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E C O N O M I C S B U L L E T I N

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Abstract

This paper reconsiders the welfare benefit of unemployment insurance when individuals might self−insure through private savings but face aggregate fluctuations. We conclude that previous studies have under−estimated by half the average welfare gain from unemployment benefit by ignoring aggregate price and employment uncertainty. But paradoxically enough, the poorest are less in favour of unemployment benefit when business cycles are taken into account. This result is due to favorable price effects which dominate the unemployment uncertainty.

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1 Introduction

A recent strand of the literature reassesses the optimal level of unemployment benefits when individuals may also rely on private savings to buffer against unemployment risks. Since self-insurance with a riskless asset has long been shown to achieve almost perfect insurance against idiosyncratic income risks (Aiyagari 1994), the current literature concludes that the additional insurance effect of unemployment benefits is nil in this context (Wang and Williamson 1999, Rogerson and Schindler 2002).

However these previous studies ignore aggregate fluctuations. This key assumption might have led to an over-estimation of self-insurance for two main reasons. The first one can be referred to as an *employment fluctuations effect*. Savings and borrowing are less likely to be able to smooth consumption during longer unemployment spells caused by recessions such as those in Europe. The second reason can be referred to as a *price fluctuations effect*. The level of insurance provided by savings and unemployment insurance crucially depends on interest rates and wage fluctuations. Furthermore, price fluctuations can have important redistributive effects depending on households' asset holdings (Krusell and Smith 2002).

To what extent do these macroeconomic considerations matter in assessing the welfare benefit of unemployment insurance under incomplete markets? The aim of this paper is to address this issue by disentangling the two employment and price effects. The welfare analysis is run under a general equilibrium incomplete markets model *à la* Krusell and Smith (1998) calibrated on two polar business cycles cases : those of America and Europe. The average welfare benefit of public unemployment insurance turns out to be significant under this general equilibrium set-up. Conversely, ignoring business cycle considerations reduces by half the average welfare benefit of unemployment insurance. The difference is accounted for equally by price and employment fluctuations.

Yet the average welfare measure hides some paradoxical distribution effects of aggregate fluctuations. The poorest are less in favour of unemployment benefit when business cycles are taken into account even though they face more unemployment risks. This result is due to favorable general equilibrium price effects in incomplete markets economies. The increase in uncertainty leads to higher precautionary savings and aggregate capital stock, lowering the productivity of capital but increasing that of labor. Consequently, wages are higher while interest rates are lower under aggregate fluctuations. This benefits to the poorest who are essentially employed or unemployed people holding few assets. This income effect reduces the need for public unemployment insurance precisely for those who are the most concerned by this policy, shedding new lights on redistributive policies.

2 The model

The model builds on Krusell and Smith's (1998) incomplete markets set up. The economy consists of a continuum of individuals - normalized to one - facing both idiosyncratic unemployment risks and aggregate uncertainty. The value function $v()$ of a given individual is represented by

$$v(k,\epsilon,;\lambda,z)=\max_{c,k'\geq 0}\{u(c)+\beta E[v(k',\epsilon';\lambda,z)|(\epsilon,k;\lambda,z))$$

under the constraints

$$c+k'=rk+w\mu(\epsilon)\ +(1-\delta)k\ \ with\ \ k'\geq 0 \tag{1}$$

where $u()$ is a standard CRRA utility function, c the level of consumption, β the subjective time discount factor, k an agent's asset holdings, k' the next period level of asset constrained to be positive. The only good consumed is produced by a representative firm according to an aggregate Cobb-Douglas technology $F(z,K,L)$ combining capital K, labor input L. The production function is affected by an aggregate productivity shock z governed by a Markov process taking on two values : z_g in good times and z_b in bad times.

In each period, an agent faces an idiosyncratic shock ϵ on the labor market and can be either employed ϵ =e or unemployed ϵ =u. If public insurance is available, the unemployed own a fraction $\mu(u)=\rho$ of current wages while the employed pay taxes ($\mu(e)=1-\tau$) so that the public insurance scheme is balanced in each period. Conversely, in the absence of public insurance, $\mu(u)$=0 and $\mu(e)$=1. The stochastic employment opportunity ϵ follows a first order Markov process $\{\pi_{z'z|\epsilon'\epsilon}\}$ displaying a correlation between idiosyncratic and aggregate shocks. Prices are determined in competitive markets according to the marginal productivity of each factor : $r=zF_K(K,L)$ and $w=zF_L(K,L)$. Thus prices vary randomly according to the joint distribution $\lambda(k,\epsilon)$ over individual capital level and employment opportunity and the recursive competitive equilibrium includes a law of motion H mapping today's distribution λ into tomorrow's distribution $\lambda'=H(\lambda,z,z')$. The resolution of the model is based on Krusell and Smith (1998) simulation algorithm which breaks down the evolution of the wealth distribution to that of the mean.

