Bling Bling,* Human Capital, and Poverty†

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Abstract

Poor families around the world spend a large fraction of their income on consumption of goods that appear to be useless in alleviating poverty, while saving at very low rates and neglecting investment in health and education. Such consumption patterns seem to be related to the persistence of poverty. We offer an explanation for this observation, based on a trade-off between conspicuous consumption and human capital as signals for unobserved income, under the assumption that individuals care about their status. Despite homothetic preferences, this trade-off gives rise to a convex saving function, which can explain the persistence of poverty.

Keywords: Conspicuous Consumption, Human Capital, Poverty

JEL classification Numbers:

*Flashy jewelry worn especially as an indication of wealth; broadly: expensive and ostentatious possessions (from *Merriam Webster* Online)

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1 Introduction

The consumption bundle of the poor includes many goods that seem to be useless in alleviating poverty. Even the poorest households, those with an income of less than one Dollar a day per capita, spend on average, across different countries, 1 to 8 percent of their income on tobacco and alcohol (Banerjee and Duflo, 2007). The median poor household in Udaipur District, Rajasthan, India, for example, spends as much as 10 percent of its annual income on festivals. Although figures vary substantially, and Udaipur's poor spend on the most on festivals in Banerjee and Duflo's survey, they are clearly not an outlier among the poor in spending a large fraction of their very low income on festivals.[1] Rao (2001), for example, argues that expenditures on festivals amounts to 15% of households' total expenditures in rural India.[2]

The consumption patterns described above are puzzling because they seem to come at a significant cost for the poor. The typical poor spend only 2-3 percent of their income on their children's education, refrain from sending a large fraction of their children aged 7-12 to school, are poorly fed, suffer from health problems, and report that they are worried and anxious to an extent that interferes with their sleep and work. In many cases, they fail to make trivial investments in their business and save so little that they cannot avoid cutting on their meals when they suffer a temporary decline in income (Banerjee and Duflo, 2007). It seems that even with their limited resources, the poor could do much more to slowly escape poverty. In this paper, we offer an explanation for the reason they fail to do so.[3]

We offer an explanation for these consumption patterns that highlights their connection with the persistence of poverty. Our explanation is based on the idea that individuals care

[1] Banerjee and Duflo write that Udaipur's poor may stand out because in the other surveys they relied on, people were not asked to account separately for the food they bought because of a festival (p. 146).

[2] It should be noted, however, that the poor typically spend less then one percent of their income on the other types of entertainment that are common in high-income countries, such as movies, theater, and video shows (Banerjee and Duflo, p. 146).

[3] We are not aware of any study that documents the consumption of Bling Bling among young African Americans and its impact on their relative poverty (but see Charles et al. (2007) for evidence that young Blacks and Hispanics spend more on 'visible goods' such as clothing, jewelry, and cars). However, Missy Elliott, a successful rapper, argued in 2004 that Bling Bling culture encourages young black men and women to spend their money irresponsibly, and that artists should encourage young people to invest responsibly in stable, long-term assets (wikipedia).

about their status and seek to impress others by engaging in conspicuous consumption, which serves as a signal about unobserved income. We further suggest that there is a trade-off between conspicuous consumption and education as signals for unobserved income. We develop a signalling model in which income is correlated with individuals' human capital and show that it gives rise to a convex saving function with respect to income, despite homothetic preferences. This saving pattern implies that there exists a threshold income, below which dynasties convergence to a low education/low income steady state (a poverty trap), and above which there is a divergent growth path.

According to the theory that is proposed here, festivals, consumption of tobacco and alcohol, clothing, and display of jewelry, are more transparent then other types consumption, and hence may provide a signal for wealth.[4] Obviously, investment in the health and the education of one's children may also serve as a signal about wealth, but unlike conspicuous consumption, it can typically be observed only in the long run when it may already be too late to impress others.

The claim that festivals serve as signals of unobserved wealth is supported by Bloch, Rao and Desai (2004). They demonstrate, based on survey data from South India, that the cost of a daughter's marriage (dowry and celebrations)[5] is the costliest event in the life of an Indian family. It can amount to more than six times a family's annual income. It often drives parents into severe debt at high interest rates, and may push families to deep poverty. Bloch et al. argue that there is a clear distinction between dowries, which may be interpreted as the price paid for desirable grooms (and consist of most of the cost of getting a daughter married) and wedding celebrations, which have a symbolic value and are intended to create a spectacle.[6] Accordingly, they show that the costs of celebrations vary significantly according to the "quality" of the groom, and could amount to one third of a family's annual income. Unlike the dowry whose value is determined in negotiations between the parents' of the bride

[4]Because the consumption of tobacco and alcohol is, at least in part, performed socially we believe that it fits the definition of conspicuous consumption. In fact, Veblen (1899) himself, who coined the phrase conspicuous consumption, claimed that the consumption of alcohol (and other stimulants) is a signal for the superior status of those who are able to afford the indulgence.

