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Poverty and Aspirations Failure: A Theoretical Framework

Patricio S. Dalton, Sayantan Ghosal and Anandi Mani

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Patricio S. Dalton
CentER, Tilburg University

Sayantan Ghosal
University of Warwick

Anandi Mani
University of Warwick

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Abstract

This paper introduces a formal model of internal constraints that derives the link between initial disadvantage with aspirations and choices. We show how the cognitive windows of individuals are endogenously determined and show how an individual's cognitive neighbors impacts on internal constraints. Our analysis suggests that accounting for poverty traps requires an account of how the external disadvantage and internal constraints interact and provides a justification for intervention programs that aim to shock aspirations directly and seek to empower participants.

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1 Introduction

In contrast to transient poverty, persistent poverty[1] is not just a snapshot of those who are poor now, but a condition that implies an understanding of a multidimensional process which makes people poor and keeps them poor[2].

An influential literature, advocated mostly by economists studying the origins of "poverty traps," argues that persistent poverty is due to constraints that are *external* to the individual.[3] Examples of such constraints are credit or insurance market imperfections (Loury, 1981; Galor and Zeira, 1993; Banerjee and Newman, 1991, 1993; Torvik, 1993 among others) coordination problems (Da Rin and Hellman, 2002, Kremer, 1993 among others), institutional or governmental failures (Bardhan, 1997), malnutrition (Dasgupta and Ray, 1986), neighborhood effects (Durlauf, 2003) or fertility decisions (Nelson, 1956).

A different approach argues that a poverty trap is perpetuated by the interaction between extrinsic circumstances (initial disadvantage e.g. poverty or social exclusion) and *intrinsic factors* such as aspirations and beliefs. The sole fact of being poor may affect preferences by constraining aspirations, self-confidence or hope which may in turn limit poor people's ability to participate and alter their own condition.[4] "Long-run poverty is fundamentally self-perpetuating [and] the entrapment goes hand in hand with [...] lack of hope," argues Mookherjee (2003, p.5). According to this view, development depends not only on increasing opportunities or relaxing external barriers, but fundamentally on releasing individual's internal constraints (Stern et al, 2004).

As pointed out by the anthropologist Arjun Appadurai (2004, p.59), poor people may lack the capacity to aspire to "contest and alter the conditions of their own poverty." For Appadurai, the

[1] Persistent poverty is defined by the incapability to fulfill basic needs during a period greater than 5 years,

[2] More than 300 million people world-wide have lived in persistent poverty in the late 1990s. The Chronic Poverty Report 2004-2005 estimates that 40% of the poverty in Sub-Saharan Africa is persistent. For evidence of chronic or persistent poverty see Jalan and Ravallion (1998), Fouarge and Layte (2003), Biewen (2003), Duncan et. al. (1993), among others.

[3] See for example Azaridis and Stachurski (2004) or Azaradis (2004) for a literature review on Poverty Traps

[4] Social psychologists have documented the lack of hope and low self-esteem as a typical endogenous characteristic in the personality of the poor population. Moreira (2003) studies the poor people in the North-eastern Brazil and points out that "as the poor lose their values, they no longer believe in themselves. They go through a process of Nihilism [denial of hope]". He documents evidence that shows that the greatest part of the poor population has these nihilistic characteristics and they submit themselves to the destiny that is given by God. The work of the renowned sociologist W. J. Wilson provides a clear evidence of the link "social exclusion-lack of aspirations-poverty" that was observed in U.S. urban ghettos since 1970. Wilson (1987) makes the case that the increasing "social isolation" of the poor, especially the black poor, has greatly contributed to their poverty. "Out of sight, out of mind" allowed most of the non-poor to either deny or forget the conditions in the ghetto. Moreover, Wilson argues that the causality takes the other direction as well: poverty also implies exclusion. He claims that concentration of poverty results in the isolation of the poor from the middle class and its corresponding role models, resources, and job networks. More generally, he argues that being poor in a mixed-income neighbourhood is less damaging than being poor in a high poverty neighbourhood.

"capacity to aspire" is a navigational capacity which includes not only the ability to set goals or aspirations but also the knowledge of how to achieve them. The higher the initial advantages, the more chances an individual has to set higher aspirations and to see the pathways which lead to their fulfillment. In contrast, the precarious life of poverty restricts the poor's aspiration levels to those of necessity, reinforcing and perpetuating the cycle of poverty and aspiration failure. A possible way out of this trap, in Appadurai's view, is to expand the poor's aspiration horizon by means of role models or to create programs which provide the poor with an arena in which to develop capabilities and have voice. Thus the capacity to aspire is a key ingredient in any notion of empowerment[5]. In section 2 below, we review existing evidence on internal constraints and examine the link between initial status and internal constraints.

Much of classical economic theory makes a sharp distinction between preference parameters (aspirations and beliefs) and their external circumstances (initial status or endowments) and assumes that these are both exogenous to the individual. If there is a systematic link between initial disadvantage and aspirations and beliefs, one could *assume* that external circumstances directly operate via a psychological channel and show how such a direct link could perpetuate poverty traps. In fact two recent papers, Genicot and Ray (2009) (via the assumption of an exogenous aspirations neighborhood) and Bannerjee and Mullainathan (2010) (via the assumption that proportion of extra income spent on temptation goods is decreasing with overall consumption) take precisely this approach. In contrast, in this paper, we introduces a formal model of internal constraints that *derives* the link between initial disadvantage with aspirations and choices to account for poverty traps and aspirations failure[6].

In our model, an individual decision-maker's ranking over available actions is affected by her aspirations (a preference parameter which modelled as a reference point) and which in turn, is defined as her expected final status given her actions. We provide a formal characterization of an internally constrained decision-maker as one who suffers a payoff loss by failing to fully internalize the way aspirations adapt to actions. We, then, show that initial status determines the probability with which the internal constraint binds: in this way we derive the link between initial disadvantage and aspirations failure.

Next, we analyze the conditions under which external signals serve as a "role model" by endogenously determining the cognitive window of the individual. A key ingredient in our analysis is the

[5] Atkinson (1998) defines social exclusion as a relative concept (people are excluded from a particular society) that involves agency (people may exclude themselves) and it implies future hopes and expectations. People are excluded not just because they are currently without a job or an income but because they have little prospects for the future.

[6] Our model can be viewed as a contribution to fill the gap in the literature pointed out by Esther Duflo (2003, p10): "... what is needed is a theory of how poverty influences decision-making, not only by affecting the constraints, but by changing the decision-making process itself".

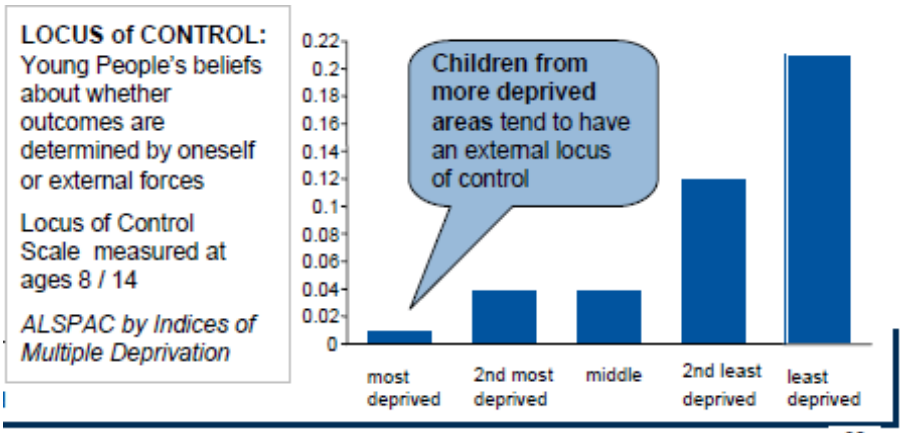
notion of similarity-based learning[7] which will determine the size of the cognitive window for an individual. In choosing a cognitive window, the individual faces a trade-off between (a) including only those individuals who have a similar initial status but also likely to have similar aspirations and achievement, and (b) including those individuals with a dissimilar (higher) initial status and more likely to have higher aspirations. We show that an individual with low initial social status will endogenously exclude individuals with a high initial social status from her cognitive window. Moreover, the size of an individuals cognitive window is decreasing when (i) the cost of choosing the action with a higher probability of altering status quo is higher, (ii) the benefit of achieving a higher final status is low when the individual has low aspirations is lower, (iii) the prior beliefs of the individual are more pessimistic.

Building on these results, we show how the distribution of initial status determines whether or not a society is connected. Between any two individuals in a connected society, there is a chain of other individuals each of whom is contained in the cognitive window of, and therefore, is a potential role model for, the preceding individual. In this sense, a poor individual is linked to rich individual in a sequence of small steps. We show that in a connected society, even if one individual isn't internally constrained, no individual is. Therefore, we derive a link between disadvantage, the distribution of initial status and binding internal constraints via the transmission of aspirations across individuals.

Overall, our analysis suggests a view of poverty traps that relies in an essential way on the interaction between extrinsic circumstances and internal constraints. Our analysis suggests that one way out of poverty traps is to directly shock the aspirations of individuals thus relaxing their internal constraints. We examine two specific interventions, the Venezuelan Classical Music Orchestras for children from disadvantaged backgrounds and the use of peers in altering actions, aspirations and health outcomes of sex workers in Songachi in Kolkata. Note that if we had assumed that external circumstances directly operate via a psychological channel in perpetuating poverty traps, we would have to conclude that only changing extrinsic circumstances could alter poverty traps. In contrast, our analysis implies that empowerment (the combination of opportunity and the "capacity to aspire") is essential to the process by which individuals exit poverty traps.

