hence, social safety nets could be valuable in low-income economies even when consumption is not very sensitive to shocks.

Keywords: Risk; Unemployment

1. Introduction

A significant strand of the literature on risk and insurance in developing economies has focused on estimating the response of household consumption to income fluctuations. Many of these studies (e.g. Townsend, 1994) find that household consumption remains quite stable when shocks occur. Based on such evidence, a common view is that, if consumption does not fluctuate very much to begin with, the welfare gains from smoothing consumption further through social insurance must be small. Morduch (1995) remarks that:

> The emerging consensus of the empirical literature [on consumption-smoothing in developing economies] is that holes in effective [consumption] insurance exist…But, in general, the holes are a good deal smaller than many had assumed… The results have clear

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> policy implications. [If] markets and alternative mechanisms do indeed provide reasonably good insurance and credit, publicly provided financial services and social security could crowd out private efforts with limited net gain to society.

The consensus on the empirical evidence has eroded somewhat since Morduch's review. More recent empirical studies have pointed out that consumption drops may be larger, especially among subgroups such as the poor (Ravallion and Chaudhuri, 1997; Morduch, 1999). However, the presumption that consumption fluctuations give a measure of the welfare costs of risks, and therefore the value of additional insurance, remains prevalent (see Gertler and Gruber, 2002; Fafchamps, 2003; Cameron and Worswick, 2003 for recent examples).

In this paper, we question whether empirical estimates of the effect of income shocks on consumption have clear policy implications. We show that the welfare gains from increasing insurance cannot be directly inferred from the size of consumption drops. Indeed, the value of insurance may be very large even in environments where consumption does *not* fluctuate much.

To see the basic idea underlying our argument, consider two economies where agents face income shocks. In the first case, agents have access to credit markets and networks that allow them to smooth consumption easily when hit by a shock. In the second economy, private market insurance is very limited. However, households are close to a subsistence level of consumption and are very reluctant to cut consumption further when their income falls for fear of starvation. These risk-averse households therefore use whatever methods they can to avoid a substantial consumption drop (such as taking children out of school). In both of these cases, an econometrician would observe a smooth consumption path in the data. However, in the latter case–where the smoothness of consumption is the result of high risk aversion and not efficient private insurance markets–social insurance could yield large welfare gains. Intuitively, these welfare gains arise from reduced reliance on costly consumption-smoothing mechanisms, leading to improvements such as greater education for children.

To formalize this idea, we adopt from the public finance literature a normative model of social insurance developed in Baily (1978) and Chetty (in press). These studies show that the welfare gain from social insurance (ignoring efficiency costs caused by distortions to behavior) is determined by the product of the percentage consumption drop caused by the shock $\left(\frac{\Delta c}{c}\right)$ with the coefficient of relative risk aversion (γ). Holding γ fixed, a smoother consumption path (smaller $\frac{\Delta c}{c}$) does in fact imply smaller welfare gains from social insurance. However, it is important to observe that γ and $\frac{\Delta c}{c}$ are inversely related. Highly risk-averse households will take extremely costly measures to insure a smooth consumption path. Therefore, in order to understand whether a social safety net is valuable, one must determine the reason that $\frac{\Delta c}{c}$ is small. If it is small because agents have good private insurance, social insurance may indeed be unnecessary. But if $\frac{\Delta c}{c}$ is small because γ is large, small consumption fluctuations may belie large welfare gains from insurance because the product $\gamma \frac{\Delta c}{c}$ could be quite large.

The results of this paper are related to those of Newbery and Stiglitz (1979), who show that the welfare benefits of commodity price stabilization schemes are determined by risk aversion and the change in output. Our contribution is to develop a welfare measure for social insurance and analyze its policy implications for developing economies in the context of empirical findings. Our analysis is also related to studies which have recognized that social safety nets may generate value by reducing the use of inefficient smoothing behaviors (e.g. Rosenzweig and Wolpin, 1993; Morduch, 1999). We link these results on inefficient smoothing to the consumption-smoothing literature by characterizing the normative implications of the risk-sharing models developed by Townsend (1994) and others.

The remainder of the paper proceeds as follows. The next section develops a simple model of income shocks and derives a formula for the welfare gains from social insurance. Section 3 shows how small consumption fluctuations can arise from either good private insurance or high risk aversion, with different implications for optimal policy. Section 4 concludes.

