Status consumption as competitions of relative income

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Abstract

The effect of long-term income inequalities on status consumption is less understood in the varied social contexts of consumption. In the proposed chapter, we avoid a view of status consumption as necessarily wasteful in favour of a formulation as a combination of choices that increase upside risk or mitigate downside risks for the consumer. Assuming a prospect theory utility for the consumers with varied risk aversion levels implied by long-term social and occupational structures, we then explore how the constraints on the long-term growth in an economy could restrict the competition for relative income. We find that the conditions implied by the long-term constraints in an economy that necessitate a differentiation of reference points across income groups provide a more nuanced view of status conditions in the context of extreme income differences.

1 Introduction

While status consumption seems to encompass all consumption above what's necessary for a consumer[1], empirical considerations have restrained us to focus on the particular case of visible consumption which is implied by the items that serve no purpose other than signaling. In the current chapter, we argue that the visible consumption approach may not provide an accurate view of the status consumption when there are wide differences in income in an economy or if the means for visible consumption are available to only a rich minority. In both such cases, the direct changes to income through long-term assets may carry more status and thus be more visible than the visible non-durable consumption. The scope and extent associated with status consumption is therefore important to address before the presence of status consumption can be tested or measured in a developing economy. To address this issue, we propose a model for status consumption under extreme income differences that is cognisant of the variability of reference points and considers asset purchases a part of status consumption. In the developing economies where a wide agragrian population lives without many assets, we believe that an approach that considers the value of long-term asset purchases towards status may provide a more accurate view of status consumption.

The representative consumer in the proposed model observes a reference point shared by all consumers participating in a competition of relative income. The consumers in the competition observe a macroeconomic process and project their long-term future relative income subject to private risk-aversion levels that influences their consumption. There are two kinds of items that can carry status in the model - the first is a risky upside investment and the second a protection against untoward circumstances in face of losses in the macroeconomy. There are two questions that interest us in the current chapter. First is how a reference point applicable to a competition of relative income could be constrained by the average long-term returns in an economy. Second, if there are conditions that may discourage status consumption in the presence of wide differences in income.

In the sections that follow, Section 2 discusses the need for a stochastic model and the ways in which status consumption could be defined in an environment of uncertainty. Section 3 discusses the details of the model. The implications of the model are summarised in Section 4.

2 Literature Review

Status consumption was notably elaborated by Veblen [2] in his 1899 treatise titled "Theory of the Leisure Class". Around the time when Marx had endorsed a view of all commodities as products of labour, Veblen sought to explore the psychological basis for consumption among the economic classes. Veblen's view of status consumption may appear critical of a "bourgeois" wastefulness at times [1] - but he doesn't dwell upon the equivalence of labour for exchange of commodities. While he observes the tendency amongst the elite to distance themselves from physical labour - he also argues that this tendency has transformed itself into a desire of displaying exploits and has survived in the culture from more primitive hunter-gatherer and agrarian societies. This symbolism seems inherent in all exchange of goods and services (including devotion and education[2]).

Veblen's ideas on consumption have revived interest in status consumption in the post-war era as the purchasing powers of consumers in the advanced economies have strengthened (see Galbraith[3] and Hirsch[4]). The

[1] "Throughout the entire evolution of conspicuous expenditure, whether of goods or of services or human life, runs the obvious implication that in order to effectually mend the consumer's good fame it must be an expenditure of superfluities. In order to be reputable it must be wasteful."[2]

[2] "The adoption of the cap and gown is one of the striking atavistic features of modern college life, and at the same time it marks the fact that these colleges have definitely become leisure-class establishments, either in actual achievement or in aspiration."[2]

expanding markets and far-reaching advertisement campaigns have suggested an ubiquity of status consumption (see the commentaries from Hirsch [4], Goldman-Papson [5] and Baudrillard[6]) - but in the revival of Veblen's ideas, the popular discourse has considered the status consumption necessarily wasteful. Whether as a behaviour exhibited by the ultra-rich or as a habit emulated by the poor, status consumption tends to circumscribe a certain decadence characteristic of the elite. While Veblen does use pecuniary emulation and invidious comparison to explain the consumption in the gilded age, his observations on human behaviour pertaining to status consumption are more general and could be viewed in light of the recent advances in behavioural sciences.

Instead of assuming that status consumption is limited to the rich and that the poor unconditionally emulate them, we argue that the role of reference group is key to the idea of status consumption. Pertaining to a reference point, a status item either helps distance oneself from the others or provides a satisfaction of having achieved at least as much as others in the group. There are two questions pertaining to the reference point that interest us in the current chapter. First, is if the reference point relevant for status consumption implied by the uncertainty in the economy. Second, does being further below the reference point suggest incentives for lower status consumption - thus implying a limit to the gain from pecuniary emulation.

There are two sets of models for status consumption that we find in the literature surveyed as part of the current study. The first is the set of social inference models that have been used widely in empirical investigations of visible consumption. The visibility-based social inference models (see Ireland[7] and Hopkins-Kornienko[8]) assume that status consumption is futile in the regular sense - an assumption that ensures the separability of demand for visible goods in the direct utility model. Empirical studies on visible consumption have often used the visibility-based models to explain the significant role of social identities in visible consumption [9, 10, 11, 12, 13, 14, 15] . The separated social groups noted in these studies (e.g. the black population in South Africa[14, 11], marginalised religious groups in India[9] and regions of erstwhile East Germany[13]) in the economies are observed to spend differently on visible items compared to others in a similar income group. That the consumers use consumption to form and maintain identities is also supported by the studies in marketing[16] and political economy[17] literature. The rapid proliferation of industrial goods in the developing economies seems to have had an effect similar to that of visible items (see Srinivas[18] , Ustuner-Holt[19] , Burke [20] on sub-Saharan Africa).

The second set of models - which our approach banks upon - are based on a social deference view of status (see Corneo[21] , Frank [22]and Coleman[23]) and view status consumption as a means to alter the more stable income hierarchies. Such a social ranking approach views status consumption as a means to modify a ranking determined by long-term standing so that the expected utility from from status is a combination of both status items and existing income.