The rest of the paper is structured as follows. Section 2 reviews evidence relating to internal constraints and initial disadvantage. Section 3 reviews the related literature. Section 4 develops a model of internal constraints. Section 5 studies how internal constraints may endogenously arise. It also analyses the impact of role models on aspirations and the way individuals limit the size of their cognitive neighborhood. Section 6 discusses specific attempts to alter the aspirations of individuals and discusses policy implications. Section 6 gives final remarks. Proofs of all propositions are

[7] Similarity based comparisons are a key ingredient in Case Based Decision Theory (Gilboa and Schmeidler (2001)).



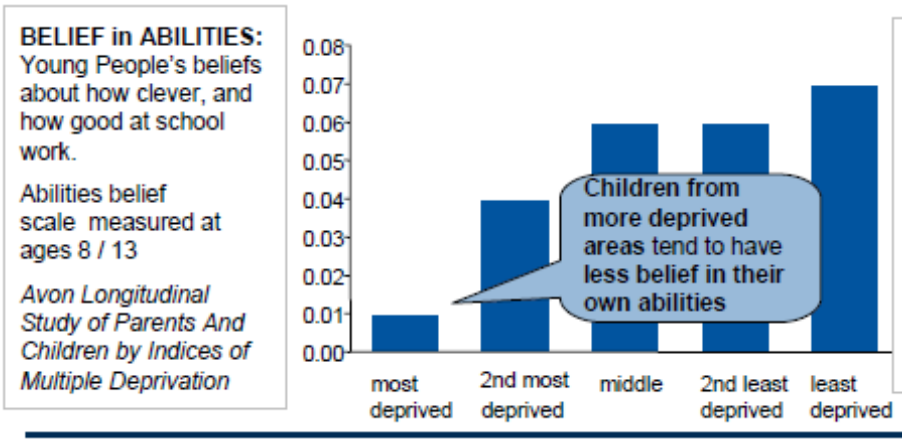
collected in the appendix.

2 Evidence on internal constraints

A centre-piece of our paper is the idea that people, to varying degrees, face internal constraints that hinder them from higher achievement. Indeed, there is widespread awareness, or at least a perception, of such constraints – reflected, for instance, in the burgeoning size of the self-help industry.

There are very plausible reasons due to which such constraints are likely to be more binding for the poor (and disadvantaged sections of society). For instance, if hard work is an important ingredient for success, an individual's beliefs about the role of hard work (versus luck or other external circumstances) in influencing life outcomes, is an important factor that will shape his/her efforts, goals and outcomes. A poor person's beliefs on this matter may be quite different from that of a richer person. The notion of a "locus of control" has been widely used by psychologists to measure whether an individual perceives that outcomes are determined by oneself or by external forces where an external locus of control indicates the presence of a binding internal constraint, a fatalistic viewpoint. A number of studies, mainly in medicine have provided evidence of an income gradient in the locus of control. For instance, the chart below (see Figure 1 and 2) reflects such differences based on data from the Longitudinal Study of Young People in England (LSYPE 2006).

It shows that young people from deprived backgrounds believe that external factors have a bigger role to play in their life outcomes than their own efforts. This is consistent with other evidence that shows that lower socioeconomic status is typically associated with putting greater weight on the role of external circumstances in determining life outcomes (Schultz and Schultz (2004)). Youth in the



LSYPE also demonstrate less faith in their own academic abilities, or overall intelligence.

Deprived youth in the LSYPE study had the lowest academic aspirations across all income quintiles. It is plausible that these beliefs and the low aspirations associated with them emerge from the reality that people see in their own lives, and in the lives of those around them. No doubt, the process of aspiration formation is very much influenced by a person's social environment. In this sense, poverty and deprivation causes people to aspire lower due to an informational disadvantage: they witness too few success stories in their social milieu to learn what matters for success.

However, there is considerable evidence to show that external constraints also create internal responses that compound the negative impact of adverse external factors. For instance, the work on 'stereotype threat' (by social psychologist Claude Steele and others) provides experimental evidence that invoking racial/gender identity results in weaker performance among African Americans and women respectively.

To take another case, the Dunedin Longitudinal Study in New Zealand shows that pessimistic expectations significantly increased the likelihood of frequent smoking and less frequent exercise (Clark et al(2003)) – suggesting a feedback effect from low aspirations to low effort, even in matters such as health where individual motivations need not be driven by market returns alone.

On the flip (and positive) side too, there is evidence now available that points to the effects of higher 'reference points' (or goals) on performance outcomes. Laboratory Experimental work by Falk et al(2010) shows that when subjects have higher reference points for earnings, they persevere longer at the experimental task. Inasmuch as aspirations may be regarded as 'reference points for life goals', this evidence points to how higher goals can affect people's life outcomes.

In real life, such reference points emerge from the social setting that people inhabit. One important issue here is to separate two distinct effects of a poor person's social milieu on his choices and

outcomes. One is the information transmission effects of a person's social milieu; the other is the set of values, beliefs and preferences that affect his/her aspirations.

Two recent papers by Jensen (with Oster 2009, 2010) provide some suggestive evidence that addresses this issue. Jensen(2010) reports the results of a field experiment in the Dominican Republic, where students were informed about the actual return differential between primary and secondary/tertiary education, which they had previously underestimated. There was a substantial increase in perceived returns to education – but almost no discernible effect on the actual rates of completion of secondary schooling. This suggests at best a modest effect of the informational role of the social environment on a person's aspirations, especially among the poor.

In contrast, Jensen and Oster(2009) report substantial changes in beliefs and attitudes on a variety of gender-related issues as a result of exposure to Cable TV programs with inspiring female protagonists. For instance, women in villages with cable TV reported lower tolerance to domestic violence, weaker preference for sons as well as increases in autonomy and declines in fertility (see also Ferrara on fertility effects). The authors also find an increase in school enrolment for girls, in villages where cable TV arrived earlier (and increased gender related programming).

The contrast between the modest effects of information in the Dominican Republic and the significant effects of characters in a soap opera on gender-related beliefs and outcomes in India is striking. It suggests that an individual's social environment has a distinct aspirational effect on her beliefs and goals, independent of the information transmitted through others' life experiences.

Separating out these two channels is the subject of ongoing research.

3 Relation to the Literature

The idea that choices are determined by aspirations is not new in the economics literature and goes back to the seminal work of Simon (1955) and more recently, Selten (1998).

Ray (2003) (commenting on Appadurai (2004)) and Genicot and Ray (2009), argue that poverty and failure of aspirations may be reciprocally linked within a self-sustaining trap. By studying a model in which individuals choose a level of effort to minimize their aspirations gap, Ray (2003) and Genicot and Ray (2009) show that individual investment efforts should be minimal for both high and low aspiration gaps. In both these papers, the aspirations neighborhood of an individual is taken as exogenous and as aspirations are formed as a function of an individual's exogenous aspirations neighborhood, Genicot and Ray (2009) assume that aspirations is the psychological channel by which extrinsic circumstances affect individual choices and play a role in perpetuating poverty traps.

Bannerjee and Mullainathan (2010) also examine poverty traps in model where poorer individuals

allocate a higher proportion of their income to temptation goods relative to individuals with a higher income. A key assumption in their analysis relates to the shape of temptation viewed as a function of overall consumption so that temptation is assumed to be the psychological channel by which extrinsic circumstances affect individual choice and thus perpetuate poverty traps.

is another closely related paper. They study a model of aspiration traps where an individual in period $t = 0$ makes a choice which will affect her attitude for the rest of her life:

Our paper is also related to the literature on endogenous reference points (Shalev (2000), Koszegi (2005), Koszegi and Rabin (2006) and (2007), Heifetz and Minelli (2006), Dalton and Ghosal (2010)). However, in this paper, we not only show that multiple, payoff ranked outcomes are possible (a result already obtained in the previous literature), we also specify a selection mechanism to account for why individuals would converge to a payoff dominated outcome to perpetuate initial disadvantage and also the different ways in which reference may be manipulated (eg role models).

Our paper is also related to the literature of relative deprivation because the concept of poverty we use is a relative one.[8] It is also related to the literature of empowerment, since it provides an analytical framework to support the theoretical ideas of empowerment.[9] As in the literature of neighborhood effects (Durlauf, 2003), we also obtain the result that persistence in economic status could be generated by group-level influences on individuals, although unlike that literature, we focus on aspirations as the transmission mechanism.

That aspirations adapt to chosen actions also appears in a strategic context in the literature of reinforcement learning in games where agents adapt by comparing payoffs achieved from actions chosen in the past relative to an aspiration level. (See for instance Bendor, Mookherjee and Ray, 2001 or Karandikar et al, 1998).

Finally, our paper is related to some specific particular models that take identity issues into consideration to study poverty and social exclusion, such us Akerlof and Kranton (2000), Hoff and Pandey (2004) or Hoff and Sen (2005)

4 A model of internal constraints

4.1 Set-up

We study a single decision maker, characterized by an initial social status, who has to choose a costly action that determines the probability distribution over achieved or final social status. The

[8] See Stark and Taylor (1991) for a general introduction to relative deprivation, Deaton (2001) for an application to health, Stark (2006) for an application to growth. For empirical papers on relative deprivation, see Duclos and Philippe (2002), Satya (1991), Berrebi and Silber (1985) among others.

