

Becker, Gary S.; Werning, Ivan; Murphy, Kevin M.

Working Paper

Status, Lotteries, and Inequality

Working Paper, No. 160

Provided in Cooperation with:

George J. Stigler Center for the Study of the Economy and the State, The University of Chicago
Booth School of Business

Suggested Citation: Becker, Gary S.; Werning, Ivan; Murphy, Kevin M. (2000) : Status, Lotteries, and Inequality, Working Paper, No. 160, The University of Chicago, Center for the Study of the Economy and the State, Chicago, IL

This Version is available at:

<https://hdl.handle.net/10419/262562>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Status, Lotteries and Inequality*

Gary S. Becker, Kevin M. Murphy and Iván Werning

May 2000

PRELIMINARY

1 Introduction

For several centuries, economists, sociologists, and philosophers have been concerned with the magnitude and effects of inequality. Economists have concentrated on inequality in income and wealth, and have linked this inequality to social welfare, aggregate savings and investment, economic development, and other issues. They have explained the observed degree of inequality by the effect of random shocks, inherited position, and inequality

*we received very helpful comments from Francisco Buera, Richard Posner and Sherwin Rosen, and excellent assistance and help from Rodrigo Soares. Becker received support from the Olin Foundation.

in abilities and in access to human capital and assets. But none of these models provide any scope for individuals collectively “choosing” the shape and degree of inequality in the distribution of income and wealth.

Pareto believed that the personal distribution of incomes in different countries is much more similar than the underlying “functional” determinants of incomes: based on factor prices and distributions of human and physical capital. He showed that his measure of inequality and skewness, the coefficient in the now called Pareto distribution, does not vary much across a sample of countries he considered, see Pareto (1896). But Pareto never developed a theory that would explain why personal distributions of incomes should be more similar than the underlying functional determinants.

Our analysis shows that Pareto’s instincts were right, for under certain assumptions, personal distributions of income tend to be similar even when the underlying functional determinants are quite different. We prove that if the initial functional income distribution is sufficiently “compact” – in a sense we make precise – and if preferences are the same in different societies, then they will have exactly the same equilibrium personal distribution of incomes.

Participation in lotteries and other risky activities is the mechanism that converts different functional income distributions into the same equilibrium

personal distribution. In our analysis, individuals are willing to participate in fair lotteries and other gambles even though they are assumed to have diminishing marginal utility of income. Their willingness to gamble is the result of the assumed importance of status in their preferences, and of the interaction between status and income.

With few exceptions, economists have paid little attention to status, whereas sociology has concentrated on the sizeable inequality in status, privilege, and opportunity found in most societies. Persons with higher status generally receive deference, esteem, and respect from those with lower status. James Coleman (1990) observed that:

“Differential status is universal in social systems... status, or recognition from others, has long been regarded by psychologists as a primary source of satisfaction to the self. That is, an interest in status can be regarded as being held by every person.” (1990, pg.130)

We follow the lead of sociologists, and assume that preferences depend in an important way on status as well as on consumption of other goods and services. When status is important, individuals would be willing to pay a lot in time, effort, and money for sufficiently high status. This is why many

individuals make considerable sacrifices of effort and money as they strive to attain higher status.

Willingness to pay has an important role in our analysis because most of the paper assumes a complete hedonic market in some types of status, although it also considers the case where status depends only on rank in the distribution of income. Individuals are assumed to be able to buy larger quantities of some types of status at market-determined cost in terms of foregone consumption goods. This assumption of a market in status does not deny either that individuals are endowed with different amounts of status, or that some forms of status- such as those which depend on family background- are fixed, at least in the short run. In fact, we derive interesting results about the effects of unequal endowments of status on the equilibrium distribution of incomes.

However, striving for status would not be so common if status were completely outside the control of individual actions. Moreover, we believe that inequality in status has evolved in all societies mainly to generate behavior by individuals striving for higher status that indirectly helps others. Whether or not that is true, the assumption of a complete market in status, where status is “for sale”, is an abstract recognition of the possibility of gaining

higher status by working hard to “pay” for it.

Status is important for the distribution of income in our analysis because we assume that higher status interacts with consumption by raising the marginal utility of consumption. Higher status raises the marginal utility of a given level of income partly because persons with high status often have access to clubs, friends, and other “goods” that are costly but are not available to those with low status. This type of marginal utility assumption was made in pioneering articles a half century ago by Friedman and Savage(1948) and Friedman(1953) in order to explain why the marginal utility of income might be rising in certain income intervals.

Like Friedman and Savage, we use the assumption that higher status raises the marginal utility of income to explain the demand for risky activities, even when utility is concave in income for a given level of status. A preference for risk could be explained without this assumption even if utility were separable in income and status, as long as utility were sufficiently convex in status. However, in that case, the optimal fair lottery would have equal consumption for everyone, regardless of their status, because the marginal utilities of consumption across persons with different status levels would then be equalized only with equal consumption.

Equal consumption is obviously violated by the evidence on the unequal distributions of income and consumption in all countries. On the other hand, complementarity in utility between status and consumption not only implies a demand for lotteries and other risky activities, but it also has unequal consumption in the form of a positive relation between status and consumption. That is, with the assumption of complementarity, unequal status itself implies a corresponding degree of inequality in consumption at the equilibrium distribution of income.

Economists have recognized the positive relation between status and consumption, and have explained this by the concept of non-competing groups. This concept states that some persons have higher functional incomes than others due to unequal access to human and physical capital. They “buy” or otherwise get higher status with their higher functional incomes.

Although we believe that the inequality in functional incomes is important, we also believe the positive relation between consumption and status is not only due to this inequality. Indeed, by building on the assumption of complementarity in preferences between status and consumption, our analysis implies a strong equilibrium positive relation between status and consumption even when everyone has the same functional income.