We emphasise that the projected utility of the representative consumer is sensitive to the reference level observed by the consumer as well as the level of risk-aversion which characterises a consumer. The role of reference point in the projection biases for future utility has been highlighted by Loewenstein et al[24][3]. Karelis[25] also suggests the importance of reference levels in the context of consumption under poverty. The non-linear response to observed risk that depends on varying degrees of risk-aversion has similarly been explored with many utility forms in the behavioural economics literature. While risk-aversion parameters are specified in CRRA (Constant Relative Risk-Aversion)and CARA (Constant Absolute Risk-Aversion) utilities as well, the behavioural approaches have sought higher descriptive significance by viewing risk-aversion levels within a disappointment aversion framework (see Gul[26], Prelec[27] and Lowenstein[28]). For example, Shefrin-Thaler [29] provide a mental accounting model incorporating parameters such as willpower to understand over-consumption and deviation from long-term goals. A disappointment aversion approach that explicitly depends on a reference point is suggested in the modern Prospect theory (PT) (see Kahneman-Tversky [30]). Here, while the applications of PT [30] often set the reference level as on empirical grounds, normative approaches to reference points have also been suggested with a framework of anticipatory emotions (see Caplin-Leahy[31], Koszegi[32] and Koszegi-Rabin[33]).

The representative consumer in the proposed model optimises a private view of status with respect to a certain reference level and a risk-aversion level. The long-term view of status on the other hand is determined with the long-term income obtained by the consumer. This captures the fact that while a high-status individual in one localised context may not be high-status in another, the notions of power and net-asset-worth are common across multiple contexts (societies, communities, nations etc.) and determine status in the long-run. The status comparisons across contexts do however require us to have a common reference - which must also be associated with incomes in the long-term.

We represent the private view of the observed risk in a macro-economic process as a non-linear response - which is modeled with a probability weighting function. The notions of subjective probability that we incorporate using this approach have been around at least since Keynes[34] and a formal treatment has been offered by de Finetti[35, 36] as well as Savage[37] (see Schoemaker[38] and von-Plato[35] for a summary). The difference in risk and uncertainty in the model essentially represents the delay or barriers to the flow of risk-related information in the economy that may

[3]The specific example used by Lowenstein[24] is how a consumer buying a small house in a wealthy neighborhood tends often forget that her frame of reference quickly becomes larger houses owing to her new neighbours.

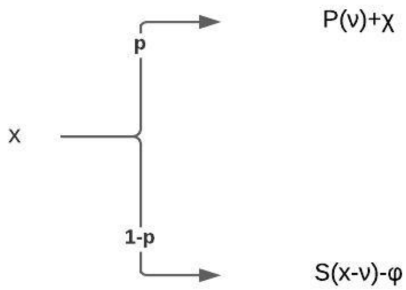

Figure 1: The binary growth economy

result in varied views of risk at different levels of societal organisation. In our model for the subjective notion of status, the occupational structures that could result in the different attitudes to risk are represented simply as differences in risk aversion preference of the consumers. Thus while a definite risk is entailed in a random process that all consumers are subjected to (regardless of their income), the consumer's uncertainty in projected utility is shaped by the individual characteristics and the reference point observed by the consumer.

The consumer's projected future being subject to her private view also means that the uncertainty perceived by the consumer may not be aligned with the risk in macroeconomic processes that determine her long-term income. In a canonical formulation of such a risky process we use a Bernoulli random process W with probability p (i.e. $E(W) = p$) that affects all individuals in the economy. All macroeconomic changes such as the proliferation of new occupations, onslaught of calamities, rise of urbanisation etc. risks are encompassed with the process. The gains and losses to an individual economy are represented as a repeated lottery that is played by all consumers as they observe the macroeconomic events simultaneously. The uncertain consumers decide to position themselves to benefit from gains in the economy or to seek protection from any losses that the economy is exposed to. Given a disposable income x - which we define as the consumer's expenditure after deducting the cost of her needs - a consumer can spend an amount ν towards the upside risk (probability p) to be compensated $\chi + P(\nu)$ in a favourable enviroment and pay ξ to obtain $S(\xi) - \phi$ in an unfavourable environment (with probability $1 - p$) . The disposable income as well as α may vary for every consumer in the population. The lottery scheme presented to every consumer in the binary growth economy is shown in Figure 1 ($x = \nu + \xi$)[4].

The gains χ differ from gains $P(\nu)$ (or between ϕ and $S(x - \nu)$) in the sense that the social context of a consumer affect the outlay x and the returns $P(\nu)$ (or $S(\xi)$). Thus even though all consumers would receive gains and incur losses equally in an economy through χ and ϕ (regardless of their outlay x), their fate is in their hands to some extent through x i.e. the gains $P(\nu)$ and protections $S(\xi)$.

It is the sign of a meritocratic society that upside risks (including activities that set oneself apart from one's reference group) be rewarded and the long-term protections honoured. The status items that have no value to the consumer when she faces an overall loss can therefore be contrasted against accumulative items that offer some protection against losses. The choice of ξ and ν correspond to the choice between the investments in permanent goods which provide a long-term security and the transient goods that improve self-image or social interactions without providing any security. Since all consumers face the same P and S, the consumers can only improve their fortunes by securing more income or betting to gain more income. The notion of status is inherent in the risk-taking involved in such decisions and is influenced by risk-aversion levels arising out of social or occupational constraints.

To further emphasise how risk-aversion levels could be implied by social or occupational structures, consider three consumers with different occupations in a small economy of an academic, a sportsperson and an investor - who are all of the same age and are observed at the start of their working life with the same income endowed to them. Even with the same reference point, each of the consumers may have different views on the likelihood of doubling their income in their lifetimes - a difference that is implied solely by the nature of payoffs in their respective occupations. The sportsperson - for instance - may bear a risk-seeking behaviour while an academic who does not expect a windfall in the short-term would be more risk-averse. The risk-profile of the investor may similarly lie somewhere in between. The consumers with different risk-aversion levels all perform a function in the economy and the extent to which they compete each other is limited by observed constraints on their combined income. Thus the consumer views of their future status depends both on the occupational structures and observed long-term distribution of outlay x in the economy.