[9] See for instance Stern (2004), World Bank (2002), or Alsop and Heinsohn (2005)

aspiration of the individual is defined as the expected social status given her chosen action and is modelled as a reference point that affects the benefit the individual obtains from her final social status.

The notation is as follows:

- Initial status: $\theta_0 \in \Theta \subset \Re$;
- Aspirations: $g \in \Theta$;
- Action: $a \in A \subset \Re$;
- Final or achieved status: $\theta \in \Theta$;
- The prior distribution over final status given action a: $p(\theta, a)$.

We will assume that Θ is closed bounded interval (so that $\Theta = \left[\underline{\theta}, \overline{\theta}\right]$) and A is a closed, bounded set (possibly finite). All payoff relevant functions will be assumed to be continuous.

Payoffs of the decision-maker over actions is described by the utility function

$$u(a, g, \theta_0) = \int_{\theta \in \Theta} p(\theta, a) b\left(\theta, g\right) d\theta - c\left(a, \theta_0\right)$$

where $b(\theta, g)$ is the benefit that the individual obtains from the achieved social status given her goal g and $c\left(a, \theta_0\right)$ is the cost of action which is assumed to depend on the initial social status of the individual. Note that in our formulation, beliefs over final status are a function of chosen actions only: in other words, we do not make a direct assumption on how extrinsic circumstances might affect psychological variables (beliefs, aspirations): we will derive such a link.

Using individual data from Switzerland on reported life satisfaction as a proxy measure for utility and income evaluation measures as a proxy for aspiration levels, Stutzer (2004) provides evidence that payoffs are increasing in income and decreasing in aspirations. In recent work, Abeler et. al. (2010) have shown in a lab setting that goals will enter preferences as a reference point and that goals and effort provision are complements.

We will assume that the benefit function can be written as

$$b(\theta, g) = \beta(\theta) + v(x)$$

where $\beta(\theta)$ is increasing in θ (so that the decision-maker gets a direct payoff gain when her final status is higher rather than lower) and $v(x)$ is a S-shaped, loss averse Kahneman-Tversky value function, defined over *relative* gains and losses $x = \frac{\theta - g}{\theta}$ (i.e. the gain or loss $\theta - g$ expressed as a proportion of θ the achieved social status). Specifically, we assume that $v(x)$ is (i) concave and differentiable over gains, (ii) convex and differentiable over losses, and (iii) loss averse i.e. steeper over losses than over gains so that 0 is the kink point for the value function.

It will be convenient to make the following assumption on the value function which limits the convexity of the value function over (relative) losses:

Assumption 1: $-v''(x)(1-x)+v'(x)\geq 0$ for all $x<0$.

Note that assumption 1 is automatically satisfied when the value function is linear over losses. Consider the following value function

$$v(x)=\begin{cases} Kx-x^2, \text{ if } x>0 \\ -K(-x)+b(-x)^2, \ b>1 \text{ if } x\leq 0. \end{cases}$$

By computation, it is verified that this value does satisfy the condition $-v'(x)(1-x)+v'(x)\geq 0$ iff $K>2b(1+2b(\overline{\theta}-\underline{\theta}))$ so that the set of value functions that satisfy assumption 1 is non-null.

The following proposition characterizes the properties of the above benefit function $b(\theta,g)$.

Proposition 1: *$b(\theta,g)$ is increasing in θ. When assumption 1 is satisfied, for $\theta'\geq\theta$, $g'\geq g$, $b(\theta',g')-b(\theta,g')\geq b(\theta',g)-b(\theta,g)$ i.e. the benefit function satisfies increasing differences in θ and g.*

Proof. See appendix. ■

Proposition 1 shows that under assumption 1, the incremental relative gain from enhanced social status is increasing in aspirations, a key complementarity characterization of the benefit function that will be in the remainder of the paper.

When assumption 1 is violated, it is easily checked that for $\theta'\geq\theta$, $g'\geq g$, $b(\theta',g')-b(\theta,g')\geq b(\theta',g)-b(\theta,g)$ only when $\theta'\geq g$; otherwise, if both $\theta,\theta'<g$, then $b(\theta',g')-b(\theta,g')\leq b(\theta',g)-b(\theta,g)$ (decreasing differences in θ,g) so that the the incremental relative gain from enhanced social status is decreasing in aspirations when aspirations are too high to begin with.

Although for the sake of concreteness, we have modelled the benefit function using Kahneman-Tversky value functions, a number of other functional forms for the benefit function would also satisfy Proposition 1. An example is $b(\theta,g)=\beta\theta-\beta'\left|\frac{\theta-g}{\theta}\right|$ where $\beta>\beta'>0$[10].

Next, we explicitly model the aspirations of the individual. According to MacLeod (1995, p.15) "aspirations reflect individual's view of his or her own chances for getting ahead and are an internalization of objective probabilities [...] [aspirations] are acquired in the "habitus" of the individual." Consistent with this view, we model aspirations, g, as the expected status given individual's actions and her initial status:

$$g=\int_{\theta\in\Theta}p(\theta,a)\theta d\theta=\pi(a)$$

Note that this formulation has the desirable feature that, in the absence of uncertainty when final status is a deterministic function of actions, the aspiration level of the individual is simply the final status she will achieve given her actions. Of course, with uncertainty, captured by the prior beliefs

[10] A different example is $b(\theta,g)=C\theta-\left(\frac{\theta-g}{\theta}\right)^2$, for large but finite $C>0$. Unlike the case with value functions, both these functions are symmetric in that gains and losses in the final social status relative to an aspiration level are treated in the same way.

$p(\theta, a)$, the individual will only be able to aspire to (and calculate) the expected final status given her actions.

Consistent with Simon (1955) and Selten (1998), the above formulation allows aspirations to adapt to actions chosen by individuals, an old idea in psychology (Helson (1964), Brickman and Campbell (1971), Parducci (1995)) and has recently been empirically validated by economists (eg. Clark et. al. (2008) amongst others).

At this point, it is convenient to state the following assumption that will be used throughout the paper:

Assumption 2: *(i)* $p(\theta, a')$ first order stochastically dominates $p(\theta, a)$ whenever $a' \geq a$; *(ii)* $c(a)$ is increasing in a.

For a fixed initial social status, assumption 2*(i)*, together with assumption 2*(ii)*, states that the probability of achieving a higher social status increases when the decision-maker chooses a costlier action.

4.2 Internal constraints

Throughout this part of the paper, we assume that the decision-maker takes her prior beliefs and initial status $p(.), \theta_0$ as given when choosing her actions. In order to model an internally constrained decision-maker, we will distinguish between behavioral and standard solutions to the underlying decision problem.

4.2.1 Behavioral decisions

The first solution concept assumes that although aspirations of the individual adapt to her actions, the individual does not internalize the implications of such an adaptive process on her payoffs fully when she makes a decision. On the contrary, she takes her aspirations as given when choosing her actions. Easterlin (2005), in the context of material aspirations, provides evidence of such a failure to internalize the adaptation of aspirations to actions.

We will require that in any decision outcome aspirations and actions are mutually consistent. We label this situation a behavioral decision problem (BDP). An outcome of a BDP can be interpreted as the steady state of an adaptive mechanism in which the aspiration level at $t+1$ depends on action chosen at t but the individual myopically does not anticipate the adjustment of aspirations to chosen actions at t. Such an adaptive process is implicit in Simon (1955) and Selten (1998) in their discussion of solutions to decision-problems where aspirations affect choices.

In a behavioral decision, the decision-maker chooses a, while taking g as given, to solve

$$Max_{a\in A}u(a,g,\theta_0)=\int_{\theta\in\Theta}p(\theta,a)b\left(\theta,g\right)d\theta-c\left(a,\theta_0\right)$$

Let $a(g,\theta_0)$ denote the set of payoff maximizing actions.

Definition 1: A *Behavioral Solution* is a pair (a^*,g^*) such that (i) $a^*\in a(g^*,\theta_0)$ and (ii) $g^*=\pi(a^*)$.

In a behavioral solution the individual takes her aspirations as given although the chosen action and the aspirations have to be mutually consistent via the feedback $\pi(.)$. Therefore, at a behavioral solution, the individual does not internalize the feedback from actions to aspirations and imposes an externality on herself[11].

Let $E\left(\theta_0\right)$ denote the set of behavioral solutions. The following useful result clarifies the structure of the set of behavioral solutions and provides an explicit characterization of this set.

Proposition 2: *Suppose assumptions 1 and 2 are satisfied. Then, payoffs satisfy the property of increasing differences in* (a,g) *and it follows that there exists a minimal and maximal element in* $a(g,\theta_0)$, $\underline{a}(g,\theta_0)$ and $\overline{a}(g,\theta_0)$, both of which are *increasing in* g. *Moreover, there exists a minimal and maximal elements in* $E\left(\theta_0\right)$, $\left(\underline{a}^*(\theta_0),\underline{g}^*(\theta_0)\right)$ and $(\overline{a}^*(\theta_0),\overline{g}^*(\theta_0))$.