Economists and philosophers have evaluated distributions of income from an ethical perspective given by a social welfare function, such as the utilitarian's maximization of the sum of individual utilities. If the welfare function is symmetrical in utilities of different individuals, and if all utilities are concave in income, then social welfare would be higher when income is less unequally distributed.

This analysis, however, typically ignores status and its unequal distribution. If utility depends on status as well as consumption goods, social welfare that is related to individual utilities would depend on status as well as consumption. Moreover, if status and consumption were complements in utility, then social welfare would be maximized when persons with higher consumption also have higher status.

Indeed, we show that if the initial functional distribution of income were sufficiently compact, the distributions of consumption and status that maximized social welfare would be exactly the same as the equilibrium distribution produced by the private sector with a full market in status. Moreover, a social planner would then increase rather than decrease inequality in income by redistributing income from the poor to the rich rather than *visa versa*.

Section 2 sets out the model of preferences and the market for status,

while section 3 proves the main result on unique equilibrium distributions of consumption and status, and shows that these equilibrium distributions and the optimal distributions to social planners are identical. Several important empirical implications of the analysis about observed income distributions are considered in section 4. Section 5 shows that the results with an explicit full market for status is equivalent to an implicit market that depends on the consumption of “status goods”. Sections 6 consider the equilibrium distribution of income when status depends only on income rank, while the relation between lotteries and more general risk-taking behavior is considered in section 7.

2 Status and Income

We assume that the utility of each person depends on his or her own consumption and status. This assumption implies that utility does not directly depend on the consumption or status of anyone else. Everyone is assumed to have the same utility function that is rising and concave in consumption

and rising in status:

$$U = u(c, s), \text{ where } u_c > 0, u_{cc} < 0, u_s > 0. \quad (1)$$

A crucial assumption of the analysis is that a rise in status increases the marginal utility of income or consumption:

$$u_{cs} > 0. \quad (2)$$

Status also affects the marginal utility of leisure, as in Veblen's classic study of social influences on economic behavior with the title "The Theory of the Leisure Class" (1934, see especially chapter III). In the interest of simplicity, we ignore the relation between status and leisure.

The analysis of social markets (Becker and Murphy, 2000) consider the complementarity between social forces and various kinds of behavior, including smoking, and purchasing jewelry and expensive watches. A natural extension is to complementarity between status - a particular form of social capital - and total consumption itself. Not only may higher status persons have access to consumer goods in limited supply that are not available to others, but also the general population expects persons with higher status to

have larger homes with better views, to be more educated and knowledgeable, to be leaders in fashion, collect art and other objects, entertain well, travel extensively, and so forth.

A second major assumption of our analysis is that the distribution of status categories is fixed and given, at least in the short run. A fixed distribution of status implies that although a person's utility only depends directly on his own status, indirectly it depends on the status of others. Presumably, status is in more fixed supply than most goods – as in status due to higher rank in the income distribution. Otherwise, status would simply be another good in the utility function, and there would be less interest in distinguishing status and “goods”.

Complementarity between consumption and status implies that individuals with greater income and status may have higher marginal utility of income than those with lower status and lower income. In that case, both richer and poorer individuals would be willing to take gambles, through lotteries or other risky activities, in which winners get *both* higher consumption and higher status, and losers get lower consumption and lower status. The result would be a possibly highly unequal distribution of income and utility, with status and consumption positively related.

We show in the next section that the analysis applies to any number of individuals and status categories, but we first illustrate the main principles graphically with two individuals A and B , who have the same utility function, and two status categories, S_0 and $S_1 > S_0$. Consider Figure 1, where the utility of A is plotted along the horizontal axis, and that of B is plotted along the vertical axis. If B had the higher status, the utility possibility boundary would be given by the negatively sloped concave curve BB as consumption good c is reallocated between A and B . Similarly, the boundary would be the concave curve AA if A had the higher status. The slope of these boundaries at each point equals the marginal utility of consumption to A relative to that of B , given the distribution of status between A and B .

The economy's boundary is the symmetrical curve BEA that is the envelope of the two curves AA and BB . This boundary has a kink at point E , and the assumption of equal utility functions means that E must lie on the 45 degree line. The economy's boundary is not everywhere concave – the utility possibility set is not everywhere convex – because there is a shift at point E of higher status from A to B as income and status is redistributed from A to B . The assumed complementarity between status and income raises the marginal utility of income to B and lowers it to A by discrete amounts when

$B's$ status is increased.

The incentives to engage in lotteries can be shown by using this kinked utility-possibility frontier. With expected utility, lotteries can convexify the feasible set. The pair of prizes which maximizes the attainable set is given by the symmetrical points, e_b and e_a in Figure 1, where the slope of the utility frontier equals -1 . Then expected utility of both A and B would lie along the chord WW with a slope of -1 that is tangent to these points. Because the slope is equal to -1 the marginal utility of consumption is the same at e_b and e_a :

$$u_c(c_1^*, s_1) = u_c(c_0^*, s_0). \quad (3)$$

With optimal lotteries, winners get higher utility, consumption, and status, and the marginal utility of consumption is the same to winners and losers.

Given complementarity between consumption and status, persons who win higher status also win greater consumption. It may be necessary to pay more for higher status, but then income would be sufficiently higher so that consumption would be greater net of the cost of status. By contrast, without gambles, there would be a compensating differential in consumption

for higher status, so that persons with higher status would have lower consumption and the same utility as others who start with the same incomes. To be sure, even separability between consumption and status could induce optimal lotteries where winners get higher status and higher utility, but then they do not get higher consumption. Only if consumption and status are complements would winners get both higher status *and* higher consumption, which is the empirically important case.