[5]See Botticini and Siow (2000) for a study of the market for dowries.

[6]Srinivas (1989) and Roulet (1996) also emphasize the prestige motive underlying marriage expenses.

and groom, the celebrations are determined by the bride's family.[7]

We develop an overlapping generations model in which individuals' preferences are defined over their own consumption, their status, and their financial transfers to their offspring, which are optimally invested in human capital. Status is defined by the social beliefs about an individual's unobserved income, and income is correlated with the level of human capital. Individuals may spend their income on conspicuous consumption, which is a signal for income, but doesn't generate any direct utility. We show the existence of a unique fully separating equilibrium. In this equilibrium, it is possible to infer the exact income of each individual based on the individual's level of human capital and expenditure on conspicuous consumption. The model also admits a pooling equilibrium with no spending conspicuous consumption, and partially separating equilibria, in which signals are undistinguished within a range of income. But the fully separating equilibrium is the only equilibrium that satisfies the intuitive criterion of Cho and Kreps (1987), which is the standard refinement applied to signaling equilibria.

We show that if human capital is non-observable, the homothetic preferences imply that a constant fraction of income is allocated to conspicuous consumption, and give rise, thereby, to a constant saving rate (in the form of investment in the offspring education). If, however, human capital is observable, the same preferences, under the fully separating equilibrium, give rise to a negative association between income and the share of conspicuous consumption, and generate thereby an increasing saving rate with income, which may give rise to a poverty trap. Hence, we illustrate that observable human capital, and its trade-off with conspicuous consumption as a signal of wealth, plays a crucial role for the emergence of a poverty trap. Indeed, as consistent with our main mechanism regarding this trade-off, Charles, Hurst, and Roussanov (2007) show that college educated spend about 13 percent less than their high school educated counterparts on visible expenditures, controlling for current and permanent income.

[7] The evidence that Bloch et al. present in support of their claim is based on the existence of a positive correlation between the expenditure on celebrations and a non-local groom, whose family's income is not known to the local villagers. Their theoretical argument is based on the assumption that the probability that the villagers in the bride's village to learn about the real quality of the groom is an increasing function of the celebration expenditure.

The rest of the paper proceeds as follows. The next section surveys the related literature about poverty traps and concern for status. In Section 3 we present the model. Section 4 is devoted to equilibrium analysis, and Section 5 to equilibrium dynamics. Section 6 concludes.

2 Related Literature

2.1 Poverty Traps

There is a sizable literature in economics that tries to explain the persistence of poverty. Most of this literature assumes that individuals are fully rational and that the poor, like other individuals, care about their own and their offspring's future well-being, and so are willing to give up part of their present consumption for the sake of the future. However, as suggested by Dasgupta and Ray (1986), Banerjee and Newman (1993) and Galor and Zeira (1993), credit constraints prevent the poor from passing the threshold of investment that permits a gradual escape from poverty.[8] While the evidence suggests that the poor do indeed have limited access to credit,[9] there is little empirical support for the existence of significant investment indivisibilities. Moreover, this approach fails to account for the evidence surveyed above, which suggests that the poor could in fact do better to improve their situation, if only they saved more and spent less on the consumption of goods we view as conspicuous.

It has also been observed that a poverty trap can emerge regardless of non-convexities in the technology if individuals' propensity to save increases with income, and credit markets are imperfect (Moav, 2002).[10] While empirical evidence strongly supports the underlying assumption that the rate of saving increases with income, and in particular, that the poor's savings rate is very low, the reason that the poor fail to save and spend their income on

[8] In Dasgupta and Ray (1986), the mechanism is based on a nutritional threshold, below which individuals cannot work. See also Benabou (1996), Durlauf (1996), and Maoz and Moav (1999) who, among many others, propose different mechanisms that generate poverty traps based on non-convexities in the technology and credit constraints.

[9] See for instance Besley (1995).

[10] In the model developed by Piketty (1997), the effort level, rather than capital investment, is indivisible. Mookherjee and Ray (2003) show that while inequality may persist irrespective of the divisibility of human capital, the multiplicity of steady states requires indivisibilities in the return to education.

festivals, tobacco, and so on, remains unclear.[11]

The paper that is perhaps closest to ours in its motivation is Banerjee and Mullainathan (2007). Banerjee and Mullainathan were the first to address the puzzling behavior of the poor described above in a theoretical model. They argue that poor individuals spend a larger fraction of their income on "temptation goods,"[12] resulting in a convex saving function in income, which, in turn, can generate a poverty trap. In particular, they show that individuals, who are aware of their problem of self control, reduce savings so as to reduce future wasteful consumption, which acts like a tax on their future wealth. Banerjee and Mullainathan's result is a consequence of their assumption that individuals have non-homothetic preferences, which implies that individuals have a weaker preference for temptation goods as they become richer. In contrast, in this paper, individuals' preferences are homothetic, and the fraction of income spent on conspicuous consumption is endogenously determined in the signaling equilibrium. In particular, the key result of our model is that, despite homothetic preferences, this share is decreasing with the level of human capital, allowing for the emergence of a poverty trap. [13]