3 Results

The comparative analysis is run on the American and the European labor markets in quarters. In the American case, we closely follow Krusell and Smith (1998) by reproducing the movements observed in postwar output fluctuations, which implies $z_g=1.01$, $z_b=0.99$, $u_g=10\%$ and $u_b=4\%$. The process for (z,ϵ) is chosen so that the average duration of each aggregate state is set to 2 years and the expected duration of unemployment is 1.5 quarters in good times and 2.5 quarters in bad times. Concerning European business cycles, we only modify the labor market features for the sake of comparison. By using Blanchard and Wolfers' (2000) data over the period 1960-1995, we find an unemployment rate of 13 % (7%) and an average unemployment duration of 6 quarters (4 quarters) during booms (recessions) respectively. In the economy with unemployment insurance, the replacement rate is set to the average European level of $\rho=0.5$ (Martin 1996). Eventually, the preferences and the technology parameters take on the standard values in the literature[1] (Krusell and Smith 1998).

We measure the welfare gain of moving from an economy without unemployment benefit to an economy with public insurance as a multiplicative increase in consumption $1 + \Psi$ required to make an agent be equally well off under the two institutional set-ups :

$$E_0\{u(c(1+\Psi)) \mid b=0\} = E_0\{u(c) \mid b>0\}$$

Note that the steady state capital stocks are different in the two economies as individuals have less incentive to save if they are entitled to unemployment benefits. Thus one has to take into account the transition path of capital accumulation in order to make things comparable. Henceforth all the welfare measures are based on the expected utility of individuals at date 0 and we assume that all individuals start with no capital initially[2].

3.1 Average welfare gains

On average, we find consistent welfare gains from UI in an incomplete markets economy characterized by business cycles - reported in Table 1. In the US, the average welfare increases by 0.94% under aggregate uncertainty (Tab1 - M1) while it merely reaches 0.4 % without such aggregate risks (Tab1 - M4). Moreover, the average welfare increases with the severity of the labor market cycles. The average welfare gain is twice as high in the European case (1.82%) as that found in the American case. Once again, ignoring business cycles leads to a decrease by half of this average welfare measure. This result is due to the mean-preserving aggregate shock which widens the dispersion of risks. Thus on average, risk-averse agents are in favour of additional public insurance as the level of uncertainty increases.

However aggregate risks can have different causes. The candidates are *i*) technological shocks, *ii*) price fluctuations and *iii*) employment fluctuations. To disentangle these effects, we compare different economies in which the channels are progressively shut down. The full benchmark economy is referred as model M1. We then first eliminate the technological shock by setting z at its unconditional mean $\bar{z} = 1$ in model M2. We then remove the pro-cyclicity of employment by setting the unemployment rate and the unemployment duration at their unconditional means $\bar{u}$ in model M3. This economy is only characterized by idiosyncratic risks. Yet, we maintain the prices faced in economy M2 so that the welfare differences between M2 and M3 only capture employment effects. We end up this experiment by a model M4 with only idiosyncratic unemployment risks as in M3 but with endogenous prices. The difference between M2→M4 and M2→M3 (M2→M3

[1] We use a relative risk aversion $\sigma = 1$, a discounting factor $\beta = 0.99$, a capital share $\alpha = 0.36$ and a depreciation rate $\delta = 0.025$. The borrowing constraint $\underline{k}$ is set to one third of the average wage.

[2] This assumption raises a problem when prices are endogenous and depend on the aggregate level of the capital stock. To address this issue, we split the population between non-wealthy and wealthy people in an overlapping generation model style. The former group could be considered as the first generation who faces the price levels imposed by the accumulation behavior of elders. In the simulation, we identify 10000 such agents for 1000 periods.

- M2→M4) measures the welfare gains from eliminating price fluctuations. This strategy closely follows the method used by Storesletten and al. (2001) to remove business cycles.

Consider first the welfare gain from UI in economies with unemployment and price fluctuations. In that case, removing the technological shock (M1→M2) does not matter that much, the welfare difference being almost nil. Things change when one focuses on the contra-cyclicity of unemployment rates. Holding prices constant, the welfare gains from UI decrease from 0.92% under contra-cyclical unemployment rates to 0.59% under a-cyclical unemployment rates (Tab. 1 : M2→M3). Eventually, the average impact of prices fluctuations (M2→M3 - M2→M4) depends mainly on the magnitude of business cycles. In the European case, they account for nearly half of the difference in UI average welfare gains between an economy with business cycles and an economy without them. In contrast, this difference is almost nil in the United States. This discrepancy is brought about by the different magnitude in aggregate risks. The more aggregate uncertainty there is, the higher will be the variation in aggregate quantities and prices and the greater will be the gains from additional public insurance. However, such gains only hold on average and might disappear when one turns to households at the extremes of the wealth distribution.

