Discussion of
Can Market and Voting Institutions Generate Optimal Intergenerational Risk Sharing?
by Antonio Rangel and Richard Zeckhauser

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The Questions

This paper takes up an important issue from an interchange among Muench (1977), Lucas (1977), and Peled (1982): how to compare consumption allocations in an overlapping generations economy. Rangel and Zeckhauser adopt Muench's proposed *ex ante* utility measure for comparing stationary allocations in overlapping generations economies. Muench called it ET-PO (equal treatment Pareto optimality). Equal treatment (ET) means stationarity (people experiencing the same random state at different times receive the same consumption allocation). Muench computed utility 'prior to birth' by averaging utilities across all the states that a person had a chance of being born into.

The alternative to ET-PO is promoted by followers of Lucas (1977) and Peled (1982), who argued that the non-optimality often detected by the ET-PO test has an obvious source in an information advantage of a planner over the decision makers and that it is too easily used to criticize good equilibria from a superior vantage point. Lucas (1977) noted that '. . . in *any* general equilibrium model with differently endowed risk averse agents, many allocations which are Pareto optimal will not be if preendowment insurance markets are admitted.' Joining the spirit of Lucas's remark, Peled formulated the concept of conditional Pareto optimality, based on expected utilities conditioned on the same information that the agents have when they make decisions. Peled advocated conditional Pareto optimality because it uses an information structure that mirrors that possessed by decision makers. Peled went on to show that there always exists a conditionally Pareto optimal competitive equilibrium, sometimes with and sometimes without valued fiat money (depending on the parameters). Peled's model has a stochastic version of Samuelson's (1958) result for non-stochastic OLG models that it is possible for a single asset (government debt or fiat currency) to cure a failure of a (non-monetary) competitive equilibrium to be Pareto optimal.

Which welfare criterion should we prefer, Muench's or Peled's? Rangel and Zeckhauser are more enthusiastic proponents of Muench's criterion than Muench himself. Muench embraced his measure half-heartedly: '. . . I am not asserting that the ET-PO criterion for optimality is the appropriate one. It seems to imply that all future generations agree before history begins. How can this be democratically achieved?' An accomplishment of Rangel and Zeckhauser's is to investigate Muench's question. They describe a voting system (a description of a list of voters, a sequence of voting dates, and a protocol for the objects to be voted upon) that can attain the ET-PO criterion 'democratically'. But they seem not to like their voting system, partly because it has an implementation problem (in addition to the ET-PO equilibrium, another very bad allocation is also an equilibrium), partly because the choice set has to be specified to allow bad out-of-equilibrium outcomes to support good equilibrium outcomes, and maybe also partly because it is not democratic from the viewpoint of old people.

Plan of this comment

I shall devote most of my comment to empathizing with Rangel and Zeckhauser's sympathy for Muench's pre-birth utility criterion. I would like to add some empirical ammunition to their case by departing from the details of their setup while embracing its spirit. I want to reinterpret and broaden the risks. My reinterpretation of those risks is designed to amplify the claim that the welfare issue that RZ raise is quantitatively important.

RZ's setup

Rangel and Zeckhauser study market and political arrangements in a pure endowment, doubly infinite (t 'starts' at $-\infty$ and 'ends' at $+\infty$) horizon model with overlapping generations of two period lived people. People within a generation have identical endowments and preferences. Preferences are stationary in the sense that a person born at $t+j$ values time $t+j+k$ consumption in the same way that a person born at time t values time $t+k$ consumption. Agents are endowed only with time-dated goods bearing the same dates that they are alive and they care only about those same goods . At each date t, endowments of both young and old depend on the realization of a single random variable θ that takes discrete values $[\,\theta_1, \quad \ldots, \quad \theta_n\,]$ where $\text{Prob}(\theta = \theta_i) = \pi_i$.