2.2 Concern for Status

Starting with Veblen (1899) and Smith (1759), a huge theoretical literature in the social sciences has been devoted the idea that people care about and try to manipulate their status in society in various ways.[14] Pinker (1997) surveys many examples of conspicuous consumption

[11] Another puzzle is related to the fact that the poor tend to have many children, which limits their financial ability to support the health and education of each child. Moav (2005) addresses this puzzle and shows that despite homothetic preferences (defined over consumption and the quality and quantity of children) and convex technology, a poverty trap can emerge in this case, as less educated individuals have a comparative advantage in producing child quantity rather than quality.

[12] For example, Banerjee and Duflo (2007) show that in spite of their low body mass index, the poor tend to spend up to 7 percent of their income on "expensive calories" such as sugar while neglecting relatively cheaper, more nutritious, alternatives.

[13] It should also be noted that Banerjee and Duflo (2006) argue that the fact that the poor do sometimes save to buy televisions and to pay for festivals suggests that they may not be so susceptible to problems of self control.

[14] For recent empirical work that shows that people care about their status and relative position in society see Luttmer (2005), Clark and Oswald (1996), McBride (2001), and Dynan and Ravina (2007). See also the survey by Kahenman and Krueger (2006) and the references therein.

in human societies as well as costly displays of power among other species. Pinker, among many others, argues that preferences for status have developed in an evolutionary process of natural selection. The evolutionary argument is based on the impact of status on mating opportunities, when status, or rather the costly signal generating status, is correlated with other desirable genetic characteristics that increase fitness.[15]

Some of the economic theory models in this literature interpret conspicuous consumption as a signal about unobserved income as we do here,[16] while others focus on the idea that people care about their relative consumption.[17] Empirical support for the notion that people use conspicuous consumption to influence their perceived status includes the work of Bloch et al. (2003) that is mentioned in the introduction; Chung and Fisher (2001) who explore the conspicuous spending patterns of recent immigrants into Canada. Finally, Charles et al. (2007) argue that since the marginal return to signaling through conspicuous consumption is decreasing in the average income of a person's reference group, we should observe less conspicuous consumption among individuals who have richer reference groups. Their prediction is consistent with their finding that consumption of 'visible goods' such as clothing, jewelry and cars is decreasing in the wealth of one's racial reference group, so that Blacks and Hispanics consume relatively more such goods than comparable Whites.

As explained in the introduction, our contribution to this literature consists of the argument that conspicuous consumption is expected to be negatively correlated with human capital, and the effect that this may have on the persistence of poverty.

[15] Experiments illustrate that sexual motives induce conspicuous behavior. Griskevicius et al. (2007), show that romantic motives seem to produce highly strategic and sex-specific self-presentations conspicuous displays of consumption and benevolence, where males tend to exert more in conspicuous consumption compared to women. Consistently, Wilson and Daly (2004), show that men respond more than women to romantic situations, by willing to discount future income for present consumption.

[16] See for example, Ireland (1994), Cole et al. (1995), Bagwell and Bernheim (196), Glazer and Konrad (1996), Corneo and Jeanne (1998), and Charles et al. (2007).

[17] See for example Duesneberry (1949), Pollack (1976), and Frank (1985) for some of the early such models. Recently, Hopkins and Kornienko (2004) and Becker and Rayo (2006) analyzed the welfare implications of such preferences.

3 The Basic Model

Consider an overlapping generations model of a one-good economy with a continuum of individuals. The good can be used for consumption, conspicuous consumption, and investment in human capital. Each individuals lives two periods, has a single parent and a single child. This parent-child relation creates a dynasty. When individuals are "young", or in their first period of life, their parents are "old" or in their second period of life.

In their first period of life, (young) individuals invest in human capital. Specifically, an individual who invests $e \geq 0$ units of the good in human capital when young acquires $h = h(e)$ units of human capital, which enters the production process in the following period, when the individual is old, where

$$h(e) = \underline{h} + \gamma e, \tag{1}$$

for some parameters $\underline{h} > 0$ and $\gamma > 1$. Individuals defer their consumption to the second period of their life, and hence use any resources they own to enhance their human capital.

In their second period of life, (old) individuals spend a fixed amount of their time working. An individual with human capital h produces a quantity

$$y = h + \pi$$

of the good, where π is a random term that is drawn from a continuous distribution with support $[\underline{\pi}(h), \overline{\pi}(h)]$ such that $\underline{\pi}(h) \geq -h$ and $E[\pi] = 0$. Old individuals allocate the resources they produce among consumption, c, conspicuous consumption, x,and a bequest to their offspring, b. Hence, their budget constraint is given by,

$$c + b + x \leq y. \tag{2}$$

Individuals' preferences are given by the following Cob-Douglas utility function:

$$u(c, b, S) = \left(\frac{c^{1-\beta} b^{\beta}}{(1-\beta)^{1-\beta} \beta^{\beta}} \right)^{1-\lambda} S^{\lambda}, \tag{3}$$

where $\beta \in (0,1)$, $\lambda \in (0,1)$, and $S = E(y|\, h, x))$ is "perceived status." That is, we assume that the perceived status is given by the social belief about the individual's expected income conditional on the level of human capital and conspicuous consumption, both of which we

assume to be observable. Individuals' consumption and the bequest they leave to their children are assumed to be unobservable.