Proof. See appendix. ■

Proposition 2 shows that at a behavioral solution, the action chosen by the individual is increasing in her aspirations. Note that it is straightforward to construct examples where behavioral solutions may be payoff ranked so that the maximal solution namely the one with highest action and highest aspirations payoff dominates all other solutions. Therefore, if multiple solutions exist there is the possibility that internal constraints may bind resulting in aspirations failure[12].

4.2.2 Standard decisions

The second solution concept is that of standard decision problems (SDP) where the decision-maker internalizes the fact that her aspirations are a function of her chosen actions as they are nothing but the expected final status given her actions. The idea here is that the individual is farsighted. She anticipates that her aspirations at $t+1$ are affected by the action chosen at t, and taking this into account, she chooses her optimal action. We do not claim that actual individuals behave like this. Rather, this provides us with a normative benchmark against which the outcomes of a behavioral decision can be evaluated. We formalize the concept of a *standard* solution in the following definition:

[11] See Dalton and Ghosal (2010) for a general model that works out the consequences of this point.

[12] Note, however, that merely asserting the possibility of multiple solutions may not be sufficient to assert that there will be aspirations failure: it will still have to be argued why the decision-maker converges to a payoff dominated solution. For the moment, we merely note that an aspirations failure is a possibility and we will return to this issue in greater detail below.

Definition 2. A *standard* solution is a pair $(\hat{a}, \hat{g})$ such that

$$\hat{a} \in \arg\max_{a \in A} m(a, \theta_0) = \int_{\theta \in \Theta} p(\theta, a) b\left(\theta, \pi(a)\right) d\theta - c\left(a, \theta_0\right)$$

and

$$\hat{g} = \pi(\hat{a}) = \int_{\theta \in \Theta} p(\theta, \hat{a}) \theta d\theta$$

In contrast to a behavioral solution, in a standard solution the individual internalizes the feedback from actions to aspirations and chooses the action accordingly.

Let $M\left(\theta_0\right)$ denote the set of standard solutions. The following proposition provides a characterization of standard solutions:

Proposition 3. *There exists a standard solution. The payoff at any standard solution is at least as great as the payoff at behavioral solution.*

Proof. See appendix. ■

Proposition 3 shows that a standard solution always (weakly) welfare dominates a behavioral solution. By definition, all standard solutions yield the same payoff.

4.2.3 Internally constrained decision-making

Note that the payoff to the individual at a standard solution sets a normative benchmark against which the payoffs of a behavioral decision can be compared. This motivates the definition of an internal constraint studied below.

We are now in a position to state the following definition:

Definition 3. An individual is *internally constrained* at a behavioral solution (a^*, g^*) whenever $(a^*, g^*) \notin M\left(\theta_0\right)$.

The above definition can be justified on the grounds that by Proposition 2 the payoff at any standard solution is (weakly) greater than the payoff at behavioral solution. Therefore, if the maximal behavioral solution isn't also a standard solution, the individual is always internally constrained.

When the individual is choosing an action behaviorally, if $E\left(\theta_0\right) \cap M\left(\theta_0\right)$ is empty, the above definition implies that the individual is always internally constrained. Even if the maximal behavioral solution is a standard solution, as long as there are multiple behavioral solutions, there is the possibility that the decision-maker is internally constrained.

Our characterization of an internally constrained individual is closely related to the notion of "personal autonomy". Autonomy is considered a basic psychological need (see Ryan and Deci, 2006) and it has been linked to human capital and welfare (Woo, 1984)). Elster (1983) defines autonomous preferences (or desires) as those "that have been deliberately chosen, acquired or modified –either by an act of will or by a process of character planning" (pp. 22). As Ryan and Deci (2006) illustrate,

a man who decides to "have another drink" would not be autonomous unless, in reflecting on this motive, he could fully endorse it.

In our framework, a standard solution models autonomous choice. Therefore, in our model, an internally constrained individual is one whose failure to internalize the feedback from actions to aspirations (i.e. individuals who solve a behavioral decision) results in a reduced payoff (relative to the normative benchmark of a standard solution)[13].

This leads us to ask the following question: what is the necessary and sufficient condition for a behavioral solution (a^*, g^*) not to be a standard solution i.e. $(a^*, g^*) \notin M(\theta_0)$? Clearly such a condition will ensure that the decision-maker is *always* internally constrained.

To this end, consider the following condition:

C: For (a, g), (a', g') such that $g = \pi(a)$ and $g' = \pi(a')$, if $u(a, g) \geq u(a', g)$, then $u(a, g) \geq u(a', g')$.

Condition (C) states that if the action a weakly payoff dominates the action a' at $g = \pi(a)$, then the pair (a, g) also weakly dominates the pair (a', g') where $g' = \pi(a')$.

In the following proposition, we show that whenever (C) is violated at a behavioral solution (a^*, g^*), the individual is internally constrained.

Proposition 4. *A behavioral solution (a^*, g^*) is also a standard solution if and only if (C) holds.*

Proof: See appendix. ■

In order to interpret just how restrictive condition (C) is it will be convenient to use first-order conditions can be used to characterize both a behavioral solution and a standard solution. We will need to assume that A is a continuous variable contained a convex and compact set.

However, in addition, there is a technical difficulty which we need to be careful about.

As 0 is a kink-point of the value function, the value function isn't differentiable in g. Essentially, we will need to work with the subgradient[14] of $v(.)$ (and $u(.)$ and $m(.)$) and note that at an action a is an interior solution to a standard decision problem optimum if and only if 0 is contained in the subdifferential of $m(.)$ at a and for each fixed g, an action a is an interior optimum of $u(.)$ if and only if 0 is contained in the subgradient (with respect to a) of $u(.)$ at a (Hiriart-Urruty and Lemarechal

[13] Note that our framework is consistent with a scenario where the decision-maker partially internalises the feedback from actions to aspirations with probability λ. In such scenario, the individual in a behavioral decision chooses actions to maximize $\tilde{u}(a, g, \theta_0) = \lambda u(a, g, \theta_0) + (1 - \lambda)v(a, \theta_0)$.

[14] A vector g is a subgradient $f : \Re^n \to \Re$ at x in the domain of f if for all z in the domain of f, $f(z) \geq f(x) + g^T(z - x)$. A function f is called subdifferentiable at x if there exists at least one subgradient at x. The set of subgradients (a closed convex set) of f at the point x is called the subdifferential of f at x, and is denotyed as $\partial f(x)$. A function is called subdifferentiable if is subdifferentiable at all points in its domain. Subdifferentials obey mnost of the same rules as differentials and in partcular, the sum rule and the chain rule.

(2001)). Subgradients will be well defined $v(.)$ is piece-wise linear or if, as we have already assume the limit of the derivative of the value function over losses is well-defined as losses go to zero and limit of the derivative of the value function over gains is well-defined as gains go to zero.

It follows that a standard solution must satisfy

$$0 \in \partial_a m(\hat{a}, \theta_0)$$

while a behavioral solution must satisfy

$$0 \in \partial_a u(a^*, g^*, \theta_0),\ g^* = \left(\int_{\theta \in \Theta} p(\theta, a^*) \theta d\theta \right).$$

The following proposition clarifies the link between a behavioral solution and a standard solution in this setting:

Proposition 5. $0 \notin \partial_a m(a^*, \theta_0)$ i.e. *the decision-maker is always internally constrained.*

Proof: See appendix. ■.

Proposition 5 makes the point that in our semi-smooth setting where some version of first-order conditions can be used to characterize solution to both behavioral and standard decision problems, condition (C) is never satisfied and the decision-maker is *always* internally constrained. However, as we shall see below, there are situations where a non-empty subset of behavioral solutions could be a standard solution. In such cases, to ensure that the individual is internally constrained, we will have to show why an individual will end selecting the payoff dominated behavioral solution. We present such an argument below in the next subsection.

4.3 Internal constraints and extrinsic circumstances

So far, we have examined decision-making and internal constraints for a fixed initial status θ_0. As the review of the evidence on internal constraints in Section 2 suggests, an individual is more likely to be internally constrained is she is is poor than if she is rich. In this part of the paper, using the model of internal constraints developed above, we will *derive* the link between initial disadvantage and internal constraints.

To this end, we will make two assumptions. To begin with we will assume that $c(a, \theta_0')$ satisfies decreasing differences in a, θ_0' so that an individual with a higher initial status assesses a lower incremental cost of choosing an action that improves the likelihood of achieving a higher final state than a poorer individual. Formally, we make the following assumption:

Assumption 3: $c(a, \theta_0')$ first order satisfies decreasing differences in a, θ_0'.

The next proposition clarifies how the set of behavioral solutions behaves as initial status changes:

Proposition 6. *The minimal and maximal elements in* $E(\theta_0)$, $\left(\underline{a}^*(\theta_0), \underline{g}^*(\theta_0)\right)$ and $\left(\overline{a}^*(\theta_0), \overline{g}^*(\theta_0)\right)$, *are increasing in* θ_0.

Proof: See appendix. ■.

Proposition 6 shows that the set of behavioral solutions is (weakly) increasing in the initial social status of the individual, θ_0, so that both higher aspirations and higher actions (which, in turn, have higher likelihood of changing status quo) are associated with higher initial status. In this sense, already an individual with a lower initial social status is at a disadvantage relative to an individual with a higher social status as the former is will have, in general, both lower aspirations and a lower probability of changing status quo consistent with the possibility of a poverty trap.