2. Normative framework

To derive a formula for the marginal welfare gain from insurance, consider the following static model of income shocks. Suppose the agent has utility over consumption $u(c)$. Let the disutility of obtaining $\$c$ of consumption be given by a linear function

$$\psi(c) = \theta c$$

A negative shock–such as bad weather, illness, crop damage or unemployment–can be modeled in this framework as an increase in θ, which makes earning money more difficult. In the good state, θ captures the disutility of effort required to generate income under normal conditions. In the bad state, θ rises because generating $\$c$ of consumption requires more costly activities such as planting new crops, searching for another job, or reducing human capital and health investments in children.

Suppose there are two states (good and bad), with $\theta_b > \theta_g = 1$. With this normalization, θ_b can be interpreted as how much more difficult it is to earn money in the bad state than the good state. For example, $\theta_b = 2$ implies that the disutility of generating consumption is doubled in the bad state. Let p denote the probability that the bad state occurs.

Let c_b denote consumption in the bad state and c_g consumption in the good state. Consumption will differ in the bad state and the good state if private insurance markets are incomplete. An actuarially fair insurance program that raises c_b by \$1 must lower c_g by $\frac{p}{1-p}$. The marginal welfare gain from such a program is given by

$$\widetilde{W} = pu'(c_b) - (1-p)\frac{p}{1-p}u'(c_g) = p\left(u'(c_b) - u'(c_g)\right)$$

We convert this expression into a money metric by normalizing this welfare gain measure by the welfare change from a \$1 increase in consumption in the good state. The welfare gain from social insurance relative to an increase in income in the good state is proportional to:

$$W \propto \frac{u'(c_b) - u'(c_g)}{u'(c_g)}$$

To simplify this expression, take a Taylor approximation to the utility function and write

$$\begin{aligned} W &\simeq -\frac{u''(c_g)}{u'(c_g)}\left(c_g - c_b\right) \\ &= \gamma\frac{\Delta c}{c} \end{aligned} \tag{1}$$

where $\frac{\Delta c}{c} = \frac{c_g - c_b}{c_b}$ is the average observed consumption drop, and $\gamma = -\frac{u''}{u'}c_g$ is the coefficient of relative risk aversion. The intuition for this formula is straightforward: The marginal welfare gain from \$1 of insurance (or, conversely, the marginal welfare cost of an income shock) depends on

the size of consumption fluctuations $\left(\frac{\Delta c}{c}\right)$ and the utility value of having a smoother consumption path (γ).

Note that this simple formula holds in a more general setting than the one analyzed here. Chetty (in press) shows that (1) applies in a general dynamic lifecycle model where agents maximize expected lifetime utility subject with an arbitrary set of choice variables and constraints under some weak regularity conditions. Hence, (1) provides a robust guide for welfare analysis.

3. Welfare gain from insurance

Eq. (1) shows that the welfare gain from insurance depends on the *product* of γ and $\frac{\Delta c}{c}$, and not the consumption drop alone. To explore the normative consequences of this point, consider a parametric example of the model above. Suppose the agent has CRRA utility over consumption in each state:

$$u(c) = \frac{c^{1-\gamma}}{1-\gamma}$$

In this setting, the worker chooses consumption in each state by solving

$$\max_c \frac{c^{1-\gamma}}{1-\gamma} - \theta c$$

Hence

$$c*(\theta) = \theta^{-1/\gamma}$$

The consumption drop from the employed to the unemployed state is therefore

$$\frac{\Delta c}{c} = \frac{c_g - c_b}{c_g} = 1 - \frac{c_b}{c_g} = 1 - \left(\frac{1}{\theta_b}\right)^{1/\gamma}$$

This expression shows that $\frac{\Delta c}{c}$ is decreasing in γ and increasing in θ_b. Intuitively, high γ makes consumption reductions particularly costly, and the agent therefore exerts greater effort in the unemployed state to maintain consumption close to the employed level. Similarly, high θ_b makes earning income while unemployed particularly costly, making it preferable to tolerate a larger consumption drop.