In order to contrast our approach based on a reference-point and a PT-like utility form more conventional views on status consumption, we compare the optimal conditions implied by a CRRA utility with the reference-point driven PT-like utility in Section 3.1. The conditions for existence of a reference point which such a comparison must depend upon are then explained in Section 3.2.

3 Model

3.1 Status comparisons under fixed reference points

Before we compare a CRRA utility for relative income competition under uncertainty with a PT-like utility,

[4] In a more general setting, one could consider the returns from consumer's investments ν and ξ to be stochastic - but in the canonical form the consumer is assumed to spread her disposable income between competitive and cooperative investments that are rewarded through deterministic functions $P(\nu)$ and $S(\xi)$ respectively.

consider the optimisation of value vs utility in a simple lottery that costs ν and provides an amount $\sigma(\nu)$ when successful (i.e. with a Bernoulli random variable so that $W = 1$ with probability p and 0 with probability $1-p$), the net change Δ in the consumer's fortune is

$$\Delta = -\nu + \sigma(\nu)W \tag{1}$$

If the consumer were to optimise Δ, she must choose ν so that the expected Δ i.e. the following expectation must be maximised

$$E(\Delta) = p\times(-\nu+\sigma(\nu)) + (1-p)\times(-\nu) = -\nu + p\sigma(\nu) \tag{2}$$

Notice that $E(W) = p$ in the Equation 2. Now consider if the consumer were to optimise a CRRA utility

$$u(A) = \frac{A^{1-\gamma}-1}{1-\gamma} \tag{3}$$

Here, she must choose ν so that $u(A+\Delta)$ is maximised. Since $u(A+\Delta) = pu(A-\nu+\sigma(\nu)) + (1-p)u(A-\nu)$ we have

$$u(A+\Delta) = p\frac{(A-\nu+\sigma(\nu))^{1-\gamma}-1}{1-\gamma} + (1-p)\frac{(A-\nu)^{1-\gamma}-1}{1-\gamma}$$

Notice that the parameter γ in the CRRA utility is the relative risk-aversion $-\frac{u''(A)A}{u'(A)}$. Assuming a simple form for $\sigma(\nu)$ as $\sigma(\nu) = \sqrt{\nu}$ which provides diminishing returns to $\sigma(\nu)$, the first conditions imply $(\frac{1}{2\sqrt{\nu}}-1)(1+\frac{\sqrt{\nu}}{A-\nu})^{-\gamma} = \frac{(1-p)}{p}$. As is evident from the solution ν^* for varying values γ given p,A_0 and $\sigma(\nu) = \sqrt{\nu}$ (see Figure 2), increasing the risk-aversion γ decreases the upside risk ν^* the consumer is willing to take. Such returns from ν must vary significantly in the real world. The returns from risky undertakings for a group of companies researching a new drug - for example - would be a lot different from the monetary returns to a group of recent graduates competing for top jobs in an industry. For the subsequent analysis, we have therefore assumed a general form for the returns function with non-decreasing but diminishing returns for the input ν.

In the model outlined in Section 2, the consumer would thus split her disposable income (outlay) x into ν and ξ which returns profit $P(\nu)+\chi$ when $W = 1$ and a security payment $S(\xi)-\phi$ depending on the investment ξ when $W = 0$. P, S and the amount ϕ are given to the consumer. The payoff from ν and ξ ($\xi+\nu = x$) in the system at every draw for the consumer is therefore:

$$G(x,\nu) = \begin{cases} \chi + P(\nu) & W = 1 \\ -\phi + S(x-\nu) & W = 0 \end{cases} \tag{4}$$

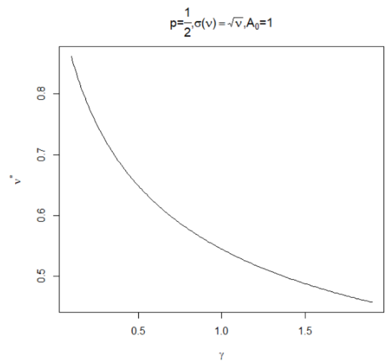

Figure 2: Plot of solution $\nu^*$for the CRRA utility under $p = \frac{1}{2}$, $A_0 = 1$ and $\sigma(\nu) = \sqrt{\nu}$

Since $E(W) = p$ the expected value to be optimised would $E(G(x,\nu)) = p(P(\nu)+\chi)+(1-p)(S(x-\nu)-\phi)$. The utility to be optimised for CRRA consumer would thus be

$$E(u(G(x,\nu)) = p\cdot u(P(\nu)+\chi)+(1-p)u(S(x-\nu)-\phi) \tag{5}$$

where the CRRA utility is defined as in Equation 3. Thus

$$\frac{\partial\Delta^*}{\partial\nu} = p(P(\nu)+\chi)^{-\gamma}P'(\nu) - (1-p)(S(x-\nu)-\phi)^{-\gamma}S'(x-\nu)$$

The first order conditions then imply that

$$\frac{P'(\nu)/(P(\nu)+\chi)^{\gamma}}{S'(x-\nu)/(S(x-\nu)-\phi)^{\gamma}} = \frac{(1-p)}{p}$$

Notice that for the risk-netural consumer we have $\gamma = 0$ and the relationship simplifies to $\frac{P'(\nu)}{S'(x-\nu)} = \frac{1}{p}-1$. $P'(\nu)$ represents a diminishing marginal utility and $S'(x-\nu)$ the rising marginal utility for ν. A higher p would mean that a lower $\nu' < \nu$ would provide the same marginal utility to the consumers as ν.