To justify these two assumptions, note that as long as some type of private consumption is not observable, then we may simply define conspicuous consumption to be the type of consumption that is observable. There are two justifications for the assumption that the bequest is not observable. (1) It is possible to interpret the bequest as the amount of resources that a parent spends in order to educate his child. A lot of this spending, such as the effort that goes into instilling in the child the value of learning or the number of hours that a parent spends helping his child with her homework, is simply non observable. (2) Young individuals spend their entire inheritance on acquiring education or human capital. However, the quality of a child's education would only be revealed when she becomes an adult, after her parent has already passed. So to the extent that the bequest is observable, it may only be observable when it is already too late to make a difference for the parent. In other words, if we interpret human capital as years of schooling, investment in human capital is a continuous process. Consequently, not much can be learned from the fact that a child attends primary school, because it is not clear what will be the child's final level of education.

We restrict the model's parameters as follows:

$$\beta\gamma > 1;$$
$$(1-\lambda)\beta\gamma < 1.$$

As will become apparent, the first assumption ensures that in dynasties in which the allocation of income to conspicuous consumption is a sufficiently small fraction of individuals' income, the expected level of human capital is growing over time. Whereas the second assumption ensures that in dynasties in which the allocation of income to conspicuous consumption is at the proximity of a fraction λ of income, the expected level of human capital is converging to a constant level.

Observe that the maximization of individuals' utility function (3) subject to their budget constraint (2) implies that for any level of expenditure on conspicuous consumption x, the bequest that each individual leaves to her offspring is given by

$$b = \beta(y - x), \tag{4}$$

and that the individual's consumption is given by

$$c = (1 - \beta)(y - x). \tag{5}$$

We turn to the analysis of the allocation of resources to conspicuous consumption, x. An equilibrium is defined in the following way: Let $x(h, y) : [0, \infty) \times [0, \infty) \mapsto [0, \infty)$ denote individuals' expenditure on conspicuous consumption as a function of their human capital h and income y, and $y(h, x) : [0, \infty) \times [0, \infty) \mapsto [0, \infty)$ denote the social beliefs about individuals' expected income as a function of their observable human capital and expenditure on conspicuous consumption.

Definition. A pair of expenditure on conspicuous consumption and social belief functions $\langle x(y, h), y(h, x)\rangle$ is an equilibrium if:

1. individuals' expenditures on conspicuous consumption $x(h, y)$ are optimal given the social beliefs $y(h, x)$; and

2. social beliefs $y(h, x)$ are consistent with the expenditure function $x(h, y)$, or

$$y(h, x) = E[y : x(h, y) = x].$$

4 Equilibrium Analysis

In a standard signaling game one player sends a message (signal) to which another player responds by taking an action that affects the former player's payoff. Thus, strictly speaking, because no one responds to individuals' choice of conspicuous consumption, that game that is described in this paper is not a standard signaling game. However, because individuals' levels of conspicuous consumption affect social beliefs, and these enter directly into individuals' utility functions, the game that is described here can be analyzed in much the same way as a standard signaling game.

Like any signalling game, the many different interpretations that can be given to different choices of off-equilibrium expenditures on conspicuous consumption gives rise to many different equilibria. But, as shown in the appendix, plausible restrictions on off-equilibrium

beliefs, and specifically, the restrictions imposed by the so called *intuitive criterion* (Cho and Kreps, 1987), imply that the equilibrium must be fully separating.[18]

Plugging equations (4) and (5) into the individuals' utility function, (3) allows us to derive the individuals' indirect utility function as a function of their income y, conspicuous consumption x, and human capital h as follows:

$$u\left(y,x\right)=\left(y-x\right)^{1-\lambda}y\left(h,x\right)^{\lambda}. \tag{6}$$

An individual with human capital h and income y chooses her level of conspicuous consumption $x\left(h,y\right)$ to maximize his indirect utility function (6). The implied first-order-condition that is associated with a fully separating equilibrium is given by the following differential equation:

$$\frac{\lambda}{1-\lambda}\frac{y-x}{y(h,x)}=1\Big/\frac{dy(h,x)}{dx}. \tag{7}$$

Note that the left-hand-side of this first-order-condition (7) describes the marginal rate of substitution between the optimal bundle of consumption and bequest, $y-x$, and status, $y(h,x)$, while the right-hand-side is the marginal cost of status (because the marginal cost of the consumption/bequest bundle is one). In equilibrium, these two marginal rates have to be equal.