In effect, there is a lottery in both consumption and status since winners get both higher consumption and higher status. The lottery in status is essential since there would not be a demand for lotteries without the inequality in status since utility is assumed to be concave in consumption alone.

If the initial position of A and B without lotteries is on BEA between points e_b and e_a both A and B would participate in fair lotteries. If they have the same initial income and utility at point E , they would have equal chances of winning the lottery, and their expected utility position would be on WW at point EU along the 45 degree line.

If the initial utility position without lotteries is higher to A than to B at point i , the expected utility position would be on WW to the right and above point i , say at i_1 . Although A gambles over the same pair of prizes, A

has the higher probability of winning C_1 and S_1 because A starts with high income: $I_A > I_B$. As I_A increases relative to I_B , the difference between their probabilities of winning also increases.

The extreme is reached when $I_A = I_1^*$, and $I_B = I_0^*$, for then A is certain to win and B is certain to lose. It is clear from Figure 1 that neither A nor B would be interested in lotteries if A 's income were sufficiently large to push the initial position to the right of e_a . A symmetrical analysis applies to B .

The optimal lottery increases the ex-post inequality in utility, consumption, and income as long as initial incomes are between I_0^* and I_1^* . Moreover, the equilibrium distribution of income, consumption, and utility is the same, *regardless* of the initial position, as long as the initial utility position is between e_a and e_b in Figure 1. To use Rosen's felicitous language (1997), an economy "manufactures" a unique degree of inequality through the desires of individuals to participate in lotteries in income, consumption, and status.

3 The Private Lotteries Equilibrium

It is best to think of the equilibrium notion in two stages. In the first stage agents engage in lotteries over income. At the start of the second stage these

income prizes are realized, and agents then participate in the hedonic status market choosing s and c . The same two stage equilibrium concept is used in Cole and Prescott (1997) in the context of the theory of clubs.

By redefining preferences, we can always renormalize a continuous distribution of s , so that s is distributed uniform on $[0,1]$. We adopt this convenient normalization for the rest of the paper.

3.1 The Hedonic Status Market

At the second stage agents consume c and s out of their full income y to solve:

$$v(y; P) \equiv \max_{c,s} u(c, s)$$

$$c + P(s) = y.$$

Here $P(s)$ denotes the hedonic price function for status.

We will assume the usual normality assumptions on u so that the solu-

tions $c^*(y; P)$ and $s^*(y; P)$ are both increasing in y ¹. This implies that in equilibrium there is positive sorting between y and s .

As is well known in these hedonic markets a boundary condition is required to close the equilibrium conditions . We assume the simplest one: $P(0) = 0$. Rosen (1997) assumes the same condition in a related analysis.

Given any distribution of y , the hedonic market equilibrium determines a price function $P(s)$. This function can be computed as follows. Positive sorting in equilibrium implies that $s^*(y; P) = F(y)$, where $F(y)$ is the distribution of income. The first order condition for optimality then implies:

$$P'(F(y)) = \frac{u_s[y - P(F(y)), F(y)]}{u_c(y - P(F(y)), F(y))} \quad (4)$$

which together with the initial condition $P(0) = 0$ can be solved for $P(s)$.

The price function $P(s)$ deals with the extreme case of complete markets in status, where any level of status can be purchased if a person is willing to

¹Namely, that u satisfies:

$$u_{cc} - \frac{u_c}{u_s} u_{cs} < 0$$

$$u_{ss} - \frac{u_s}{u_c} u_{cs} < 0.$$

These conditions are automatically met if u is concave and $u_{sc} > 0$ for example.

pay its market price. However, the principle is applicable with less extreme assumptions. Moreover, as we shall see in section 5, under certain assumptions the equilibrium allocation from the above complete status-market can be perfectly replicated with a simpler market structure interpretation that allocates a fixed total supply of a “status good”.

Economic development increases income, but presumably development has a much smaller, if any, effect on the supply of status. For example, the distribution of income ranks is independent of average income level, and it is not obvious whether other forms of prestige and status are in significantly greater supply now than at the turn of this century, or several centuries ago.

If status becomes relatively scarcer as economies develop, the price of status would rise relative to that of consumption goods. Clearly, the willingness to pay for marginal units of s , given by equation (4), would rise as average incomes grew since the marginal utility of goods, u_c , would fall, and the marginal utility of given status, u_s , would increase. The increase in u_s would be especially large when status and consumption are complements.

3.2 The Fair Lottery Market

In the first stage, agents engage in an ex-ante fair lottery over wealth. Their problem is then to solve,²

$$\max_{f_i(y)} \int v(y; P) f_i(y) dy$$

subject to:

$$\int f_i(y) dy = 1$$

$$\int y f_i(y) dy = w_i + \int P(s) dH_i(s) ds.$$

Here w_i is the wage income and $\int P(s) dH_i(s)$ the status endowment income for person i , where $H_i(s)$ represents the cumulative holdings function. The $H_i(s)$ functions must add up to s (given our normalization):

$$\int_{i \in I} H_i(s) d\mu(i) = s,$$

²To simplify the exposition we represent lottery positions by a density.

where μ is the measure of agent indexes.

The *f.o.c.* of the above problem implies that for all income levels where $f_i(y) > 0$:

$$v(y) = \lambda_{mi}y + \mu_i.$$

Differentiating the above expression and using the envelope condition gives:

$$u_c[c^*(y; P), s^*(y; P)] = \lambda_{mi}. \quad (5)$$

We now turn to the formal definition of the equilibrium concept. The normality assumptions greatly simplifies the equilibrium statement because of positive sorting. We confine attention to an equilibrium notion that has no aggregate uncertainty in the sense that the final distribution of full income, $F(y)$, is not random. In finite economies this requires some coordination among prizes. Many other interpretations are available in economies with a continuum of agents.