To demonstrate how the CRRA utility consumers would optimise relative income, now consider two consumers with different outlays x_1 and x_2 who must optimise the utility from distance in final income i.e. $\Delta_{12}{\equiv}E(u(G(x_1,\nu_1) - G(x_2,\nu_2))$ and $\Delta_{21}\equiv E(u(G(x_2,\nu_2)-G(x_1,\nu_1))$ respectively. The following can be said about the Nash equilibrium for consumers with CRRA utility.

Theorem 3.1. *For CRRA consumers with outlay x_1, x_2 optimising the utility from the differences $\Delta_{12}{\equiv}E(u(G(x_1,\nu_1) - G(x_2,\nu_2))$ and $\Delta_{21} \equiv E(u(G(x_2,\nu_2) - G(x_1,\nu_1))$ respectively, a Nash Equilibrium is achieved for ν_1^* and ν_2^* iff $G(x_1,\nu_1^*)$ and $G(x_2,\nu_2^*)$ are maximised.*

Proof. For v_1^* such that $G(x_1, v_1)$ is maximised at $G(x_1, v_1^*)$ and v_2^* such that $G(x_2, v_2)$ is maximised at $G(x_2, v_2^*)$. Consider $\hat{v}_1$ such that

$$E(u(G(x_1, \hat{v}_1) - G(x_2, v_2^*))) > E(u(G(x_1, v_1^*) - G(x_2, v_2^*)))$$

Since $E(\cdot)$ is linear (see Equation 5), this implies $u(G(x_1, \hat{v}_1) > u(G(x_1, v_1^*)$ which is a contradiction. The converse is similarly implied. □

Theorem 3.1 states that CRRA for relative income is no different from CRRA for individual income, as a consumer 1 (or consumer 2) with CRRA would "max-out" her x_1 (or x_2) for maximising the relative income just same way she would optimise $G(x_1, v_1)$ or $(G(x_2, v_2)$). Therefore consumers with CRRA utility do not consider the distance in income from the other consumer. Unlike the CRRA utilty, a utility with reference point could provide a more nuanced view of the competition for relative income as it would permits the representative consumer to have a different behaviour when she is too close to a reference point from when she is too far from the reference point.

As stated in the Section 2, the two key features of the relative income utility in the proposed model are i) the nonlinear weighting of risk and ii) the consumer's loss-aversion with respect to a reference point. Both the properties of the utility characterise the competition for status - which we interpret as the risk-adjusted evaluation of one's relative income advantage. The utility relative to a common reference point for a lottery L which is made of payoffs $\{x_i\}$ with probabilities $\{p_i\}$:

$$u(x, \mathbf{p}) = \sum_i^n \upsilon(x - r) \cdot w_\alpha(p_i) \tag{6}$$

Here, $\mathbf{p}$ represents the vector probabilities$\{p_1, p_2, .., p_n\}$ for events $E_{i \in [1,n]}$ each of which carry a payoff x_i to the consumer, $w_\alpha(p)$ is a probability weighting function representing a consumer's risk-aversion parameter α , r is the reference point used by the consumer and $\upsilon(\Delta)$ is an asymmetrical polynomial function in Equation 7 that is referred to as the value function (see Kahneman-Tversky[30] and Rabin[39]) . Figure 4 shows the value function with varying degrees of loss-aversion setting $\lambda = 1$). It is evident that a consumer with either of the above value functions would be loss-averse i.e. she would dislike losses more than she may like profits.

$$\upsilon(\Delta) = \begin{cases} \Delta^\gamma & \Delta \geq 0 \\ -\lambda(-\Delta)^\gamma & \Delta < 0 \end{cases} \tag{7}$$

The nonlinear uncertainty perceived by the consumer is represented with a probability weighting function $w_\alpha(p)$[40, 41] (controlled by a risk-aversion parameter α) . Here, $p(t)$ is the probability of achieving a certain income level in this stochastic income process (observed by both the participating consumers) so that $w_\alpha(p)$ determines the

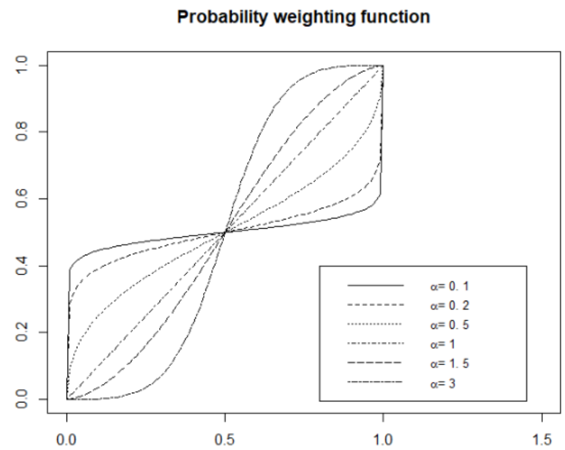

Figure 3: Probability Weighting Function $\frac{p^\alpha}{p^\alpha + (1-p)^\alpha}$

"private" (non-linear) weighting of the risk $p \equiv p(t)$ by the consumer. The particular form of weighted probability function we use is the Karmakar probability weighting function[5]

$$w(p) = \frac{p^\alpha}{p^\alpha + (1-p)^\alpha} \tag{8}$$

Here, α is simply the risk-aversion level of the consumer whereas p is the probability observed by the consumer. The graphs of Karmakar probability weighting function for varied degrees of risk-aversion α are presented in Figure 3 . As is evident from its definition, the above probability weighting function defines two contrastive consumer types. First is a low-α consumer who overvalues low-probability and takes high probability as certain. Second is a high-α consumer who ignores low-probability events (as if they didn't exist) and overvalues high-probability events – treating them as almost certain. A low-α individual is indeed more likely to engage in status consumption (non-durable consumption with high upside risk) than the high-α individual (who remains circumspect about surer events). Further, it is assumed that the risk-aversions vary between $[\alpha_l, \alpha_h]$ i.e. $\nexists \alpha_i$ for an consumer i such that $\alpha_i < \alpha_l$ or $\alpha_i > \alpha_h$.