The solution $y(h,x)$ of the differential equation (7), noting that in equilibrium, $y=y(h,x)$, is (implicitly) given by the following equation:

$$y(h,x)^{1/(1-\lambda)}-\frac{x}{\lambda}y(h,x)^{\lambda/(1-\lambda)}=\left(h+\underline{\pi}\left(h\right)\right)^{1/(1-\lambda)}. \tag{8}$$

Except for special cases (such as $\lambda=1/2$), it is impossible to obtain an explicit solution for the equilibrium social belief $y(h,x)$. But it is possible to invert the implicit solution for $y(h,x)$ in equation (8) to obtain an explicit solution of the equilibrium level of conspicuous consumption $x(h,y)$ as follows:

$$x\left(h,y\right)=\lambda\left(y-\frac{\left(h+\underline{\pi}\left(h\right)\right)^{1/(1-\lambda)}}{y^{\lambda/(1-\lambda)}}\right) \tag{9}$$

[18]Intuitively, the intuitive criterion requires that individuals who deviate from equilibrium and claim to be of a certain type or set of types should be believed if all the other types would not want to deviate in the same way, even if by deviating they are believed to be of this type or set of types.

This result is summarized in the following proposition.

Proposition 1. The signalling game has a unique fully separating equilibrium

$$\langle x\left(y,h\right),y\left(h,x\right)\rangle .$$

In this equilibrium, $x\left(y,h\right)$ is given by equation (9) and $y\left(h,x\right)$ satisfies equation (8).

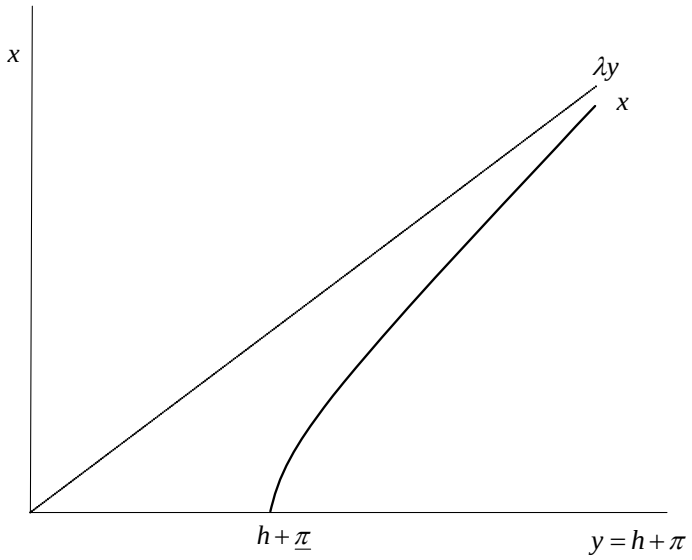

Figure 1: Equilibrium expenditure on conspicuous consumption, $x\left(y,h\right)$

The equilibrium expenditure on conspicuous consumption, $x\left(y,h\right)$, for $\underline{\pi}\left(h\right)=-h$, is

$$x=\lambda y.$$

Otherwise, for $\underline{\pi}\left(h\right)>-h$, as depicted in Figure 1, it has the following notable properties:

1. $x\left(h,h+\underline{\pi}(h)\right)=0$. If the random shock is the lowest possible then the individual does not spend any income on conspicuous consumption.

2. For any fixed level of human capital h, individuals' expenditure on conspicuous consumption is increasing in their total income y (that is, it is increasing in the shock to their income).

3. For any fixed level of human capital h, individuals' expenditure on conspicuous consumption is concave in their income y.

4. For any fixed level of human capital h, the slope of individuals' expenditure on conspicuous consumption with respect to income, increases to $\lambda/(1-\lambda)$ as individuals' income decreases to $h + \underline{\pi}(h)$.

5. For any fixed level of human capital h, the slope of individuals' expenditure on conspicuous consumption with respect to income, tends to λ as individuals' income increases.

In addition, the equilibrium expenditure on conspicuous consumption, $x(y,h)$, has the following two important properties. First, holding income constant, the larger is the unobserved element of an individual's income, π,or the smaller is individual's (observable) human capital, the larger is the individual's expenditure on conspicuous consumption. And second, for a given distribution of the shock π,the larger is an individual's level of human capital h, the smaller is the expected fraction of the individual's income that is devoted to conspicuous consumption.

As explained in the introduction, the fact that the share of conspicuous consumption out of income is decreasing with the level of human capital is a key result of the model because it is necessary for the existence of a poverty trap.

Note that if human capital is unobserved, it is equivalent to the case in which $h = 0$,and $y = \pi$. Hence, as follows from (9), conspicuous consumption, for unobserved human capital is a constant fraction of income, $x = \lambda y$, which therefore cannot give rise to a poverty trap.