The above proposition tells us that the set of behavioral solutions is weakly increasing in initial status: it still doesn't tell us why internal constraint is more likely to bind for a poorer individual. Is there a selection mechanism which entails that the individual will converge to a payoff dominated behavioral solution?

To answer this question, consider the case where the individual has a finite number of available actions so that $A = \{a_1, ..., a_N\}$ with $a_n < a_{n+1}$, $n = 0, 1, ..., N-1$ and suppose Θ is a compact interval interval $\left[\underline{\theta}, \overline{\theta}\right]$. For each action a_n let

$$g_n = \int_{\theta \in \Theta} p(\theta, a_n) \theta d\theta.$$

By first order stochastic dominance note that $g_n < g_{n+1}$, $n = 0, 1, ..., N-1$. Assume that each behavioral solutions is strict so that all pairs $\{(a_k, g_k) : 1 \leq k \leq K\}$ which are behavioral solutions have the property that $u(a_k, g_k, \theta_0) > u(a, g_k, \theta_0)$ for all $a \in A$. Assume that the behavioral solution (a_k, g_k) is payoff dominated by $(a_{k'}, g_{k'})$ whenever $k < k'$. Finally, we assume that (a_K, g_K) is also a standard solution so that any other decision outcome corresponds to an internally constrained individual.

Define a sequence $\{\tilde{g}_k(\theta_0) : 0 \leq k \leq K\}$ where for each $k \geq 1$, $k < K$, $\tilde{g}_k(\theta_0)$ solves the equation

$$\begin{aligned} & \int_{\theta \in \Theta} p(\theta, a_{k+1}) b(\theta, g) \, d\theta - c(a_{k+1}, \theta_0) \\ = & \int_{\theta \in \Theta} p(\theta, a_k) b(\theta, g) \, d\theta - c(a_k, \theta_0). \end{aligned}$$

with $\tilde{g}_0(\theta_0) = \underline{\theta}$ and $\tilde{g}_K(\theta_0) = \overline{\theta}$. Observe that under assumption 2, as $c(a, \theta_0)$ satisfies decreasing differences in a, θ_0, the right hand side of the equation (derived by re-arranging terms in the preceding equation)

$$\begin{aligned} & \int_{\theta \in \Theta} \left(p(\theta, a_{k+1}, \theta_0) - p(\theta, a_k, \theta_0)\right) b(\theta, g) \, d\theta \\ = & \; c(a_{k+1}, \theta_0) - c(a_k, \theta_0). \end{aligned}$$

is decreasing in θ_0. Therefore, $\tilde{g}_k(\theta_0)$ is decreasing in θ_0 for each $k \geq 1$, $k < K$.

By construction, note that for each k and $g' \in (\tilde{g}_{k-1}(\theta_0), \tilde{g}_k(\theta_0))$, $a_k \; u(a_k, g', \theta_0) > u(a, g', \theta_0)$ for all $a \in A$ so that a_k is the unique best response. Therefore, $(\tilde{g}_{k-1}(\theta_0), \tilde{g}_k(\theta_0))$ is the basin of attraction of the behavioral decision (a_k, g_k).

Suppose there is some initial value of g_0 generated by some pdf $f(g)$ (with associated cdf $F(g)$) over Θ. Then if $g_0 \in (\tilde{g}_{k-1}(\theta_0), \tilde{g}_k(\theta_0))$, the individual will choose a_k and there will end up with an aspiration level g_k i.e. the behavioral decision (a_k, g_k). Therefore, the probability with which the internal constraint binds (i.e. g_0 is not in the basin of attraction of the behavioral decision (a_K, g_K)) is the probability that $g_0 < \tilde{g}_{K-1}(\theta_0)$ which is $F(\tilde{g}_{K-1}(\theta_0))$. As $\tilde{g}(\theta_0)$ is decreasing in θ_0, the probability that internal constraint binds, $F(\tilde{g}(\theta_0))$, is decreasing in θ_0.

Therefore, *the lower is the initial status of the individual the greater is the probability that the internal constraint binds and in a behavioral decision.*

The preceding discussion can be summarized in the following proposition:

Proposition 7: *The greater the disadvantage (measured in terms of initial status) of the decision-maker, the greater is the likelihood that the internal constraint binds i.e. aspirations failure occurs.*

This result precisely reflects MacLeod (1995) description of his ethnographical studies on aspirations in deprived neighborhoods: "a lower class child growing up in an environment where success is rare is much less likely to develop strong ambitions than is a middle-class boy growing up in a social world of people by those who have “made it” and where the connections between effort and reward is taken for granted" (p.15)

Both θ_0 and/or $F(.)$ can interpreted as a characteristic of the individual being studied. For example an individual who has a low social status but has the right motivation could tend to do better than another low status individual with low motivation. From a policy perspective, the relevant instruments will attempt to address both θ_0 and/or $F(.)$. For example changes in θ_0 could correspond to things like changes in initial wealth (social status, health, location, nutrition, housing etc.) of an individual while changes in $F(.)$ could correspond to process by which the initial aspirations levels.

One way to raise the aspirations of all individuals belonging to a disadvantaged group would be to alter the behavior of a carefully chosen subset of such individuals. A different way would be to raise the self-confidence of a disadvantaged individual directly. The two case studies, Classical Music Orchestras for children from disadvantaged backgrounds and the decrease in the HIV infections in Sonagachi (Kolkata's oldest and best established red-light district), discussed in greater detail in Section 5, illustrate the above points.

5 Role models, cognitive neighborhoods and the transmission of aspirations

In practice, one way of raising aspirations (i.e. relaxing the internal constraint directly) is by observing role models (Rao and Walton, 2004): individuals draw on the aspirations of their cognitive neighbors and, in this sense, role models may become an important variable in the formation of their aspirations. But what determines which other individuals are cognitive neighbors and, thus, potential role models of the decision-maker? We will address this question in this section.

5.1 A simplified model of aspirations failure

To fix matters, throughout this section we will focus an extremely simplified version of the general model studied in the preceding section. Let the individual choose between just two actions, $A = \{\underline{a}, \overline{a}\}$. Let $\underline{g}(\theta_0) = \pi(\underline{a}, \theta_0)$ and $\overline{g}(\theta_0) = \pi(\overline{a}, \theta_0)$. Let $\tilde{g}(\theta_0)$ solve the equation

$$\begin{aligned} & \int_{\theta \in \Theta} p(\theta, \overline{a}) b(\theta, g)\, d\theta - c(\overline{a}, \theta_0) \\ = & \int_{\theta \in \Theta} p(\theta, \underline{a}) b(\theta, g)\, d\theta - c(\underline{a}, \theta_0). \end{aligned}$$

and assume that (i) $\underline{g}(\theta_0) < \tilde{g}(\theta_0) < \overline{g}(\theta_0)$ so that both $(\overline{a}, \overline{g}(\theta_0))$ and $\left(\underline{a}, \underline{g}(\theta_0)\right)$ are behavioral solutions, and (ii) $(\overline{a}, \overline{g}(\theta_0))$ is the unique standard solution and that the individual is located at $\left(\underline{a}, \underline{g}(\theta_0)\right)$. Clearly, in this case, $(\overline{a}, \overline{g}(\theta_0))$ payoff dominates $\left(\underline{a}, \underline{g}(\theta_0)\right)$ so that the latter decision outcome corresponds to that of an internally constrained individual.

To further simplify matters, assume that at $p(\theta_0, \underline{a}) = 1$ and $p\left(\theta', \underline{a}\right) = 0$ for all $\theta' \neq \theta_0$ so that choosing action $\underline{a}$ results in the individual perpetuating her initial status. In addition, $p(\theta_0 + \Delta, \overline{a}) = p$, $p(\theta_0, \overline{a}) = 1 - p$ and $p\left(\theta', \overline{a}\right) = 0$ for all $\theta' \notin \{\theta_0, \theta_0 + \Delta\}$ so that at $\overline{a}$, the individual attaches a probability p to improve her initial status by a discrete amount Δ while she believes that she will remain at her initial social status with probability $1 - p$.

Further, for ease of exposition, it is convenient to normalize payoffs so that $b\left(\theta_0, \underline{g}(\theta_0)\right) = c(\underline{a}, \theta_0) = 0$ and her payoff at $\left(\underline{a}, \underline{g}(\theta_0)\right)$ is set equal to zero. Under these assumptions observe that:

(i) $\left(\underline{a}, \underline{g}(\theta_0)\right)$ corresponds to an aspirations trap: as $\underline{g}(\theta_0) = \theta_0 < \tilde{g}(\theta_0)$ she aspires to remain at her initial social status and actually remains there;

(ii) $(\overline{a}, \overline{g}(\theta_0))$ corresponds to a scenario with raised aspirations: $\overline{g}(\theta_0) = \theta_0 + p\Delta > \tilde{g}(\theta_0)$ so that she aspires to improve her initial status and believes she can do so with probability p.