Definition 1: *For given endowments $H_i(s)$ and w_i , a positively-sorted competitive-lottery equilibrium is a price function, $P(s)$, with $P(0) = 0$, a final distribution of income, $F(y)$, individual lottery positions $\{f_i(y)\}$ and*

conditional consumption functions $c(y)$ and $s(y)$, increasing in y such that:

1. given $P(s)$, $f_i(y)$ solves the consumer's lottery problem;

the demands $c(y)$ and $s(y)$ solve the consumer's consumption problem,

given $P(s)$, for all y .

2. Markets clear:

(a) The lottery market clears: the lottery demands $f_i(y)$ generate the final distribution of income $F(y)$.

(b) The consumption market clears: $\int c(y)dF(y) = \bar{w} = \int_I w_i d\mu(i)$

(c) The status market clears with positive sorting: $s(y) = F(y)$.

We now construct a particular equilibrium distribution, which we denote by $F^*(y)$. This distribution has the property that a large set of initial conditions have it as an equilibrium outcome. The allocation is constructed by holding the marginal utility constant at a level that satisfies feasibility of total resources:

$$u_c(c^*(s), s) = \lambda$$

$$\int c^*(s) = \bar{w}$$

The solution to these equations defines a consumption function $c^*(s)$ which can be used to define an implied price function:

$$P^*(s) = \int_0^s \frac{u_s(c^*(s), s)}{u_c(c^*(s), s)} ds.$$

With this price function an implied full income is computed as:

$$y^*(s) = c^*(s) + P^*(s)$$

The associated distribution function, $F^*(y)$, is simply the inverse of $y^*(s)$.

For a large class of initial conditions, this constructed allocation constitutes the final outcome of a lottery-equilibrium. That is, $F^*(y)$ is the final distribution of full income for a large class of initial distributions of income.

Proposition 1: *Assume the distribution of full income, $F^*(y)$, is a mean-preserving spread of the initial distribution of full income, $F(y)$, computed at the implicit prices, $P^*(s)$, as above. Then there exists a lottery-equilibrium that supports $F^*(y)$ as the final outcome.*

By the definition above,

$$\frac{u_s(c^*(s), s)}{u_c(c^*(s), s)} = P^{*'}(s).$$

So that $c^*(F^*(y))$ and $F^*(y)$ are optimal demands for full income level y .

Both functions are increasing in y .

The marginal utility of the indirect utility function,

$$v'(y) = u_c(c^*(F^*(y)), F^*(y)) = \lambda,$$

is constant by the definition of $c^*(s)$. This implies that all agents are indifferent to taking any lottery with gross-income prizes that lie in the interval of $[y^*(0), y^*(1)]$, that is, in the support of $F^*(y)$. It remains to be shown that there exists a set of lottery demands $\{f_i(y)\}$ that generate $F^*(y)$. This last point is guaranteed by the mean-preserving spread condition.

Because y^* is a mean-preserving spread of y , there must exist a random variable ε such that (Rothschild and Stiglitz (197x)):

$$y^* = y + \varepsilon$$

$$E[\varepsilon|y] = 0.$$

This implies that there does exist a fair lottery that produces the distribution y^* from y with net-income prizes of the lottery demands are given by ε . The lotteries so defined are fair since $E[\varepsilon|y] = 0$.

3.3 A Planner's Problem

It is easily shown that the allocation constructed above corresponds to the allocation of the following social planner problem:

$$\max_{c(s)} \int u[c(s), s] ds$$

$$\int c(s) ds = \bar{w}.$$

The above problem can be interpreted in any of two extreme ways: (1) the planner is a utilitarian (either in control or taking as given the assignments of s) that by choosing $c(s)$ chooses deterministic allocations across agents. Agents are treated differently in equilibrium; (2) the planner maximizes the

ex-ante expected-utility of a single lottery over consumption and social status's. In this case the planner treats agents equally, assigning the same ex-ante expected-utility level. Of course, intermediate interpretations are also valid where a lottery is held with some agents favored over others in their chances.

The *f.o.c.* of this problem yields (with $u_{cc} < 0$ the necessary conditions are also sufficient):

$$u_c[c^*(s), s] = \lambda, \tag{6}$$

the same condition as the allocation associated with the distribution $F^*(y)$.

This leads to the following proposition.

Proposition 2: *Under the conditions of proposition 1, the lottery-equilibrium achieves the same ex-post allocation as the utilitarian planner.*

In the conventional problem without status, a utilitarian faced with diminishing marginal utility of incomes, and using lump-sum taxes and subsidies, would redistribute sufficient income from rich to poor to equalize everyone's marginal utility of income. If they have the same utility function, this implies equal consumptions, incomes, and utilities as well. The intro-

duction of status, however, implies that consumption will generally not be equalized. In fact, with the complementarity assumption, consumption rises with income and so a planner widens differences in utility.

In the usual analysis there is a major conflict between the income distribution proposed by a utilitarian planner and that generated by the market. However, the conclusion is radically different if utility also depends on status, and if consumption and status are complements. Then the utilitarian and the market may arrive at the same distribution of income and status.

4 Some Empirical Implications

The crucial feature of our analysis (and of Friedman (1953), Robson (1992), and Rosen (1997)) is that the distribution of income is generated endogenously from behavior. In our analysis, behavior determines the equilibrium income distribution by matching the distribution of consumption to the given distribution of status. Most models of income distribution have stressed the effects of exogenous forcing processes, such as differences in market luck or genetic make-up, to explain the observed degree of income inequality and of mobility. These models do not incorporate decisions that offset or magnify

these exogenous risks. Our analysis is just the opposite, for we ignore all forcing shocks, and consider only uncertainty created by markets in response to demands from individuals.