For probabilities $\{p_i\}$ assigned to the various options $\{x_i\}$ to the consumer, one can thus assess the utility from the lottery L to the consumer. Using the above formulation for the binary growth economy where x and $\alpha \in [\alpha_l, \alpha_h]$ may both vary for any two given consumers, the optimal selection for a consumer with risk-aversion parameter α would optimise the following utility

[5]A probability weighting function prevents the common consequences paradox (see Dhami[40]) in consumer choice. A more general probability weighting function than the Karmakar function that both avoids t he subproportionality issue and satisfies the reduction invariance is the Prelec[27] function (reduction invariance is the property that for a lottery $L = (x, p_1)$ received with probability $p_2$where $(L, p_2) \sim (x, q)$, it is always implied that $(L^\lambda, p_2^\lambda) \sim (x, q^\lambda)$ for all $\lambda > 0$ (where$L^\lambda = (x, p_1^\lambda)$).

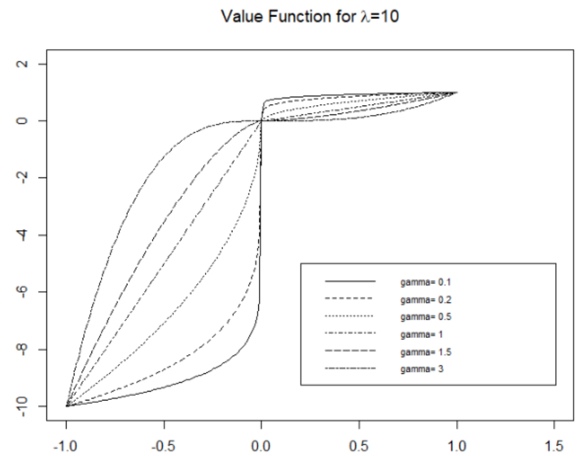

Figure 4: Value Function

$$u(x,\nu,\alpha,r) = w(p,\alpha)\upsilon(P(\nu)+\chi-r) + w(1-p,\alpha)\upsilon(S(\xi)-\phi-r) \quad (9)$$

Unlike with the CRRA utiltiy, the presence of loss-aversion with respect to r for relative income means that a consumer would be more desperate to reduce the distance from reference point when she is below the reference point than she would be to increase the distance from the reference point when she is above the reference point. Further, the constraints on the competition could be implied through differences in reference points with the above utility.

Further, given that the risk-attitudes depend on social and occupational structures, an equilibrium between consumer with varying risk-aversion could be supported by the relative position of the consumers with respect to a given reference point in the mode. To elaborate this further, let us decompose the value function $\upsilon(x)$ defined in the Equation 6 to rewrite $u(x,\nu)$ as

$$\begin{aligned} u(x,\nu) = {} & \mathbb{1}_{P(\nu)+\chi>r} w(p)\cdot\upsilon(P(\nu)+\chi-r) \\ & - \mathbb{1}_{P(\nu)+\chi<r}\lambda w(p)\upsilon(r-P(\nu)-\chi) \\ & + \mathbb{1}_{S(x-\nu)-\phi>r} w(1-p)\cdot\upsilon(S(x-\nu)-\phi-r) \\ & - \mathbb{1}_{S(x-\nu)-\phi<r}\lambda w(1-p)\upsilon(r-(S(x-\nu)-\phi)) \quad (10) \end{aligned}$$

For simpler notation let us also set $w_1 \equiv w(p,\alpha_1)$, $w'_1 \equiv w(1-p,\alpha_1)$, $w_2 \equiv w(p,\alpha_2)$, and $w'_2 \equiv w(1-p,\alpha_2)$ (notice that $w_1 + w'_1 = 1$) , the expected utility to be optimised for consumer 1 is:

$$\begin{aligned} u(x_1,\nu_1) = {} & \mathbb{1}_{P(\nu_1)+\chi>r} w_1\cdot\upsilon(P(\nu_1)+\chi-r) \\ & - \mathbb{1}_{P(\nu_1)+\chi<r}\lambda w_1\cdot\upsilon(r-P(\nu_1)-\chi) \\ & + \mathbb{1}_{S(x_1-\nu_1)-\phi>r} w'_1\cdot\upsilon(S(x_1-\nu_1)-\phi-r) \\ & - \mathbb{1}_{S(x_1-\nu_1)-\phi<r}\lambda w'_1\cdot\upsilon(r-(S(x_1-\nu_1)-\phi)) \end{aligned}$$

Similarly for consumer 2, we have

$$\begin{aligned} u(x_2,\nu_2) = {} & \mathbb{1}_{P(\nu_2)+\chi>r} w_2\cdot\upsilon(P(\nu_2)+\chi-r) \\ & - \mathbb{1}_{P(\nu_2)+\chi<r}\lambda w_2\cdot\upsilon(r-P(\nu_2)-\chi) \\ & + \mathbb{1}_{S(x_2-\nu_2)-\phi>r} w'_2\cdot\upsilon(S(x_2-\nu_2)-\phi-r) \\ & - \mathbb{1}_{S(x_2-\nu_2)-\phi<r}\lambda w'_2\cdot\upsilon(r-(S(x_2-\nu_2)-\phi)) \end{aligned}$$

Unlike the CRRA case, the maximisation of utility depends not only on ϕ, χ, $P(\nu)$ and $S(x-\nu)$ but also on how consumers are positioned with respect to r. Consider for example how the different returns from $P(\nu)$ and $S(\xi)$ would influence the competition when $x_1 < r < x_2$. It follows that the higher returns of $P(\nu)$ from ν (relative to $S(\xi)$ for ξ) would encourage risk-seeking while risk-aversion (higher α) would be favoured when $S(\xi)$ grows sharper with ξ.