Clearly $\tilde{g}(\theta_0)$ is decreasing in θ_0. If some initial value of g_0 is generated by some pdf $f(g)$ (with associated cdf $F(g)$) over Θ. Then,

(i) if $g_0 < \tilde{g}(\theta_0)$, the individual will choose $\underline{a}$ and there will end up with an aspiration level $\underline{g}$ i.e.$(\underline{a}, \underline{g})$ selected;

(ii) if $g_0 \geq \tilde{g}(\theta_0)$, the individual will choose $\overline{a}$ and there will end up with an aspiration level $\overline{g}$ i.e. $(\overline{a}, \overline{g})$ selected

As $\tilde{g}(\theta_0)$ is decreasing in θ_0, the probability that internal constraint binds i.e. the individual is located in an aspirations trap, $F(\tilde{g}(\theta_0))$, is decreasing in θ_0.

5.2 Similarity based learning and endogeneous cognitive windows

So consider an internally constrained individual located in an aspirations trap. How does a role model come into the picture? The role model comes into the picture as an external signal. Suppose the individual observes an external signal which consists in the following information about a different individual: the initial status, θ_0', action $\overline{a}$ and achieved social state $\theta_0' + \Delta$. We say that this individual becomes a role model when the internally constrained individual located in an aspirations trap chooses the action $\overline{a}$ after observing the signal, i.e. the individual becomes inspirational. When does it happen? Will any external signal convinces a "fatalistic" individual to choose an action that shifts her to a better equilibrium? If not, what are the conditions under which this happens?

Social psychologists have studied these concerns for decades, and have consistently highlighted the similarity of others as an important aspect for the transmission of aspirations (e.g. Lockwood and Kunda, 1997). There are countless programs showcasing the successes of a superior individual that are designed to boost the aspirations of a particular target group with similar initial conditions. For example, prominent women scientists are often invited to address high school girls or eminent African Americans are introduced to African American children. Moreover, not only similarity has been shown to be an important aspect for the transmission of aspirations, but also research have confirmed that social comparison is an endogenous process (e.g., Festinger, 1954, Goethals & Darley, 1977; Wood, 1989). That is, people *choose* to compare only with similar others and avoid comparisons with dissimilar others.

In order to model the conditions under which an external signal serves as a role model, following Gilboa and Schmeidler (2001), we endow the individual with a similarity function $s : \Theta \times \Theta \to [0, 1]$ where $s(\theta_0, \theta_0') = 0$ denotes no similarity and $s(\theta_0, \theta_0') = 1$ denotes full similarity. This function provides a quantification of the decision-maker's similarity assessment of how similar her own initial status is relative to the initial status of the potential role model. We assume that assessing the similarity across different pairs of initial status is the main cognitive task of the decision-maker. Importantly, the similarity function is subjective in the same sense in which probabilities are subjective in expected utility theory. Gilboa and Schmeidler (2001) provide an axiomatic treatment

of choice determined by similarity weighted payoff estimation.[15] A continuous similarity function that is consistent with Gilboa and Schmeidler (2001) is:

$$s\left(\theta_0', \theta_0\right) = 1 - \frac{\left|\theta_0' - \theta_0\right|}{\left|\overline{\theta} - \underline{\theta}\right|}$$

Consistent with the above similarity function, we assume that $s\left(\theta_0, \theta_0\right) = 1$ and that $s\left(\theta_0', \theta_0\right)$ is decreasing in the distance between θ_0' and θ_0.

Fix the external signal $\left(\theta_0', \overline{a}, \theta_1' = \Delta + \theta_0'\right)$. Given a similarity function, the decision-maker updates her payoffs from choosing $\overline{a}$ as follows:

$$\begin{aligned} & s\left(\theta_0', \theta_0\right)\left[b\left(\Delta + \theta_0, \underline{g}\left(\theta_0\right)\right) - c\left(\overline{a}, \theta_0\right)\right] + pb\left(\Delta + \theta_0, \underline{g}\left(\theta_0\right)\right) - c\left(\overline{a}, \theta_0\right) \\ = \quad & \left(s\left(\theta_0', \theta_0\right) + p\right) b\left(\Delta + \theta_0, \underline{g}\left(\theta_0\right)\right) - \left(1 + s\left(\theta_0', \theta_0\right)\right) c\left(\overline{a}, \theta_0\right) \end{aligned}$$

which, after an affine transformation of payoffs, is equivalent to

$$\frac{s\left(\theta_0', \theta_0\right) + p}{1 + s\left(\theta_0', \theta_0\right)} b\left(\Delta + \theta_0, \underline{g}\left(\theta_0\right)\right) - c\left(\overline{a}, \theta_0\right)$$

This has the interpretation that after observing the external signal, the decision-maker has updated her prior beliefs so that her posterior beliefs of changing her social status is:

$$p_1 = \frac{s\left(\theta_0', \theta_0\right) + p}{1 + s\left(\theta_0', \theta_0\right)}$$

and with probability $1 - p_1$ she believes that she will remain at her initial social status.

As p_1 is increasing in $s\left(\theta_0', \theta_0\right)$ so that $p_1 \geq p_0$ with the strict inequality whenever $s\left(\theta_0', \theta_0\right) > 0$. Therefore, the updating of priors after observing the external signal is an example of similarity based learning.[16]

[15] We note that there may be an objective element in the assessment of similarity. The problem is familiar from econometrics where one might want to infer the conditional distribution $p\left(y \in A | x_0\right)$ where the sample frequency of x_0 is zero i.e. $p(x_0) = 0$. Assume that all variables are unidimensional. In such scenarios, it is standard in econometrics to use a uniform kernel estimate (Hardle, 1990; Manski, 1995) which is an estimate of the sample frequency with which $y \in A$ amongst those observations x_i such that $|x_i - x_0| < d$ (where d is the sample specific bandwidth chosen to confine attention to those observations in which x_i is close to x_0). In a sample with n observations, the expression for the uniform kernel estimate is

$$\frac{\sum_{i=1}^{N} \mathbf{1}\left(y \in A\right) \mathbf{1}\left(|x_i - x_0| < d\right)}{\sum_{i=1}^{N} \mathbf{1}\left(|x_i - x_0| < d\right)}.$$

Then, the uniform kernel estimate corresponds to a "bandwidth" similarity function where

$$s\left(\theta_0', \theta_0\right) = \begin{cases} 1, \text{ if } \left|\theta_0' - \theta_0\right| \leq d \\ 0, \text{ otherwise} \end{cases}$$

[16] Remark that in the case when $n = 1$ (the case of a single role model, the case studied so far), $\Theta = \left[\underline{\theta}, \overline{\theta}\right] \subset \Re$ with the interpretation that x_0 corresponds to θ_0, x_i corresponds to θ_0' and $y \in A$ corresponds to achieving Δ', the expression for p_1 reduces to uniform kernel estimate for the "bandwidth" similarity function.

After observing the external signal, the decision-maker will choose $\overline{a}$ iff

$$\frac{s\left(\theta_0', \theta_0\right) + p}{1 + s\left(\theta_0', \theta_0\right)} b\left(\Delta + \theta_0, \underline{g}\left(\theta_0\right)\right) - c\left(\overline{a}, \theta_0\right) \geq 0$$

or equivalently

$$\frac{s\left(\theta_0', \theta_0\right) + p}{1 + s\left(\theta_0', \theta_0\right)} \geq \hat{p}\left(\theta_0\right) = \frac{c\left(\overline{a}, \theta_0\right)}{b\left(\Delta + \theta_0, \underline{g}\left(\theta_0\right)\right)}$$

Observe that as $s\left(\theta_0', \theta_0\right) \to 0$, $p_1 \to p$. Moreover, if $s\left(\theta_0', \theta_0\right) \cong 1$, $p_1 \cong \frac{1+p}{2}$. Therefore, even when $s\left(\theta_0', \theta_0\right) = 1$, the external signal serves as a role model iff $\frac{1+p}{2} \geq \hat{p}\left(\theta_0\right)$. Specifically, whenever $\hat{p}\left(\theta_0\right) > \frac{1+p}{2}$, the individual located at θ_0 will never learn from observing an external signal.

More interesting note that if $\lim_{s\left(\theta_0', \theta_0\right) \to 0} \frac{s\left(\theta_0', \theta_0\right) + p}{1 + s\left(\theta_0', \theta_0\right)} = p < \hat{p}\left(\theta_0\right)$. It follows that as long as $s\left(\theta_0', \theta_0\right)$ is (weakly) decreasing in the distance between θ_0' and θ_0 there is an endogenous upper bound to the cognitive window of the individual which can be computed from the inequality

$$s\left(\theta_0', \theta_0\right) \geq \frac{\hat{p}\left(\theta_0\right) - p}{1 - \hat{p}\left(\theta_0\right)}.$$

As the fraction on the rhs of the preceding inequality is increasing in $\hat{p}\left(\theta_0\right)$. As $\hat{p}\left(\theta_0\right) = \frac{c\left(\overline{a}, \theta_0\right)}{b\left(\Delta + \theta_0, \underline{g}\left(\theta_0\right)\right)}$, it follows that the size of the cognitive window of the individual located at θ_0 is decreasing when

(i) the cost of choosing the action $\bar{a}$ is higher;

(ii) the benefit of achieving a higher final status is low when the individual has low aspirations is lower;

(iii) the prior beliefs of the individual are more pessimistic.

Note that for the individual who consists of the external signal to choose $\overline{a}$, it must be the case that she attaches a sufficiently high probability to alter her initial status in the first place i.e. $p' \geq \hat{p}\left(\theta_0'\right)$ where p' is the initial belief of the individual in question. It follows that the ideal role model is one with a similar initial status to the decision-maker but a much higher self-confidence than the decision-maker locked in an aspirations trap.