The most important result of the analysis is that the equilibrium income distribution would be the same for a range of initial functional distributions. This may help to explain Pareto's observation (1896) that income distributions tend to be relatively similar among countries and over time. Our analysis implies that if tastes and status distributions were the same, then, indeed, personal income distributions would be the same in different countries and over time, even though functional income distributions were (not too) different.

Figure 2 gives a graphical portrayal of this conclusion, where the horizontal axis plots a particular measure of the functional inequality of income – perhaps the standard deviation of the logarithm of income – and the vertical axis, and the vertical axis plots the equilibrium degree of income inequality. If functional inequality were less than OI , lotteries lead to the same equilibrium inequality, OE , with the degree of equilibrium inequality determined by the conditions in Proposition 1. When functional inequality exceeds OI , lotteries are no longer demanded by everyone, and the equilibrium income

inequality would tend to rise along with functional inequality.

This analysis also implies that public policies which seek to reduce inequality may be rendered ineffective by compensating increases in self-generated inequality. Indeed, in our model, all policies that attempt to reduce income inequality below an initial equilibrium level of inequality at OE will generally fail because lotteries and other gambles would restore the inequality towards OE. However, policies that reduce the “functional” degree of inequality would reduce the inequality in ex-ante, or expected, utilities even though they did not change much the ex-post income and utility distributions.

The analysis also has interesting empirical implications about differences in measured distributions of income due to differences in the degree of equality of opportunity. In societies where status is not determined by family background, race, religion, etc., but is up for “sale”, the initial “endowment” of status would be much more equally distributed than in more highly structured societies, where family background and the like determine status endowments.

If there were a potential market for status in both types of societies, the equilibrium distributions of consumption and status would be the same in both types, if the conditions in Proposition 1 held in both cases. However,

the distributions of measured income would be quite different. “Open” societies with more equal distributions of status endowments would have greater observed inequality in incomes because equilibrium incomes in these societies would include the cost of status. By contrast, since the equilibrium inequality in status would be more “endowed” and less purchased and sold in highly structured societies, the distribution of income there would mainly reflect only the distribution of consumption.

This may contribute to explaining the greater inequality in observed incomes in the United States than in Europe. The U.S. has a more open and looser social structure than European nations. Therefore, the cost of buying status would be included in the United States’ distribution of income, whereas in Europe the equilibrium distribution of status would be much more similar to the distribution of endowed status. As a result, European incomes would be largely measuring consumption alone, while American incomes would measure both consumption and status. Since in equilibrium, consumption and income increase and decrease together, American incomes are stretched out compared to incomes that mainly only measure consumption.

Higher status in open societies is mainly acquired by the winners of lot-

teries and other risky activities, while it is mainly endowed in more rigid societies. This would be consistent with the greater appeal of entrepreneurial and other risky activities (see section 7) in more open countries like the United States than in Europe and other more rigid nations.

5 Explicit and Implicit Status Markets

Although certain status positions have been explicitly traded throughout history, we do not believe trade actually takes place in such a rich hedonic market. Rather, a subset of goods, such as diamonds and gold, implicitly provide a market for social status, perhaps by the relative amounts consumed of these goods. We investigate how much can be done with such a simpler market arrangement. Perhaps the richer hedonic social market is not used simply because it is not required to generate the market allocation of status.

Indeed we present an example of an *implicit* market organization of this sort that generates the exact same allocation as an *explicit* market for status would.

5.1 Ranking on “status goods”

There are two physical goods, c and z , and status, s . Good c is valued for intrinsic personal-consumption purposes, while z is intrinsically worthless and is valued solely for its indirect effect on status. We capture this by defining utility over c and s only as before (z does not enter the utility function directly). The available distribution of status to be allocated is as before. However, the arrangement for doing so is now different.

There are no initial individual status endowments, and no direct trade in status takes place. Instead, status is assigned according to the relative consumption of z , the “social good”. That is, people are *ranked* according to their consumption of z , the higher the z , the higher the status. In this sense purchases of z indirectly buy status.

Agents take the price of z and the amount consumed of z by everyone else as given. The consumption of z across the population determines a cumulative distribution function $R(z)$. Our ranking assumption on the z implies that in equilibrium $s = R(z)$.

The following proposition states that implicit markets achieve the same allocations as explicit ones do.

Proposition 3: *If an equilibrium $P(s)$ exists with an explicit market*

in status then there exists an equivalent equilibrium for the implicit market.

That is the allocations of c and s implied by both are identical.

This proposition is important because it implies that society does not require a rich explicit hedonic market for status. Instead, people can be ranked by their relative consumption of “social goods”.

Although the marginal price of z is constant, in equilibrium the implicit price function for s is not generally linear since s is determined by the consumption distribution of z , which is generally non-linear. What the proposition shows is that the flexibility obtained in this way is enough to generate the same equilibrium allocation as with an hedonic market structure.

We believe this result makes the notion of a market for status much more palatable. Interestingly, the implicit market arrangement assigns status by rank, yet ranks on z are drastically different from ranks on income. Ranks on z are equivalent to perfect hedonic markets for status, while ranks on income have various externalities associated with them.

These equivalence observations apply to a broader set of problems than the risk-taking application which is the focus of this paper. For example, it applies to the leisure-work margins stressed by Frank (1999) and others. If income from work is used to purchase items in fixed supply in pursuit of

social status (such as z), then there is no inefficiency from society's 'rat-race'.

We have made various assumptions to reach this equivalence result, and in the rest of this section discuss various implications of relaxing them.

5.2 Other assumptions

Crucial to the equivalence argument is the assumption that z is available in fixed supply. If c and z were producible from labor and other resources, then equilibrium would entail a wasteful use of resources. This is the type of concern expressed by Frank and other authors. This suggests a potential efficiency explanation for why social goods, such as diamonds and gold, are often goods in rather fixed supply.