5 The Dynamics of Income and Conspicuous Consumption

The fact that individuals' output is subject to random shocks implies that the relationship between an individuals' human capital, income, and bequest, and their offspring's human capital and income is stochastic. We describe this relationship for the case of a dynasty that begins with an individual who has human capital $h \geq \underline{h}$ and where the random shock to output, π, is equal to its expected value, zero, in every period. For $\lambda \leq 1/2$,the wealth of dynasties who consistently experience bigger shocks will grow more quickly, and the wealth of dynasties who consistently experience smaller shocks will grow more slowly. For $\lambda > 1/2$,

since the slope of individuals' expenditure on conspicuous consumption with respect to income, increases to $\lambda/(1-\lambda)$ as individuals' income decreases to $h+\underline{\pi}(h)$,the relationship between the shock and wealth accumulation is non-monotonic, as there exists a range of income in which the marginal propensity to conspicuously consume is larger than one, implying that a rise in income (due to the random component) will result in a decline in the bequest.

The reason for this simplification, focusing on the path of $\pi = 0$, is that we want to represent our analysis in a two dimensional figure, but as implied by (9) an individual's level of human capital in any given period depends both on the output and human capital of her parent. Although the analysis provides only a partial view of the type of growth paths that may exist in the economy, the view that is afforded is representative of the economy as a whole.

Denote the human capital and output of an individual in a given dynasty at time t by h_t and y_t, respectively. As explained above, we examine a dynasty where $h_0 \geq \underline{h}$ and where $y_t = h_t$ for every $t \geq 1$. We denote the function that governs the dynamics of human capital by $\phi : [0,\infty) \to [\underline{h},\infty)$, so that

$$h_{t+1} = \phi(h_t)$$

for every $t \geq 0$. By (4), (1), and (9),

$$\begin{aligned}
\phi(h_{t+1}) &= \underline{h} + \gamma b_t \\
&= \underline{h} + \gamma\beta\left(h_t - x_t\right) \\
&= \underline{h} + \gamma\beta\left((1-\lambda)\,h_t + \lambda\left(\frac{\left(h_t + \underline{\pi}\left(h_t\right)\right)^{1/(1-\lambda)}}{h_t^{\lambda/(1-\lambda)}}\right)\right)
\end{aligned}$$

where b_t and x_t denote the individual's bequest and expenditure on conspicuous consumption in period t,and individuals invest in education their entire bequest, and hence $e_t = b_t$.

It can be verified that the function ϕ has the following properties:

1. If the lower bound on the noise term is equal to the individual's human capital in absolute value, $\underline{\pi}\left(h_t\right) = -h_t$, then

$$\phi(h_{t+1}) = \underline{h} + \gamma\beta\left(1-\lambda\right)h_t$$

In this case, h_{t+1} is a linear function of h_t that intersects the 45 degree line since it is assumed that $(1-\lambda)\gamma\beta < 1$.

2. If the lower bound on the noise term is a constant, $\underline{\pi}(h_t) = \underline{\pi}$, then for $h_t \geq -\underline{\pi}$, ϕ is increasing and convex, with a slope that increases from $\gamma\beta(1-\lambda)$ at $h_t \to -\underline{\pi}$ to $\gamma\beta$ as h_t tends to infinity.

Suppose that the lower bound on the noise term $\underline{\pi}(h)$ is given by the following function:

$$\underline{\pi}(h) = \begin{cases} -h_t & \text{for} \quad h < -\underline{\pi} \\ \underline{\pi} & \text{for} \quad -\underline{\pi} \leq h \end{cases} \tag{10}$$

where $\underline{\pi} < 0$. Such a function is consistent with the observation that a big negative shock may cause a low human capital individual to lose all income, but that wealthier individuals can usually afford enough insurance to ensure that they will not become penniless even if the worst occurs. It follows that the function ϕ is increasing and (weakly) convex. If in addition $\underline{\pi} < \underline{h}/(\gamma\beta(1-\lambda)-1)$,[19] then,under the assumption that $(1-\lambda)\beta\gamma < 1$ and $\beta\gamma > 1$, ϕ intersects the 45 degree line twice as depicted in Figure 2.