The following proposition summarizes the above discussion:

Proposition 8. *Suppose* $p' \geq \hat{p}\left(\theta_0'\right)$ but $p < \hat{p}\left(\theta_0\right)$, *the external signal will be a role model if and only if* $p < \hat{p}\left(\theta_0\right) \leq \frac{s\left(\theta_0', \theta_0\right) + p}{1 + s\left(\theta_0', \theta_0\right)}$. *As long as* $s\left(\theta_0', \theta_0\right)$ *is (weakly) decreasing in the distance between* θ_0' *and* θ_0 *the size of the cognitive window of the individual located at* θ_0 *is implicitly defined by the inequality* $s\left(\theta_0', \theta_0\right) \geq \frac{\hat{p}\left(\theta_0\right) - p}{1 - \hat{p}\left(\theta_0\right)}$ *and is decreasing in* $c\left(\overline{a}, \theta_0\right)$, $b\left(\Delta + \theta_0, \underline{g}\left(\theta_0\right)\right)$ and p.

Proposition 8 states the conditions under which the decision-maker will draw upon the aspirations and achievements of a role model who will alter her choices, aspirations and achievements and show her the way out of the aspirations trap. The key requirement is that it has to be the case that the extrinsic circumstances (the initial status) of the role model are similar, in the view of the decision maker, to the extrinsic circumstances (the initial status) of the decision-maker herself.

Thus, the decision-maker will not attach much weight on the experience of success of an individual who is characterized by very different circumstances such as culture or wealth or any other relevant dimension viewed as relevant by the decision maker as determining initial status. Nevertheless, even if the initial status of the role model will have to be similar to the decision-maker, the role model will be required to have different beliefs i.e. have a much higher degree of self-confidence.

Existing work on role models (see, for example, Chung (2000)) assume that individual attach a similarity weight of one to the achievement of other individuals: in this case, Bayesian updating and similarity based learning are the one and the same.

The above proposition explains how the decision-maker chooses her "cognitive window", the sample of individuals from which the decision-maker draws her role models. Ideally, what a decision-maker wants to observe is someone who is identical (similarity one) to herself but with a higher level of aspirations and achievement. However, a person similar to herself is likely to have the same aspirations, and make the same decisions as herself. So the decision-maker needs to include individuals with a higher initial status than herself in her cognitive window.

Proposition 8 implies that a decision-maker with a low initial status will exclude those with a higher initial status from her cognitive window when the similarity assessment is decreasing in the distance between initial status. If the decision-maker's includes only those individuals who are similar to her in her cognitive window, she is likely to observe other individuals who have similar aspirations and make similar decisions to herself. In order to increase the likelihood of observing an individual who has a higher degree of self-confidence and therefore, has higher aspirations and achievement she will need to include individuals who aren't similar (i.e. have a higher initial social status) to herself. However, Proposition 8 implies that there is limit on how far the individual will go so that, typically, there will be individuals who will be excluded from her cognitive window.

5.3 Connectedness and the transmission of aspirations

The upshot of the above analysis is that an individual included in the cognitive window of the decision-maker (i.e. has the status of a role model) generates an information externality as, with positive probability, the decision-maker will change her aspirations and her chosen upon observing the achievement of such an individual. This suggests that there is the possibility of aspirations could be transmitted across individuals in a society. We conclude this section with a simple N-person extension of the preceding model where the transmission of aspirations is linked to the distribution of initial social status (i.e. the nature of inequality) in a society.

To this end, consider a society with N (a large but finite number) individuals distributed on $\left[\underline{\theta}, \overline{\theta}\right]$. We say that i is connected to j if $\theta_0^i < \theta_0^j$ but when j chooses $\bar{a}$ j belongs to the cognitive

neighborhood chosen by i and is a role model for i. A society is strongly connected if between any two individuals i, j in a society there is a chain of individuals $k_1, ..., k_M$ such that i is connected to k_1, k_m is connected to k_{m+1}, $m = 1, ..., M-1$, and k_M is connected to j. In other words, in a connected society, any two individuals are linked by a chain of overlapping cognitive windows.

In this society, each individual is solving a decision-problem where the choice is between choosing an action that perpetuates the status quo or an action that changes the status quo with some probability. We assume that the default is choosing the status quo although the individual could observe the actions and achievement of other individual included in her cognitive window before choosing her action.

Define the similarity function so that $s\left(\theta_0', \theta_0\right) = 1 - \frac{\left|\theta_0' - \theta_0\right|}{\left|\overline{\theta} - \underline{\theta}\right|}$. Then, Proposition 8 implies that $\hat{p}\left(\theta_0\right) \leq \frac{s\left(\theta_0', \theta_0\right) + p}{1 + s\left(\theta_0', \theta_0\right)}$ if and only if $\left|\theta_0' - \theta_0\right| \leq \left|\overline{\theta} - \underline{\theta}\right| \left(\frac{1 + p - 2\hat{p}(\theta_0)}{2\hat{p}(\theta_0)}\right) = \varepsilon$.

On final definition: the distribution of individuals in a society is globally dense if for each individual player i there exists a different individual j with $\left|\theta_0^i - \theta_0^j\right| < \left|\overline{\theta} - \underline{\theta}\right| \left(\frac{1 + p - 2\hat{p}(\theta_0)}{2\hat{p}(\theta_0)}\right)$. When the distribution of initial status is globally dense, then between any two individuals in a society, there is a chain of other individuals each of whom is contained in the cognitive window of, and therefore, is a potential role model for, the preceding individual. In this sense, a poor individual is linked to rich individual in a sequence of small steps.

One final piece of notation: let $G(.)$ denote the cumulative distribution function that generates the initial beliefs p of each individual in the society.

Proposition 9. *If the distribution of individuals is globally dense the society is strongly connected. As long as there exists one individual k with $p^k \geq \hat{p}\left(\theta_0^k\right)$, all individuals in it choose $\overline{a}$ and aspire to change their social status. The probability that all individuals will choose $\overline{a}$ is* $\max_{k \in N} 1 - G(\hat{p}\left(\theta_0^k\right))$.

Proof. See appendix. ■

Thus, when the distribution of initial status is globally dense, the society is strongly connected. In a connected society, whether or not any one decision-maker is internally constrained depends on what other individuals included in her cognitive neighborhood do: each such individual imposes an information externality on the individual that determines whether or not she is internally constrained. Therefore, as long as one individual is able to relax her internal constraint, all individuals in the society are also able to relax their internal constraints.

The following example examines what happens when the distribution of individuals fails to be globally dense.

Example 1. (Polarization and aspirations failure)

Consider a society where a fraction α individuals are initially located at $\underline{\theta}$ and $1 - \alpha$ individuals

are initially located at $\overline{\theta}$ with $s\left(\overline{\theta},\underline{\theta}\right)=0$. Assume that $p<\hat{p}\left(\theta_0\right)$ for all $\theta_0=\underline{\theta}$ while $p'\geq\hat{p}\left(\theta_0'\right)$ for all $\theta_0'=\overline{\theta}$. Observe that no $\theta_0'=\overline{\theta}$ is in the cognitive neighborhood of any $\theta_0=\underline{\theta}$. Therefore, all individuals initially located at $\underline{\theta}$ are internally constrained.■

The next example examines what happens in an egalitarian but poor society where the distribution of individuals is concentrated at a specific disadvantageous initial status.

Example 2. (Equality and aspirations failure)

Consider a society where all individuals are initially located at $\underline{\theta}$. Assume that $\hat{p}\left(\underline{\theta}\right)>1$. Then, clearly $p<\hat{p}\left(\theta_0\right)$ for all $\theta_0=\underline{\theta}$ and there is aspirations failure for all individuals initially located at $\underline{\theta}$. More generally, the probability that all individuals choose $a=\overline{a}$ is $1-\left[G(\hat{p}\left(\theta_0\right))\right]^N$. ■

Proposition 9, together with the examples 1 and 2, suggests that inequality in the distribution of initial status may have subtle effect on the how individuals in a society aspire and choose actions. On the one hand, when the distribution of initial social status is polarized, the society may fail to be connected and therefore, there will be failure in the transmission of aspirations across individuals in that society and individuals with a low initial social status will be internally constrained and caught in an aspirations trap. On the other hand, when there is perfect equality in the distribution of initial social status, either all individuals in a society have high aspirations and seek to change their status quo or all individuals in a society are caught in an aspirations trap. The latter is the more likely scenario if all individuals in that society are poor to begin with.

6 Altering internal constraints in practice

If economic betterment is an important goal for policy, the formal analysis presented suggests that direct attempts to alter the internal constraints of individuals can alter the aspirations and choices of individuals. Thus, in addition to redistributive measures, our results suggest that interventions that directly shock the aspirations of individuals or alter and enrich the cognitive neighborhoods of individuals are likely to have a beneficial impact.