Rangel and Zeckhauser restrict themselves to studying stationary allocations, i.e., they depend only on θ but not on calendar time. They propose to compare the Pareto efficiency of various allocations in terms of two different ideas of what identifies a person. Let $v(\theta)$ be the optimum value function for a young agent born in state θ. Rangel and Zeckhauser study welfare measures based on utility comparisons with two possible datings:

1. The conditional-on-θ or 'interim' optimum value $v(\theta)$.

2. The pre-birth or *ex ante* optimum value $Ev = \sum_i \pi_i v(\theta_i)$.

By excluding heterogeneity within a generation, Rangel and Zeckhauser focus on intergenerational risk sharing. To emphasize the potential quantitative significance of the substantive issue they are raising, I prefer to recast their discussion of the ex ante versus the interim welfare criteria in another setting that highlights intragenerational risk sharing. In Rangel and Zeckhauser's, there are different types and risks to be shared only because people are born at different phases of the 'business cycle' idexed by θ. In longer lived overlapping generations models, Rangel and Zeckhauser point out that much if not most of such risk could probably be insured by trading a small number of assets. So it seems likely that the ex-ante versus conditional-on-type welfare distinction acquires more quantitative importance if we introduce within generation heterogeneity across types.

Coincident but heterogeneous agents

Thus, consider instead the kind of environment Lucas alluded to in the quotation above. Let there be a stable distribution of types of people, where a type is a permanent attribute that cannot be controlled and that affects earnings from labor. Even in a standard general equilibrium model with coincident life-spans, the *ex ante* versus conditional-on-type welfare issue arises: welfare comparisons depend on whether utilities are evaluated before or after types are determined. A standard (Arrow-Debreu) way to set things up would be to take types as realized, and to permit trading of a complete set of history-dependent claims to consumption bundles. The coincident life-time complete markets model satisfies the two fundamental welfare theorems for a welfare criterion based on conditional-on-type utilities. But from the pre-birth viewpoint of 'persons' whose types are uncertain, a competitive equilibrium allocation would be dominated by allocations that get more sharing across types. Only if agents could trade 'before birth' would the welfare theorems hold for this economy.

Insurance for types with very low labor income

Thinking about private arrangements for trading 'before birth' requires a model with parents and children. Children cannot trade before their births, but their parents can and would often want to. Thus, consider any of a number of conditions that dramatically reduce earnings potential and that are realized at birth. I believe that private insurance for these conditions is not sold now. This is curious because many of these conditions are easy to verify and involve no moral hazard. I offer the following calculations as rough estimates of what such insurance would cost. The four conditions autism, cerebral palsy, Down's syndrome, and spina bifida have the following incidences per 10,000 live births in the United States: 4.5, 20, 12.5, and 5. So take the probability of having one of them to be .0042. With a stationary population, to purchase an annuity paying $50,000 per year conditional on a child having one of these disorders would then cost a one-time payment of $4200 per child.[1]

My reaction to these figures is that such insurance seems cheap to provide. Why doesn't private insurance exist? Why is it not provided by the government, or at least the U.S. government?

Pre-birth risk for workers

In terms of their earnings ability, the low or zero-earnings types of people just mentioned are extreme values from a distribution of types. Applied economists have adduced ample quantitative evidence for the importance of types characterized by unobserved abilities that are valued in the labor market. I shall mention a couple of sources for estimates that might help give quantitative content to the theoretical welfare distinction. Of course, because variations of ability in the range that we are now considering are much harder to disentangle from effort, they are more difficult to insure through private arrangements. I'll return to this point below. But first let me give some numbers.

Evidence from twins studies

Behrman, Rosenzweig, and Taubman (1994) present evidence for substantial labor-market-relevant endowment heterogeneity. They use observations on identical twins to identify the effect of individual-specific endowments on log earnings. They estimate that 27% of the variance of log earnings from labor is due to variance in individual specific endowments. Behrman, Rosenzweig, and Taubman also discuss how some of these individual effects might be insured through sharing within families or creating new family links through marriage. In particular, they discuss whether schooling and marriage serve

[1] I am capitalizing the per person cost of $210.00 per year at an interest rate of 5% per year.

to attenuate or reinforce the individual-specific effects on earnings. They estimate that schooling is allocated to reinforce and that marriage matches are made to attenuate the individual specific effects.