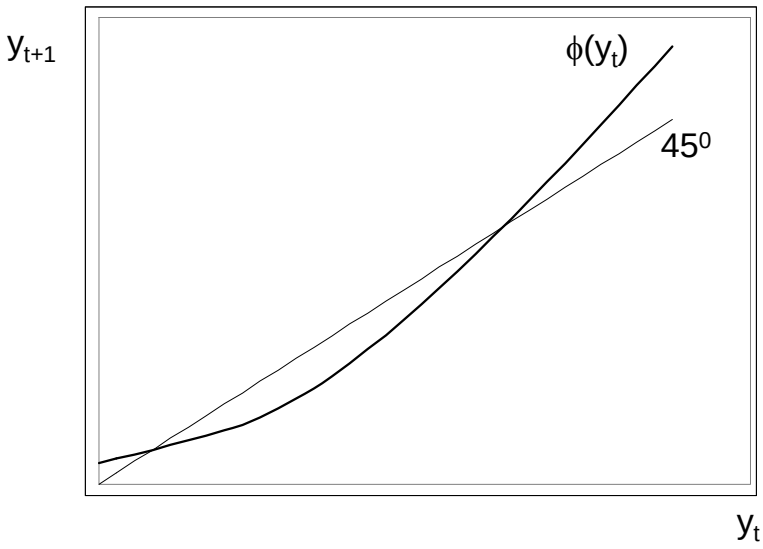

Figure 2: The dynamics of human capital and output

It thus follows that a dynasty that begins with a low level of human capital will be trapped in poverty unless it experience a series of large positive shocks to output. In contrast, the

[19] Implying that $\underline{\pi}$ is sufficiently large in absolute value, or that $\underline{h}$ is sufficiently small, given $\underline{\pi}$.

output of a dynasty that begins with a high level of human capital will grow indefinitely (converging to a rate of growth $\beta\gamma - 1$), unless it experiences a series of large negative shocks.

It should be noted that restricting $\underline{\pi}(h)$ by (10), is not necessary. As long as $|\underline{\pi}(h)|/h$ is decreasing monotonically, above some threshold, the qualitative results hold.

6 Concluding Remarks

We offer a contribution to the literature studying conspicuous consumption by illustrating that if human capital provides a signal on individual's wealth, then holding constant income, the less educated would spend more on conspicuous consumption, as the two signals substitute each other. This result, we show, has further implications for the understanding of the behavior of the poor and the persistence of poverty. The main intuition is that dynasties that are on a track of human capital accumulation reduce the share of income devoted to conspicuous consumption, which supports the path of further accumulation of wealth and human capital in the dynasty allowing for upward mobility. In contrast, low human capital individuals spend a larger fraction of their income on conspicuous consumption which prevents them from accumulating human capital.

Interestingly, if females tend to worry less about status, as suggested by the evolutionary considerations, then societies in which women have more control over resources, would be characterized by less conspicuous consumption.

An extension of the model that could incorporate differences across countries with respect to the transparency of human capital and investment in children's human capital may offer an explanation for cross country differences in the persistence of poverty. These potential differences across countries could lead, or be interpreted, as differences in social norms or culture with respect to "making a show".

Appendix

Proof of Proposition 1. Solve the differential equation

$$\frac{\lambda}{1-\lambda}\frac{y-x}{y(h,x)} = 1 \Big/ \frac{dy(h,x)}{dx} \,. \tag{11}$$

and argue that the solution is unique. ■

Proposition 2. An equilibrium $\langle x(h,y), E[y|h,x]\rangle$ that meets the intuitive criterion is fully separating.

Proof. The proof follows from the following five steps.

1. An equilibrium belief function $E[y|h,x]$ is non-decreasing in x. If, to the contrary, for some $h \geq 0$ and $x' > x$, $E[y|h,x] > E[y|h,x']$, then an agent can spend less on conspicuous consumption and still be believed to have a higher expected income. A contradiction to the optimality of the conspicuous consumption function.

2. An equilibrium expenditure on conspicuous consumption function $x(h,y)$ is nondecreasing. Suppose to the contrary that an agent with human capital h and income y' spends x' on conspicuous consumption, $c' = (1-\beta)(y'-x')$ on consumption, and $b' = \beta(y'-x')$ on bequest, and is believed to have an income $\overline{y}'$, while an agent with human capital h and income $y < y'$ spends $x > x'$ on conspicuous consumption, $c = (1-\beta)(y-x)$ on consumption, and $b = \beta(y-x)$ on bequest, and is believed to have an income $\overline{y} \geq \overline{y}'$. Because the latter agent optimizes,

$$\begin{aligned}&((1-\beta)(y-x))^{(1-\beta)(1-\lambda)}(\beta(y-x))^{\beta(1-\lambda)}\overline{y}^{\lambda} \\ &\qquad\geq ((1-\beta)(y-x'))^{(1-\beta)(1-\lambda)}(\beta(y-x'))^{\beta(1-\lambda)}(\overline{y}')^{\lambda},\end{aligned}$$

or

$$\begin{aligned}&(y-x)^{(1-\beta)(1-\lambda)+\beta(1-\lambda)}(1-\beta)^{(1-\beta)(1-\lambda)}\beta^{\beta(1-\lambda)}\overline{y}^{\lambda} \\ &\qquad\geq (y-x')^{(1-\beta)(1-\lambda)+\beta(1-\lambda)}(1-\beta)^{(1-\beta)(1-\lambda)}\beta^{\beta(1-\lambda)}(\overline{y}')^{\lambda},\end{aligned}$$

or, because $\frac{y'-x}{y-x}$ is increasing in x,

$$\left(\frac{y'-x}{y-x}\right)^{(1-\beta)(1-\lambda)+\beta(1-\lambda)}(y-x)^{(1-\beta)(1-\lambda)+\beta(1-\lambda)}(1-\beta)^{(1-\beta)(1-\lambda)}\beta^{\beta(1-\lambda)}\overline{y}^{\lambda}$$
$$>\left(\frac{y'-x'}{y-x'}\right)^{(1-\beta)(1-\lambda)+\beta(1-\lambda)}(y-x')^{(1-\beta)(1-\lambda)+\beta(1-\lambda)}(1-\beta)^{(1-\beta)(1-\lambda)}\beta^{\beta(1-\lambda)}(\overline{y}')^{\lambda}.$$