We assumed that z is intrinsically worthless. If instead, z has some intrinsic value, its role as status-assigner would generate a distorted allocation. Good z would then be forced to play two different roles, and its price would generally be higher than the price that would prevail in the status-market where z does not order social status. The higher price induces some people to consume less and others more relative to the status-market allocation. However, the welfare loss would be small if the intrinsic value of z , while positive, were small, such as for gold and diamonds. If a good is of little

value it does little harm to allocate it incorrectly.

Our conclusion is that commonly observed properties of “social goods” such as their relative fixed supply, their low intrinsic value, and their “luxury” properties may not be an accident. These properties of social goods make the allocation achieved by ranking on a “social good” closer to that required by a fully operating hedonic market in status.

6 Income Rank

Instead of assuming a market in status, the limited economic literature on status usually assumes that status is automatically conveyed by rank in the distribution of income or of other “position” goods. This is the approach taken by Frank (1999), and by Robson (1992) and others when interpreting Friedman (1953) and Friedman and Savage (1948).

This section shows that our main result, summarized in Proposition 1, fully carries over to the case where status is not bought, but is instead automatically related to income rank. In other words, the assumption of a market in status is not at all necessary to produce a unique equilibrium distribution of income when the initial distribution is sufficiently compact.

Assume that consumption is equal to income and that status is assigned directly by rank in the income distribution. That is, $c = y$ and $s = F(y)$ adopting the uniform $[0, 1]$ normalization of s , where $F(y)$ is the distribution function of income y . Our proof of a result corresponding to Proposition 1 is by construction, and it parallels a proof used by Robson (1992) to prove existence of what he calls a ‘stable welfare distribution’.

As before we characterize the distribution of income that makes individuals indifferent to lotteries. In the case of rank, the indirect utility over income involves no maximization and is simply:

$$v(y) \equiv u(y, F(y)). \quad (7)$$

Here $v(y)$ should be thought as indexed by the distribution of income, $F(y)$, as $v(y)$ is indexed by $P(s)$ in the status market case. Differentiating (7), one obtains,

$$v'(y) = u_c(y, F(y)) + \frac{\partial}{\partial y} F(y) u_s(y, F(y)) \geq u_c(y, F(y)). \quad (8)$$

It is now the total derivative above which is held constant in equilibrium and not the partial derivative, u_c , as was the case with status markets.

At the lowest bound of income, \underline{y} we must be either at a corner, so that $\underline{y} = 0$, or have equality of the weak inequality in (8). Otherwise, a local convexity would be present which would be exploited in lotteries by the lowest income agents. This condition implies that in equilibrium there must be zero density at the lowest end of the distribution if not at a corner: $\frac{\partial}{\partial y}F(\underline{y}) = 0$. Therefore \underline{y} is defined either by

$$u_c(\underline{y}, 0) = \lambda$$

or $\underline{y} = 0$ if $u_c(0, 0) < \lambda$. In this way λ determines \bar{y} .

Optimal lotteries imply that the indirect utility function lies on a straight line over any interval where lottery prizes are being taken. This means that:

$$v(y) = u(y, F(y)) = \lambda(y - \underline{y}) + u(\underline{y}, 0).$$

Given λ and \bar{y} , this equation can be solved for $F(y)$. The whole system can thus be solved as a function of λ . Finally, λ is determined so that total income equals \bar{y} . We guarantee that this is possible by assuming an Inada condition, that $\lim_{c \rightarrow \infty} u_c(c, s) = 0$ for all s (Robson(1992) uses a slightly more general condition).

Denote the equilibrium distribution constructed in this way by $F^\#(y)$. By the same argument used in the status market case, if the initial distribution of income, $F(y)$, is such that $F^\#(y)$ is a mean-preserving spread of $F(y)$, then the ex-post allocation given by $F(y)$ is supported as an equilibrium. This result is now stated as:

Proposition 4: *If the distribution of income given by $F^\#(y)$ constitutes a mean-preserving spread of the initial distribution of income, $F(y)$, then there exists a rank-lottery equilibrium with final distribution of income given by $F^\#(y)$.*

Although this proposition is similar to Proposition 1, lotteries induced by status that is determined by income rank produces various real externalities, whereas lotteries induced by a market for status are Pareto-optimal. A person who gambles to raise his rank ipso facto lowers the ranks of others when he wins, and raises the ranks of others when he loses. This imposes real, not simply pecuniary, positive and negative externalities on these others.

Therefore, it no longer follows that the equilibrium distribution of income, $F^\#(y)$, is the same as the income distribution, $F^*(y)$, produced by a social planner. Robson (1992) discusses several differences between these distributions. However, the observation that lotteries produce both positive

and negative real externalities when status depends on rank suggests that the market's equilibrium degree of income inequality can be smaller or greater than the income inequality preferred by a planner, although the ordering generally depends on the measure of inequality.

7 Entrepreneurial and Risky Investments Versus Lotteries

Our analysis implies that lotteries would be important if given the initial functional distribution of income, the marginal utility of income is higher to persons with greater incomes and status because of the complementarity between status and income. Yet although actual lotteries are popular and are highly profitable to the usual government monopolies, only lower income families typically spend more than a small fraction of their incomes on lottery tickets.

Some persons have concluded from the unimportance of lotteries that most persons are risk averse, and that they are reluctant to gamble more than a small fraction of their wealth. However, lotteries may be unimportant to these groups not because they are risk averse, but because they have more

efficient ways to gamble.

Suppose that higher income persons can gamble through equities, occupational choices, and entrepreneurial activities. Then lotteries would be of little value to them because they have superior ways to gamble through utilizing the more productive risks in an economy. Even an actuarially fair lottery has only a zero expected return, and most government lotteries are far from “fair” since they impose a heavy tax on lottery tickets. By contrast, stocks and bonds usually yield positive expected returns, and the returns to risky entrepreneurial activities are even greater.