Fixed effects in income dynamics

Another kind of evidence for heterogeneity comes from the literature on quantitative long-lived overlapping generations models. Storresletten, Telmer, and Yaron (1998) (STY) have constructed a numerical long-lived overlapping generations model for analyzing some proposed social security reforms.[2] In their model, agents receive an exogenous stochastic endowment sequence, which STY choose to match to labor income. (Like RS, STY abstract from labor supply decisions.) Agents can save in the form of a small number of assets, including physical capital. Because their model is basically a life-cycle version of a precautionary savings model, STY want a realistic specification of the labor income dynamics. To calibrate their model to the contemporary U.S., they use PSID data on labor earnings to create a specification that captures both (a) the personal labor income dynamics, and (b) the dispersion of the cross section labor income distribution by age of workers. To capture both of these, STY use a model with fixed effects, that is, different types. We can use their estimates to calibrate the importance of 'type' in determining labor income variance.

Thus, Storresletten, Telmer, and Yaron use the following transitory-permanent-fixed-effects statistical model for the substantial part of the log of labor earnings u_{it} of the ith person at age t that cannot be explained by education and various other control variables:

$$u_{it} = \alpha_i + z_{it} + \epsilon_{it} \tag{1a}$$

$$z_{it} = \rho z_{it-1} + \eta_{it}. \tag{1b}$$

Here $\epsilon_{it}, \alpha_i, \eta_{it}$ are each normally and idependently distributed and with mean zero and variances $\sigma_\epsilon^2, \sigma_\alpha^2, \sigma_\eta^2$, respectively, and $|\rho| < 1$. The model (1) makes u_{it} a mixture of a transitory piece ϵ_{it}, a persistent piece z_{it}, and a person-specific fixed effect α_i. Through precautionary savings, an individual can self-insure much of the transitory and persistent components (at least if ρ is sufficiently smaller than unity); the fixed effect cannot be self-insured after birth. Model (1) implies the following covariances:

$$\mathrm{var}(z_{it}) = \rho^2 \mathrm{var}(z_{it-1}) + \sigma_\eta^2 \tag{2a}$$

$$\mathrm{var}(u_{it}) = \sigma_\alpha^2 + \mathrm{var}(z_{it}) + \sigma_\epsilon^2 \tag{2b}$$

$$\mathrm{cov}(u_{it}, u_{it-j}) = \sigma_\alpha^2 + \mathrm{cov}(z_{it}, z_{it-j}) \tag{2c}$$

$$\mathrm{cov}(z_{it}, z_{it-j}) = \rho^j \mathrm{var}(z_{i,t-j}) \tag{2d}$$

[2] I thank Amir Yaron for discussing with me aspects of the rough calculations reported below based on the STY papers.

To initialize (2b), STY assume that $\text{var}(z_{i,-1}) = 0$.

STY use samples drawn from the PSID to fit the parameters of this model. First they use pooled time series to estimate $\rho, \sigma_\epsilon^2, \sigma_\eta^2$. Setting $\sigma_\alpha^2 = 0$, they use these parameters to compute the cross-section distribution of income by age: the theoretically computed cross section dispersion (without the fixed effects) increases with age, but for all ages it is below the actual cross-section dispersion of adjusted income u_{it} calculated directly from the PSID data. This observation impels STY to add the fixed effect through σ_α^2 and to adjust ρ to match the cross section distribution of u_{it}. They attain the parameter values $\sigma_\alpha^2 = .326, \sigma_\epsilon^2 = .005, \sigma_\eta^2 = .019, \rho = .98$. With these parameter values, the model roughly reproduces the level, upward slope, and curvature of the empirical cross-section income variance – age relationship. These estimates of the variances imply a cross-section standard deviation of the log of income for the youngest workers of $\sqrt{.35}$; this implies that the standard deviation of the *level* of income is approximately $\exp(.35)(\exp(.35) - 1) = .5947$. The observed initial cross section standard deviation of the level of income was \$2100 in 1968 dollars. (The mean level of income (per adult-equivalent members of household) was \$3300.) Thus, to get comparable units for the STY study, it is appropriate to multiply their standard deviation by $\frac{2100}{\sqrt{.5947}}$ to convert it into 1968 dollars.