Equation 10 allows us to identify the conditions under which the poorer consumer (consumer 1 with $x_1 < x_2$) would be necessarily more risk-seeking or risk-averse in the binary growth economy. Consider without loss of generality that consumer 1 is poorer than consumer 2 i.e. $x_1 < x_2$. If the security through comes at a heavy price (poor returns from $S(\xi)$) for the consumers and the consumer 2 is far more risk-averse than consumer 1 ($\alpha_1 < \alpha_2$) a ν_2^* could be chosen by the consumer 2 so that $P(\nu_2^*) + \chi < r, S(x_2 - \nu_2^*) - \phi > r$. The utility for the consumer 2 is therefore

$$\begin{aligned} u(x_2,\nu_2) = {} & -\lambda w_2\cdot\upsilon(r-P(\nu_2)-\chi) \\ & + w'_2\cdot\upsilon(S(x_2-\nu_2)-\phi-r) \end{aligned}$$

On the other hand, consider if the consumer 1 selects ν_1^* so that $P(\nu_1^*) + \chi > r$, $S(x_1 - \nu_1^*) - \phi > r$ for the same P, S, χ, ϕ - thus implying the following utility for consumer 1

$$\begin{aligned} u(x_1,\nu_1) = {} & w_1\cdot\upsilon(P(\nu_1)+\chi-r) \\ & + w'_1\cdot\upsilon(S(x_1-\nu_1)-\phi-r) \end{aligned}$$

It follows that for a high enough p in the observed macroeconomy, the risk-seeking consumer 1 would be more likely to increase ν (and collect more $P(\nu)$). Similarly, consider if consumer 1 chooses ν_1^* to satisfy $P(\nu_1^*) + \chi < r, S(x_1 - \nu_1^*) - \phi > r$ and thus implying the utility

$$\begin{aligned} u(x_1,\nu_1) = {} & -\lambda w_1\cdot\upsilon(r-P(\nu_1)-\chi) \\ & + w'_1\cdot\upsilon(S(x_1-\nu_1)-\phi-r) \end{aligned}$$

On the other hand, consider if the consumer 2 chooses ν_2^* so that $P(\nu_2^*)+\chi > r, S(x_2-\nu_2^*)-\phi < r$ implying the following utility. Thus a more risk-averse consumer 1 would capture higher security in the overall aggregated economy.

$$
\begin{aligned}
u(x_2,\nu_2) = w_2 \cdot \upsilon(P(\nu_2)+\chi-r) \\
-\lambda w_2' \cdot \upsilon(r-(S(x_2-\nu_2)-\phi))
\end{aligned}
$$

Unlike with CRRA utility where relative positioning did not matter, the consumers on either side of the above reference point could be in an equilibrium with differing risk-aversion levels implied the long-term social and occupational structures in an economy with bounded returns.

However the optimisation with respect to a reference point is equivalent to an optimisation of relative income only as long as the reference point itself depends on the income of both (or all) of the participating consumers. A more thorough comparison of the utility in Equation 9 with the CRRA utility must therefore involve a more detailed specification of the reference point.

To this purpose, we rely on the observation the reference in the utility from Equation 9 can only depend on the the distribution of both x and α in the population of consumers. Further, since the risk-aversion preferences are private, a common reference must only be inferred from function of $\{x_i\}$ i.e. the vector of outlays x available to every consumer and the interval $[\alpha_l,\alpha_h]$ i.e. the knowledge of lowest and highest risk-aversions . There are two extreme possibilities for the consumers' inference of a reference point based on the their outlays $\{x_i\}$. The first extreme is one where the consumers believe that they live in a very fair society and thus all values of x would eventually converge to the same value in the long-run. This would imply a common and stable reference point - which would be invariant with respect to any developments in the macro-economy. The other extreme is a despondent economy where the consumers choose reference points that are the same as their current outlay - thus ruling out a common reference point for all. However, such an extreme does not leave any no scope for status consumption since every consumer only looks at her own outlay as reference. Both there extremes are therefore to be avoided for the reference r in the function $r \equiv h(\{x_i\},\alpha_l,\alpha_h)$.

To assist the further discussion of how reference points are defined for a given macroeconomy, we define a few functions related to the utility optimised by the consumer. With the utility in Equation 9, the optimal selection of ν for a given reference r and the consumer's α and x is defined as

$$
\iota(x,\alpha,r) = \{\nu^* | \nexists \nu | u(x,\nu,\alpha,r) > u(x,\nu^*,\alpha,r)\} \tag{11}
$$

The expected income $J(x,\alpha,r)$ obtained after making the above choice $\iota(x,\alpha,r)$ for a lottery payoff function $G(x,\nu)$ (see Equation 4) can be written as

$$
J(x,\alpha,r) \equiv E_p(G(x,\iota(x,\alpha,r)) \tag{12}
$$

With above function, we seek a long-term equilibrium implied by a certain macreconomy that constraints the competitions for status by limiting the resources the consumers could compete for. Arguing that the consumers have enough time to observe the long-term reference, we formulate a reference point as an inference from the consumer outlay states in the long-term equilibrium implied by the macroeconomy.

3.2 Reference points implied by long-term equilibria

So far we have assumed an exogenous risky process that is observed differently by consumers depending on their risk-aversion levels. A more realistic representation of the process is one where returns from the lottery presented to the consumer are subject to constraints or resources of a certain macroeconomy. Such constraints imply that the returns provided to the consumer from $P(\nu)$ and $S(x-\nu)$ that depend on their risk-seeking and risk-averse behaviours must balance each other while adding up to the returns in a certain macro-economy. We represent such constraints of the macro-economy with returns ρ and R provided on a fixed starting income of consumers with same respective probabilities p and $1-p$. More particularly, the "macroeconomy lottery" on initial income X is defined as