Tab.1 - Average welfare gains from UI

	Gains %		Eliminated effects	Commentary
	US	Europe		
M1	0.94	1.82		Full business cycles
M2	0.92	1.79	$\bar{z}$	No technological shock
M3	0.59	1.51	$\bar{z}, \bar{u}$ $\bar{r}_2, \bar{w}_2$	No aggregate risks + Exogenous prices
M4	0.40	1.18	$\bar{z}, \bar{u}$ r_4^*, w_4^*	No aggregate risks + Endogenous prices

3.2 Heterogeneity of welfare gains

Table 2 decomposes the welfare gains from UI by utility percentiles in the American and the European cases. For example the column 1% provides the welfare difference between the 1% least fortunate people living in an economy without public insurance and those living in an economy with UI. Note that this analysis closely matches a decomposition by wealth levels. The lowest (highest) expected utilities refer to people who have experienced the highest unemployment (employment) spell and who end up with the lowest (highest) level of assets.

Tab.2 - Decomposition of welfare gains from UI

	US					Europe				
	1%	25%	50%	75%	99%	1%	25%	50%	75%	99%
M1	6.35	2.07	.53	-.46	-1.88	17.29	3.46	0.867	-1.02	-3.60
M2	6.30	2.05	.51	-.44	-1.81	17.25	3.42	0.83	-1.00	-3.57
M3	7.73	1.52	.17	-.92	-2.55	17.69	3.19	0.33	-1.62	-3.96
M4	7.69	1.50	.15	-.94	-2.56	17.34	2.86	0.02	-1.94	-4.30

This analysis provides two key insights. The first and more expected one is that the welfare gain from UI is a decreasing function of wealth. The poorest benefit much more from public insurance than the average since they consist of borrowing-constrained unemployed people who do not have private means to smooth their consumption. Tab. 2 (M1 - US) indicates that their welfare gain is six times as high as the average welfare gain in the American case. By contrast, the wealthiest lose from UI since they mainly consist of employed people who are rich enough to self-insure but who do have to pay taxes for public unemployment provision. A corollary of this effect is that the UI welfare gains for the poorest increase as the labor market cycles become more stringent. Tab. 2 (M1 - Europe) suggests that the welfare gain for the 1% poorest is three times higher in European economies compared to the American one. Inversely the welfare losses are much higher for the wealthiest in the European case compared to their American counterparts as they have to pay higher taxes.

The second key and more paradoxical result is linked to the distributional effects of aggregate fluctuations. Contrary to the previous average evaluation, introducing aggregate fluctuations decreases the welfare gains or losses from UI as far as the two extremes of the wealth distribution are concerned. Let us focus on the plight of the poorest. Tab. 2 suggests that their welfare gain from UI decreases on average by 18% in the US and 3% in Europe when business cycles are taken into account (comparison of M1-M2 with M3-M4). To understand the mechanism at work, one has to disentangle the two competing employment and price effects. Aggregate fluctuations increase employment uncertainty and should thus increase the UI welfare gain for those who are the most exposed to unemployment risks. But this higher employment uncertainty also increases the precautionary savings motive which rises the aggregate capital stock, the labor productivity and thus wages.

This price effect is quantitatively quite relevant. For example in the American case, the average capital rises by 0.7% in the presence of aggregate uncertainty (M4→M1), leading to an average increase by 1.27% of the wage mean. It turns out that this favorable price effect for the poorest dominates the detrimental employment effect, in particular in the American case in which unemployment fluctuations are less stringent than in Europe. In conclusion, everything works as if aggregate fluctuations reduce the inequality gap between the poorest and the richest by increasing wages and decreasing rental rates in a general equilibrium incomplete markets framework.

4 Conclusion

This paper has reconsidered the welfare benefit of unemployment insurance when individuals may also use self-insurance on the credit market. A key extension of the model is to run this welfare analysis in the context of aggregate employment and prices fluctuations. It turns out that prices have distributional effects that are beneficial to the poorest despite the increase in unemployment uncertainty. More generally, the interaction between price fluctuations and wealth heterogeneity is likely to challenge traditional public redistributive policies in more fully-fledged models.

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