Therefore, a desire to gamble may be more productively satisfied through the positive-sum gambles provided by human, physical, and financial capital investments than through negative-sum or even zero-sum lotteries (see the discussion of entrepreneurial activities and lotteries in Brenner, 1983). We believe this explains why start-ups and other entrepreneurial efforts, attempts to discover new goods, better production processes, and medical treatments, and various other risky activities are much more common and less well rewarded than would be expected from the usual assumptions of risk aversion and diminishing marginal utility of income.

Crime is sometimes an alternative to lotteries since criminal activities

are risky and can be very profitable. Criminals would be risk preferrers if they are more affected by changes in the probability of apprehension and conviction than by equal percentage changes in the size of punishments (see the proof in Becker, 1968). Various studies suggest criminals appear to be risk-preferrers (see McCarthy and Hogan, 2000). However, drug dealing and other crimes may be attractive to ghetto and other poor young persons not because they are risk preferrers for a given status but rather because risky activities are their best chance at higher status as well as higher income.

8 Conclusions

This paper assumes, along with most commentators on social arrangements, that the desire for status is a powerful motive in any society where members interact with each other. It also assumes that status and income generally are strong complements in the sense that greater status raises the marginal utility of other consumption.

Several significant results are derived from these two rather simple basic assumptions, and from several auxiliary assumptions, especially a fixed distribution of status and the existence of fair lotteries. The most extraordi-

nary result is that if the initial functional distribution of income is sufficiently compact, then the equilibrium distribution of income, and the equilibrium covariance of consumption and status, are the same for all initial income distributions within the “compact” range. By sufficiently compact is meant that the equilibrium distribution of income is a mean-preserving spread of the initial distribution.

This principal result is proven when there are complete markets in status, with higher and lower status levels sold at an equilibrium set of hedonic prices. The paper shows, however, that the result also follows when status is only acquired indirectly through the purchase of status goods.

Moreover, our principal result on an equilibrium distribution of income does not require that status is sold either directly or indirectly. Although sociologists have identified many determinants of status, most economic analyses relate status to relative position, as in rank in the distribution of income. We show that the principle result fully holds when status is automatically related to income rank. Then if the initial distribution of income were sufficiently compact, then all initial distributions within the compact range have the same equilibrium distribution of income.

When status is either directly or indirectly bought and sold, the equilib-

rium distributions of income and status would be exactly the same as that produced by a utilitarian social planner who can fully allocate consumption and status. However, these equilibrium are not generally identical when status depends on ranks because changes in a person's rank, say through winning or losing lotteries, imposes positive and negative externalities on others by lowering or raising their ranks. In the rank case, the equilibrium distribution of income produced by lotteries may differ from that desired by a planner.

With a few prominent exceptions, economists have not assumed that behavior is important in directly “choosing” the observed distribution of income. Building on some of these exceptions, our paper shows that the assumption of risk-taking and lotteries to acquire higher status and higher incomes leads to predictions about the distribution of income that might explain both differences and similarities in income distributions among societies, and over time within the same society. This suggests that choice and risk-taking are crucial ingredients of the observed distributions of income and status.

References

- [1] Becker, Gary S. (1968). Crime and punishment: An economic approach. *Journal of Political Economy*, v76, n2, March-April 1968, pp.169-217.
- [2] Becker, Gary S. and Murphy, Kevin M. (2000), *Social Economics: Market Behavior in a Social Environment*, Harvard University Press, 2000.
- [3] Brenner, Reuven (1983). *History: The human gamble*. Chicago: University of Chicago Press, 1983, 247p.
- [4] Cole, Harold L. and Prescott, Edward C. (1997). Equilibrium Valuation with Clubs. *Journal of Economic Theory* 74, 19-39.
- [5] Frank, Robert H. (1999). *Luxury fever: why money fails to satisfy in an era of excess*. New York: Free Press, 1999, 326p.
- [6] Friedman, Milton. (1953). Choice, chance, and the personal distribution of income. *Journal of Political Economy*, v 61, n4, August 1953, pp.277-90.
- [7] Gregory, Nathaniel (1980). Relative wealth and risk taking: A short note on the Friedman-Savage utility function. *Journal of Political Economy*, v88, n6, Dec 1980, pp.1226-30.

- [8] McCarthy, Bill, and Hogan, John, "When Crime Pays: Capital, Competence, and Criminal Success", unpublished, 2000.
- [9] Pareto, Vilfredo (1894) "Cours d'économie politique professé à l'Université de Lausanne.", F. Rouge; Pichon, 1896.
- [10] Robson, Arthur J. (1992). Status, the distribution of wealth, private and social attitudes to risk. *Econometrica*, v60, n4, July 1992, pp.837-57.
- [11] Rosen, Sherwin (1997). Manufactured inequality. *Journal of Labor Economics*, v15, n2, April 1997, pp.186-196.
- [12] Veblen, Thorstein (1934). The theory of the leisure class: an economic study of institutions. New York: The Modern Library, 1934, 404p.

9 Appendix: Proposition 3

Consider first the equivalence of the second stage. Define the inverse relation of $s = R(z)$ by $z = r(s)$. To obtain status s the consumer must purchase $z = r(s)$ of the social good, z . The cost of obtaining s is equal to $p_z r(s)$, so the consumer's choices will be equivalent to the status-market case with $P(s) = p_z r(s)$. The demands are then $c^*(y; p_z r(s))$ and $s^*(y; p_z r(s))$, where the c^* and s^* functions are defined as in section 3; also denote the demand for z by $z^*(y; p_z r(s)) = r(s^*(y; p_z r(s)))$. All these functions are increasing in y so that the equilibrium is positively sorted.