These comparative statics indicate that the value of $\frac{\Delta c}{c}$ observed in some developing economies could be small for two distinct reasons: (1) θ_b is low, i.e. agents are able to easily and inexpensively smooth consumption by borrowing or through informal insurance mechanisms or (2) γ is high, i.e. agents are very risk averse to fluctuations and work hard to have a small consumption drop even though θ_b might be high. In case 1, the marginal welfare gain from social insurance $\left(\gamma \frac{\Delta c}{c}\right)$ is likely to be small. In contrast, in case 2, the gain from social insurance could be quite large even if $\frac{\Delta c}{c}$ is small because $\gamma \frac{\Delta c}{c}$ may be large.

Table 1 illustrates this point quantitatively by showing simulations of the implied consumption drop and welfare gain for a range of γ and θ_b. Part A of the table shows that a relatively small consumption drop of $\frac{\Delta c}{c} \approx 10 - 15\%$ can be generated by a variety of combinations of γ and θ_b, indicated in bold on the diagonal of the table. Part B shows that the welfare implications implied by the different combinations can vary widely. With $\gamma = 5$ and $\theta_b = 2$, the marginal increase in

Table 1
Calibrations of consumption drop and welfare gains of social insurance

Disutility of effort in unemp. state (θ_b)	Coefficient of relative risk aversion (γ)				
	1	2	3	4	5
	A. Consumption drop ($\Delta c/c$)				
1	0.00	0.00	0.00	0.00	0.00
1.25	0.20	**0.11**	0.07	0.05	0.04
1.5	0.33	0.18	**0.13**	0.10	0.08
1.75	0.43	0.24	0.17	**0.13**	0.11
2	0.50	0.29	0.21	0.16	**0.13**
	B. Marginal welfare gain ($\gamma\Delta c/c$)				
1	0.00	0.00	0.00	0.00	0.00
1.25	0.20	**0.21**	0.22	0.22	0.22
1.5	0.33	0.37	**0.38**	0.39	0.39
1.75	0.43	0.49	0.51	**0.52**	0.53
2	0.50	0.59	0.62	0.64	**0.65**

Panel A shows the implied consumption drop without social insurance for various combinations of risk aversion and disutility of effort to earn income in the bad state for the stylized model in Section 3. The table shows that many combinations of risk aversion and disutility of effort can generate consumption drops similar to those observed in the data (in bold on diagonal). Panel B shows the marginal welfare gains of social insurance for each combination of parameters. Welfare gains are rising on the diagonal even though the consumption drop is constant.

expected utility from an extra dollar of insurance is three times as large as the gain with $\gamma=2$ and $\theta_b=1.25$, even though both sets of parameters generate roughly the same $\frac{\Delta c}{c}$.

To understand this result more concretely, consider two different descriptions of an economy, both of which could generate a consumption drop of 10 percent. In the first scenario (low γ, low θ_b), agents have access to credit markets and financial networks that allow them to smooth consumption easily when hit by a shock. In this case, an increase in social insurance would primarily crowd out existing private market arrangements at the margin, with little net welfare gain. In the second scenario (high γ, high θ_b), private market insurance arrangements are very poor, but households are very risk averse. They therefore use costly, high θ_b, methods to avoid a substantial consumption drop. In this case, the provision of social insurance could yield large welfare gains despite the smoothness of consumption, because such programs reduce households' reliance on costly consumption-smoothing mechanisms when hit by shocks. It follows that one cannot infer the marginal welfare gain of insurance based on the size of the consumption drop alone.

4. Conclusion

This paper has shown that empirical evidence on the response of household consumption to income shocks must be interpreted cautiously when drawing policy inferences. Small consumption fluctuations need not imply that existing insurance is "adequate" in developing economies. In fact, the converse may be true: consumption may be smooth precisely because the welfare costs of consumption fluctuations are very high.

To evaluate the welfare consequences of insurance policies, one must determine why and how households smooth consumption—because of high risk aversion (high γ) or through good insurance arrangements (low θ_b)? This question is of practical relevance because many

households in low-income countries could have high γ, e.g. due to subsistence constraints. Evidence that household resort to costly consumption-smoothing mechanisms (e.g. Frankenberg et al., 1999; Dercon, 2002; Miguel, 2005; Chetty and Looney, in press) also suggests that γ could potentially be high for many households. Distinguishing between the two explanations of consumption smoothness would be a useful direction for future research on risk and insurance.

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