But then

$$((1-\beta)(y'-x))^{(1-\beta)(1-\lambda)}(\beta(y'-x))^{\beta(1-\lambda)}\overline{y}^{\lambda}$$
$$>((1-\beta)(y'-x'))^{(1-\beta)(1-\lambda)}(\beta(y'-x'))^{\beta(1-\lambda)}(\overline{y}')^{\lambda},$$

which means that the agent with income y' cannot be optimizing.

3. If for some level of human capital h the belief function $E[y|h,x]$ is constant (as a function of x) on an interval, then it "jumps up" immediately to the right of this interval. That is, if for some fixed h the social belief $E[y|h,x]$ is constant on an interval $[a,b]$ or $[a,b)$ and is such that $E[y|h,x] > E[y|h,b]$ for $x > b$ then $\lim_{x\searrow b} E[y|h,x] > E[y|h,b]$ or $E[y|h,b] > \lim_{x\nearrow b} E[y|h,x]$, respectively. We prove this claim for the latter case. The proof for the former case is similar. Suppose to the contrary that two agents with the same h spend a and b on conspicuous consumption. If the two agents are believed to have the same expected income then the agent who spends b on conspicuous consumption cannot be optimizing.

4. If for some h, $E[y|h,x]$, viewed as a function of x alone, is constant on an interval $[a,b)$, then the agent with the lowest income y_b who spends b on conspicuous consumption in equilibrium must be indifferent between spending b or a on conspicuous consumption. If no such agent exists, and an agent with income $\inf\{y : x(h,y) = b\}$ spends a on conspicuous consumption, then this agent must be indifferent between spending a or b on conspicuous consumption. In the former case, it follows from the fact that agents with incomes $y < y_b$ prefer to spend a on conspicuous consumption and continuity; in the latter case, it follows from the fact that agents with incomes $y > \inf\{y : x(h,y) = b\}$ prefer to spend b on conspicuous consumption and continuity.

The statement and proof in the case where $E[y|h,x]$ is constant on an interval $[a,b]$ is similar.

5. Fix an equilibrium $\langle x(h,y), E[y|h,x]\rangle$. If the belief function $E[y|h,x]$ is (strictly) increasing, then we're done. Suppose then that for some level of human capital h, the belief $E[y|h,x]$ is constant on some interval $[a,b)$, and that it jumps up immediately thereafter as implied by step 3. Suppose that the equilibrium is such that an agent with income y_b spends b on conspicuous consumption, and that agents with lower incomes spend no more than a on conspicuous consumption (the argument for the case where agents with incomes $y > y_b$ spend at least b on conspicuous consumption, and an agent with income y_b spends a on conspicuous consumption is similar). Step 4 implies that an agent with income y_b is indifferent between spending a on conspicuous consumption if he is believed to have an average income of $E[y|h,a]$, and spending an additional sum of $b-a$ on conspicuous consumption if he is believed to have an average income of $E[y|h,b] > E[y|h,a]$. Similarly, for some small $\varepsilon > 0$, an agent with income $y_b - \varepsilon$ is indifferent between spending a on conspicuous consumption if he is believed to have an average income of $E[y|h,a]$, and spending an additional sum of $b-a-\delta_\varepsilon$ on conspicuous consumption if this implied that he would be believed to have an average income of $E[y|h,b] - \Delta_\delta > E[y|h,a]$. In contrast, an agent with a lower income than $y_b - \varepsilon$ strictly prefers to spend a than to spend $b - \delta_\varepsilon$ even if this means that he would be believed to have the higher income $E[y|h,b] - \Delta_\delta$. So, an agent with income between $y_b - \varepsilon$ and y_b would like to spend a little more if this meant that it were believed to have a higher income but this is not possible with the equilibrium beliefs $E[y|h,x]$. But, if such an agent deviates from equilibrium and spends an additional sum of $b - a - \delta_\varepsilon$ on conspicuous consumption, then it should be believed that his income is at least $y_b - \varepsilon$, because, as explained above, it is not be in the interest of an agent with a lower income to deviate in this way even if he were believed to have an income that is equal to $y_b - \varepsilon$. This argument implies that if $E[y|h,x]$ is part of an equilibrium that satisfies the intuitive criterion, then it cannot be constant on any interval. It therefore follows that it must be part of a fully separating equilibrium. ■

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