$$
L(X) = \{(X(1+\rho),p),(-X(1+R),1-p)\} \tag{13}
$$

The growth of the combined income of the consumers is therefore subject to these returns from the macroeconomy. To facilitate the discussion of these constraints, we consider a "lottery-maker" entity that gathers the aggregate outlay x from the consumers and distributes the returns $p(P(\nu)+\chi)$ $+(1-p)(S(x-\nu)-\phi)$back to the consumers based on the returns from the macroeconomy lottery. This collective, non-profit-making lottery maker influences the long-term relative income in the economy by merely placing large bets ($X >> x_i$ for all consumers i) on the amounts collected from the consumers. The social and occupational structures that imply $\alpha_i \in [\alpha_l,\alpha_h]$ for the consumers participating in the macroeconomy are also fixed in the long-run. Assuming that this lottery maker is risk-neutral (an assumption which doesn't change the analysis significantly), the expected outcome for the above lottery given an investment X, the rate of return $(1+\rho)$ and the rate or loss $(1+R)$ is

$$
E(L(X)) = pX(1+\rho)-(1-p)X(1+R)
$$

Now consider that while not all lotteries presented to the consumer may be aligned with the above macroeconomy lottery, a certain lottery that represents the returns in the long run must. In other words, a long-term eqiulibrium would correspond to a certain long-term consumer lottery identified by $\{\bar{P}, \bar{S}\ , \bar{\chi}, \bar{\phi}\}$ that provides the returns aligned with the above macroeconomy lottery. Even though the lottery maker may provide incentives for risk-aversion if the risk-taken by the consumer is more than what can undertaken in the macroeconomy (or provide incentives for risk-seeking if too much security is being sought by the consumers) in the short-term, the long-term equilibrium would have a risk-taking policy implied by the lottery components $\{\bar{P},\ \bar{S}\ ,\ \bar{\chi},\ \bar{\phi}\}$ and the consumer's inferred references $r_t = h(\{x_i\}, \alpha_l, \alpha_h)$ such that the risk and value in the macroeconomy is distributed exactly to the lottery participating consumers. In essence, therefore every consumer with a certain α_i ought to know of the level of income implied by long-term consumer lottery $\{\bar{P}, \bar{S}\ , \bar{\chi}, \bar{\phi}\}$ imposed by the macroeconomy. As we further demonstrate, a stable long-term lottery $\{\bar{P},\ \bar{S}\ ,\ \bar{\chi},\ \bar{\phi}\}$ and a certain $h(\{x_i\}, \alpha_l, \alpha_h)$ which increases with $\{x_i\}$ together imply stables states in the economy so that $J(x_i) \rightarrow \bar{x}_i + \delta$ (where δ is a constant). Since the reference point is viewed by all consumers the long-term reference point would simply by $r = h(\{\bar{x}_i\}, \alpha_l, \alpha_h)$ where $\bar{x}_i$ represents the long-term equilibrium outlay for consumer i and the α_l, α_h are the range of risk-aversion parameters.

To motivate this proof, notice that since the same lottery is offered to all consumers and since the consumer's risk aversions α are private, the said lottery maker is not aware of differences in α i.e. a lottery cannot be set to discriminate a consumer based on a certain α. What lottery maker does observe with along with other consumers is the reference point $r = h(\{x_i\}, \alpha_l, \alpha_h)$ which is inferred the same way by her as by other consumers using the observed distribution of outlays $\{x_i\}$. To see how the macroeconomy restricts the long-term lottery $\{\bar{P},\ \bar{S}\ ,\ \bar{\chi},\ \bar{\phi}\}$, we first consider the liquidity constraint on $\{\bar{P},\ \bar{S}\ ,\ \bar{\chi},\ \bar{\phi}\}$ - the condition that the lottery maker neither takes an amount or a risk higher than what she provides to the consumers based on the lottery definition. For n consumers, this amount owed by the lottery maker at every draw of the lottery is

$$p(\sum_i P(\nu_i) + n\chi) + (1-p)(\sum_i S(x_i - \nu_i) - n\phi)$$

A degenerate case for the lottery is when the starting disposable income for all the consumers is zero i.e. when $x_i = 0\ \forall i$. In this case, the lottery maker would not bet anything and would promise nothing to the consumers by setting up $\chi = \phi = 0$ and $P(\nu) = S(\xi) = 0$[6]. When all consumers have non zero disposable income to participate in the lottery i.e. $x_i > 0\ \forall i$, the lottery maker would on the other hand distribute the proceeds and risk to consumers who are owed $\sum_i P(\nu_i)$ and $\sum_i S(\nu_i)$ after the lottery.

The other constraint that matters to the lottery maker is the incentive for the lottery participant. For a consumer to have an incentive to participate in the lottery $\{\bar{P}, \bar{S}\ , \bar{\chi}, \bar{\phi}\}$, it must be ensured that the lottery provides a net expected gain for every consumer. In other words, the lottery maker must choose the lottery components (without considering α) so that the expected gain in income is higher or the same. In terms of the functions we have defined, the expected income $J(x, \alpha, r) \forall \alpha \in [\alpha_l, \alpha_h]$ must be higher than the income x the consumer has before playing the lottery. The incentive constraint $J(x_t, \alpha, r_t) \geq x_t$ thus causes the reference point to directly influence the lottery maker's setup of the long-term lottery components $\{\bar{P},\ \bar{S}\ ,\ \bar{\chi},\ \bar{\phi}\}$. Notice also that each consumer lottery $\{\bar{P},\ \bar{S}\ ,\ \bar{\chi},\ \bar{\phi}\}$ that solves the liquidity and incentive constraints corresponding to a macroeconomy lottery would have a unique reference point $h(\{x_i\}_t, \alpha_l, \alpha_h)$ observed by the lottery maker (as well as other consumers).

The restrictions on $\{\bar{P}, \bar{S}\ , \bar{\chi}, \bar{\phi}\}$ due to the macroeconomy are simplified by the observation that incentive constraint is a stronger condition than the liquidity constraint. This is proven along side with the first condition for the incentive constraint.