To assess the implication of these parameters for Rangel and Zeckhauser's issue of ex ante versus conditional evaluation of utility, we can use STY's specification to compute the variance of the expected present discounted value of $\exp u_{it}$ defined as :

$$\text{PV} = E \sum_{t=0}^{T} R^{-t} \exp u_{it}. \tag{3}$$

Here E is the mathematical expectation with respect to the distribution generated by process (2). The variance of (3) measures the life-time labor income risk faced by an agent before he or she is born. Part of the variance of (3) comes from the fixed effect α_i, with the remaining part coming from chance income variations realized during the life-time. For STY's specification with $R = 1.04$ and a working life of $T = 45$ years, I compute that the standard deviation of (3) is 40,500 in 1968 dollars, and that 69% of the variance is due to the fixed effect α. A standard deviation of 40,500 is substantial compared to an estimate of the average present value of income of 83,000 1968 dollars that can be coaxed from STY's figures. Thus, the income variance is substantial, and so is the fraction of it due to the fixed effect. The 69% portion of the variance due to the fixed effect would be weighed by Rangel and Zeckhauser's ex ante welfare criterion, but not by the conditional criterion.

Insurability of working types

The diverse individual-specific effects of 'abilities' described in the previous two sections are not observable and can be inferred only by sophisicated statistical procedures.

Country	$P_{90} - P_{10}$
Finland, 1991	2.75
Sweden, 1992	2.78
Belgium, 1992	2.79
Netherlands, 1991	3.05
Germany, 1989	3.21
France, 1984	3.48
Canada, 1991	3.90
United Kingdom, 1991	4.67
United States, 1991	5.78

Table 1: 90-10 quantile ratio, after tax and transfer personal income.

It is therefore not surprising that the private market does not offer to insure them. However, at least implicitly, societies provide social insurance for them though tax and transfer schemes. If we assume that abilities are equally distributed across countries, after tax and transfer income distributions across countries provide hints about the variation of the magnitude of the social insurance against realization of ability. For various countries, Table 1 shows 90-10 percentile ratios for measures of after tax, after transfer income. The data are from Smeeding (1998), who reports that the income data include rents and interest but exclude capital gains and various in kind transfers. Smeeding conjectures that including in-kind transfers would make less equal countries still less equal. The figures in Table 1 confirm what is widely known: that there is substantially more sharing across types in Northern European countries than in the U.S.

Efficiency and Equality

The RZ model and my use of the STY statistics probably overstate the case for using the *ex ante* criterion. It is probably not a good idea to interpret the figures in Table 1 with a model with exogenous labor income. Work in the tradition of Shavell and Weiss (1979) points to worthwhile incentives that are sustained by unequal consumption distributions. Shavell and Weiss assume that labor market outcomes are partly the result of a worker's hidden actions. In making consumption outcomes depend on the history of observed labor market outcomes, Shavell and Weiss's planner spreads the consumption distribution over time to reward workers who probably are partly lucky and probably also taking more productive private actions. Thus, the Shavell-Weiss unemployment compensation designer uses risk and the worker's aversion to it to manage incentive problems. Wealth distributions that spread out during time as a way optimally to trade off risk and efficiency have emerged in a variety of models in this tradition, e.g., Green (1987), Phelan and Townsend (1991), and Thomas and Worrall (1990). The pure endowment economies under discussion here don't let us to think about this issue.

Welfare Criteria and Transition Issues

Welfare criteria based on conditional versus ex-ante expected utility answer different questions, and so cannot be evaluated without regard to the question at issue. Similarly, welfare criteria like Muench's ET-PO that compare only stationary allocations address questions like 'what kind of society operating forever according to stationary allocation rules would you like to be born into?' The criteria have to be adjusted to answer questions that by their nature compare non-stationary allocations. Thus, Storesletten, Telmer, and Yaron (1998) and others in the Auerbach-Kotlikoff (1987) tradition who seek quantitatively to compare alternative proposals to reform social security arrangements struggle to adopt a welfare criterion that appropriately weighs conflicting interests. For evaluating proposals to change pre-existing arrangements, at a minimum we need an initial stationary equilibrium, a new terminal one, and a transition path between them. For analyzing transition issues, the most popular framework within the Auerbach-Kotlikoff tradition is the one-sided infinite horizon economy studied by Samuelson and Peled, in which there is an initial old generation most of whose uncertainties have been resolved and who have entitlements that have to be respected in evaluating welfare. I recommend reading the paper by Storesletten, Telmer, and Yaron (1998) alongside the Rangel-Zeckhauser paper, because of how they struggle to get as far as possible using an *ex ante* welfare criterion and stationary equilbria to analyze alternative reform proposals.

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