In equilibrium it must be true that $R(z)$ represents the actual distribution of purchases of z , that is, the perceived ranking must equal the actual one it generates. Positive sorting implies that this condition is equivalent to:

$$s^*(y; p_z r(s)) = F(y).$$

Now assume $P(s)$ is an equilibrium price function for the explicit status-market. That is,

$$\int c^*(y; P) = \bar{w},$$

$$s^*(y; P) = F(y).$$

Take $p_y r(s)$ to satisfy:

$$p_y r(s) = P(s). \tag{9}$$

Then the consumer's problem yields the same demands for c and s that ensure equilibrium in the case of an explicit market. Consistency of $R(s)$ is then ensured as well as equilibrium in the market for good c .

Market clearing for z can be written in equilibrium as,

$$\int_0^1 r(s) ds = \frac{1}{p_y} \int P(s) ds = \bar{z}.$$

Therefore we must have that:

$$p_y = \frac{\int_0^1 P(s) ds}{\bar{z}}.$$

Turning to the first stage, because the total value of the endowment of z , $p_z \bar{z}$, is equal to the total value of the endowment of status, $\int P(s) ds$, it is clear that each distribution of z corresponds to some distribution of status, and

vice-versa, in that they produce the same initial distribution of full income, y , and hence the same lottery-equilibria allocation.

The graph illustrates the Edgeworth box in the (U_a, U_b) plane. The origin is at the bottom-left. The horizontal axis is U_a and the vertical axis is U_b . A 45-degree line is drawn from the origin. A dashed line with slope -1 is tangent to the contract curve at point E . Points A and B are marked on the axes. Points e_a , e_b , i , i' , j , k , and EU are marked on the graph. A curve labeled W is also shown.

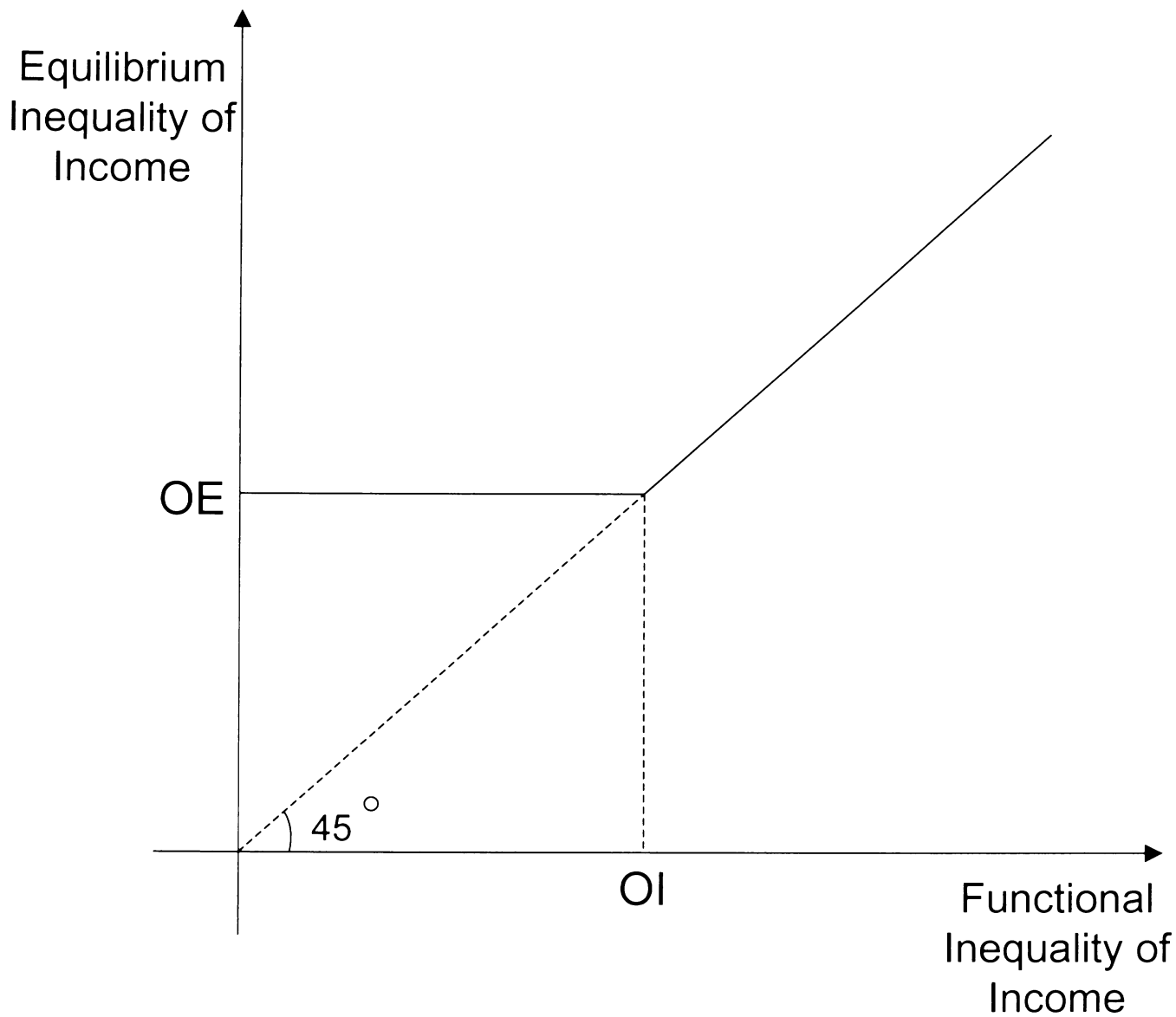


Figure 2