Theorem 3.2. *A macroeconomy lottery must be profitable i.e. E(L)>L for there to be a long-term equilibrium satisfying the incentive constraint.*

Proof. The liquidity condition implies that $p(\sum P(\nu_i) + n\chi) + (1-p)(\sum_i S(x_i - \nu_i) - n\phi) = e_L \sum x_i$ where $e_L = p(1+\rho) - (1-p)(1+R)$ is a constant. Thus the components P, S, χ, ϕ in the long-term need to be set up so that

$$\frac{p(\sum P(\nu_i) + n\chi) + (1-p)(\sum_i S(x_i - \nu_i) - n\phi)}{\sum x_i} = e_L$$

The incentive condition relevant to the lottery maker that every consumer i must satisfy is

$$p(P(\iota(x_i, \alpha_i, r)) + \chi) + (1-p)(S(x_i - \iota(x_i, \alpha_i, r)) - \phi) \geq x_i$$

Summing over all consumers, the two equations imply that $e_L \geq 1$ - a condition that is satisfied for any macroeconomy with profitable or break-even returns. ☐

Notice how that the converse of the above theorem is not always true - i.e. all profitable macroeconomy lotteries do not correspond to long-term $\{\bar{P}, \bar{S}, \bar{\chi}, \bar{\phi}\}$ and the corresponding reference. The condition $e_L \geq 1$ implies only that consumer's liquidity condition is met. As we don't require $p(P(\nu_i) + \chi) + (1-p)(S(x_i - \nu_i) - \phi) \geq x_i$ to hold for all consumers i in order to satisfy the condition on sums $p(\sum P(\nu_i) + n\chi) + (1-p)(\sum_i S(x_i - \nu_i) - n\phi) \geq e_L \sum x_i$, the incentives condition may not be met for all consumers if $J(x, \alpha, r)$is too low. In other words, a consumer with a low α_i (i.e. risk-taking behaviour) as well as x_i poses an incentive problem to the lottery maker who must ensure that $J(x_i, \alpha_i, r) \geq x_i$ holds for all $\alpha_i \in [\alpha_l, \alpha_h]$ [7]. It also follows that a long-term lottery is only feasible as long as a reference exists for all consumers to stay in the lottery. Further, if the reference point $h(\{x_i\}, \alpha_l, \alpha_h)$ does increase as consumers increase their x_i by playing successive

[6] $P(\nu) = S(\xi) = 0$ would also be a society without competitions. χ, ϕ would be set up in such an economy corresponding to the returns in the macroeconomy lottery of Equation 13.

[7] The lower γ for lower x with respect to r makes it even more likely that the consumers fall below r regardless of the profitability of the macreconomy. Note that the recommended value for γ in PT is γ =~0.88 (Kahneman-Tversky).

lotteries , the only condition that would allow this to happen is when $J(x,\alpha_i,r) = x$ for all $\alpha_i \in [\alpha_l,\alpha_h]$ in the long-term. The following theorem which provides the second condition for incentive constraint clarifies this.

Theorem 3.3. *For increasing and diminishing returns from P , S and and $h(\{x_i,\alpha_l,\alpha_h\})$ increasing with x_i,the only consumers participating in the lottery in a long-term equilibrium must have $J(x,\alpha,r) = x+\delta$ (where δ is a constant).*

Proof. Let's assume $J(x_i,\alpha_i,r) > x_i$ for a certain consumer i while all other consumers $j \neq i$ have $J(x_j,\alpha_j,r) = x_j$. Since $h(\{x_i\},\alpha_l,\alpha_h)$ is an increasing function of $\{x_i\}$, the income of the consumers $j \neq i$ i.e. $x_j = J(J(...(J(x_j,\alpha_j,r)))$ would fall below the $J(J(...J(x_i,\alpha_i,r)))$ and fail to satisfy the incentive condition for all unless $J(x,\alpha,r) = x+\delta$ for a constant δ. □

Thus a reference point that exists only if incentive condition is satisfied for consumers have risk-aversion levels in $[\alpha_l,\alpha_h]$ as a function $h(\{x_i\})$ such that $J(x,\alpha,r) = x$ for all $\alpha \in [\alpha_l,\alpha_h]$. The reference point in the long-run thus indicates how the relative income competition among the consumers is constrained by a certain macroeconomy. Also, since long-term occupational structures are part of the macreconomy and the reference point a necessary condition for the feasibility of the lottery, the existence of the reference point becomes a necessary condition for all consumers to participate in the lottery implied by a macro-economy. This does make empirical sense since while for the same risk-aversion a higher income x means higher expected future income and status in the long-run, the uncertainty about the other consumer's α permits some risk-taking in the short-run so long as the consumers are not too far from the common reference point. For example, if a consumer 1 has a disposable income of 100£ per month while consumer 2 has 1000£, social interactions could facilitate a similar sense of status for the two in the short-run if the consumer 1 believes that she can follow a path to richness that is not open to consumer 2. A more risk-seeking consumer 1 would thus obtain the same utility as consumer 2. However, it is also true that if the consumer 1 is too risk-seeking then then she may seek a security that the macroeconomy may not provide as a common reference. Having different reference points may therefore be a necessary effect of wide differences in income.

4 Conclusions

The two goals of this chapter were to formulate a reference point using risk in a macroeconmy and to explore the incentives for lower status consumption. With a specification of a reference point in terms of the constraints imposed by a macroeconony, we can now explain how much risk or how much risk-aversion may be too much for there to be a common reference point. The unfeasibility of a reference point demonstrates how two disparate income and risk-aversion levels implied by the occupational or social structures prevent a common reference point for status comparisons.

The conditions for existence of reference points not only provide us a more nuanced view of status consumption than the CRRA utility, but also explain how improbable social mobilities across extreme income differences discourage status competitions between them. This helps us understand low incentives for status consumption could be a result of distance from the reference point. More specifically, since the incentives for taking upside risk can be overweighed by the need for security when one is too far below the common reference, an equilibrium would be favoured between consumers with different risk-aversion. The unfeasibility of reference points thus provide a quantiative explanation for why status consumption may be better explained with difference reference points in the real world.

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