One such programme is the Venezuelan Classical Music Orchestras for children from disadvantaged backgrounds. More than 400,000 Venezuelan children, most coming from poor families have taken and take part of a network of orchestras directed by Jose Antonio Abreu that began being carried out 30 years ago. The lessons are free of charge and a public foundation "FESNOJIV", which is also supported by the Inter American Development Bank, provides the instruments. The project does not primarily aim to create professional musicians, but to integrate poor children into the society. 96 percent of the young musicians have good to excellent school records. They stand out as high achievers thanks to their steady relationship with music. UNESCO awarded FESNOJIV its

International Music Award in 1993-94 and in 1998 UNDP commended it as an outstanding example of poverty reduction. In the words of its founder, Antonio Abreu[17]: "The majority of the children and juveniles belong to the groups that are most vulnerable and excluded in all of Venezuelan society. Participating in the orchestral movement has made it possible for them to set up new goals, plans, projects and dreams, and at the same time it is a way of creating meaning and helping them in their day-to-day struggle for better conditions of life through the variety of opportunities that the orchestral movement offers them."

The importance of role models (Rao and Walton 2004) cannot be understood within the framework of a standard cost-benefit analysis. Individuals will draw on the aspirations of their cognitive neighbors, and in this sense role models become an important variable in the formation of their aspirations.

Changing a role model to break an aspiration trap has been empirically showed to be a very effective policy of poverty reduction. One of the most remarkable examples comes from Kolkata (Calcutta), India. The objective of the Government by the 1990s was to decrease the HIV infections in Sonagachi, Kolkata's oldest and best established red-light district, with over 4,000 sex workers working in 370 brothels that service about 20,000 clients a day (see Rao and Walton, 2004, p.7). As Rao and Walton (op. cit.) points out, during the 1990s, the Government's "interventions tended to reflect the values of the middle-class bureaucrats who crafted them. They focused on rehabilitating the sex workers, rescuing them, and [...] training them." to be ready for an insertion in the "good life". This strategy did not work. As Rao and Walton argues, the relatively high earnings in sex work and the discrimination faced by former sex workers in the world outside Sonagachi, led most women to return prostitution.

In this context, a very different strategy worked one which involved convincing and training twelve sex workers which would pass the important information about the use of condoms as peers education to their co-workers. This process, as argued by Rao and Walton, led over a period of two or three years, to a "metamorphosis" in the sex worker's aspirations. Moreover, the program was remarkably successful as a health intervention, with almost all sex workers using condoms at least some of the time and the HIV incidence in Sonagachi substantially decreased.

This successful health intervention can be interpreted with the lens of our model as a change in the quality of the cognitive window of a decision-maker.

[17] See http://www.rightlivelihood.org/recip/abreu.htm

7 Final Remarks

We propose a model that associates initial disadvantage, aspirations and decisions to change their status-quo. Our analysis suggests internal constraints are a key ingredient in perpetuating poverty traps. We find that initial disadvantage is likely to generate aspirations failures, a combination of low aspirations and low achievement. We then study how and under what conditions a role model can help a poor person to solve her aspirations failure and climb out of poverty. We allow the person to choose her cognitive window and show that, in principle, a poor person will restrict the set from where the role model is selected. Our model and results are supported by evidence from anthropology, sociology and social psychology. The fact that the same condition of poverty affects (and is affected by) lack of aspirations and hope is a recurrent topic in any of these disciplines, although surprisingly, it has been disregarded in formal economic models. The concept of empowerment has also been understudied in economics theory, despite the great importance that is given to the concept in the anti-poverty policy agenda.

Finally, our preliminary results are consistent with the empirical evidence that there is a tendency of a polarization of the societies (see Duclos, et. al, 2004; Quah 1993, 2005; Azaradis and Stachurski, 2004, p. 39; Atkinson, 2003). Likewise, they are consistent with empirical evidence showing that communities with higher levels of social cohesion and narrow gaps between poor and rich produce better health and welfare outcomes than wealthier societies with higher levels of social disintegration (Putnam, 2000). Marmot and Wilkinson (1999) show that in addition to economic prosperity, equality and social cohesion are also powerful determinants of health. The experience of Kerala is also a very clear evidence that social cohesion through participation of the poor in programs contributes to achieve high positive indices of Human Development (see for example, Kannan, 2000)

The model could be extended in a variety of ways. Possibilities include: extending it to a n-player strategic context; studying the dynamics of different initial income distributions or analyzing the effect of different types of policies (other than a role model) on solving an aspirations failure.

References

[1] Akerlof G. and R. Kranton (2000) "Economics and Identity," *Quarterly Journal of Economics*, 115, 3, 715-753.

[2] Alsop R. and N. Heinsohn (2005) "Measuring Empowerment in Practice: Structuring Analysis and Framing Indicators," *World Bank Policy Research Working Paper* 3510.

[3] Appadurai (2004) "The Capacity to aspire," in V. Rao and M. Walton (eds.), *Culture and Public Action*, The International Bank for Reconstruction and Development, The World Bank, Washington, DC.

[4] Atkinson, A.B. (1998) "Social Exclusion, Poverty and Unemployment," in *Exclusion, Employment and Opportunity*, A. B. Atkinson and J. Hills (Eds.) Centre for Analysis of Social Exclusion, January.

[5] Atkinson, A.B. (2003) "Income Inequality in OECD Countries: Data and Explanations," *CESifo Economic Studies*, 49, 479-513

[6] Azariadis C. and J. Stachurski (2004) "Poverty Traps," Forthcoming in the *Handbook of Economic Growth*, Philippe Aghion and Steven Durlauf, eds.

[7] Azariadis, C. (2004): "The theory of poverty traps: what have we learned?" in *Poverty Traps*, S. Bowles, S. Durlauf and K. Ho, eds.

[8] Banerjee A. V. and A.F. Newman (1991) "Risk-Bearing and the Theory of Income Distribution," *Review of Economic Studies*, 58, 211-235

[9] Banerjee A. V. and A.F. Newman (1993) "Occupational Choice and the Process of Development," *Journal of Political Economy*, 101, 2, 274-298

[10] Bardhan P (1997) "Corruption and Development: A Review of the issues," *Journal of Economic Literature*, 35, 1320-1346

[11] Bendor, J., D. Mookherjee, and D. Ray. (2001) "Aspiration-Based Reinforcement Learning in Repeated Games: An Overview," *International Game Theory Review,* 3(2-3): 159-174.

[12] Biewen M. (2003) "Who Are the Chronic Poor? Evidence on the Extent and the Composition of Chronic Poverty in Germany," IZA *DP* No. 779

[13] Bloom, D. E., D. Canning and J. Sevilla (2003) "Geography and Poverty Traps," *Journal of Economic Growth*, 8, 355-378.

[14] Brickman, P. and Campbell, D.T. (1971) "Hedonic Relativism and Planning the Good Society", in M.H. Apley (ed.) *Adaptation-Level Theory: A Symposium*, New York: Academic Press, 287-302.

[15] Chung, Kim-Sau (2000), "Role models and arguments for affirmative action", *American Economic Review,* 90(3), 640-648.

[16] Clark A., P. Frijters and M. Shields (2008) "Relative Income, Happiness and Utility: An Explanation for the Easterlin Paradox and Other Puzzles", *Journal of Economic Literature*, vol.46, no.1, pp.95-144.

[17] Da Rin, M. and T. Hellmann (2002) "Banks as Catalysts for Industrialization," *Journal of Financial Intermediation*, 11, 366-397

[18] Dalton P. and S. Ghosal (2010) "Behavioral Decisions and Welfare," *CentER Discussion Paper 2010-22*, Tilburg University

[19] Dasgupta and Ray (1986) "Inequality as a Determinant of Malnutrition and Unemployment," *The Economic Journal*, 96, 1011-1034

[20] Deaton, A. (2001) "Relative Deprivation, Inequality, and Mortality," National Bureau of Economic Research, Inc, *NBER Working Papers*: 8099

[21] Dickerson, S.S. and M.E.Kemeny (2004), "Acute stressors and cortisol responses: a theoretical integration and synthesis of laboratory research", *Psychological Bulletin*, 130(3), 355-391.

[22] Dixon J. and D. Macarov (Eds) (1998) *Poverty: a Persistent Global Reality*, London; New York: Routledge.

[23] Duclos, J-Y and G. Philippe (2002) "Absolute and Relative Deprivation and the Measurement of Poverty," *Review of Income and Wealth,* 48, 4, 471-92

[24] Duclos, J-Y, J. Esteban and D. Ray (2004) "Polarisation: Concepts, Measurement, Estimation," *Econometrica*, 72, 6, 17-37.

[25] Duncan, G.J., B. Gustafsson, R. Hauser, G. Schmauss, H. Messinger, R. Muffels, B. Nolan, and J.C. Ray (1993), "Poverty dynamics in eight countries," *Journal of Population Economics*, 6, 215-234

[26] Durlauf (2003) "Groups, Social Influences and Inequality: A Membership Theory Perspective on Poverty Traps," University of Wisconsin, mimeo.

[27] Ellerman, D. (2002) "Autonomy-respecting assistance: Towards new strategies for Capacity Building and development assistance," in: Fukuda-Parr, Sakiko, Carlos Lopes and Khalid Malik (eds.) *Capacity for development. New solutions to old problems*, London: Earthscan Publications

[28] Easterlin, R. A. (2005) "A puzzle for adaptive theory" *Journal of Economic Behavior & Organization*, vol. 56, issue 4, pages 513-521

[29] Festinger, L. (1954) "A theory of social comparison processes", *Human Relations*, 7: 117–140.

[30] Foster A. and M. Rosenzweig (1995) "Learning by Doing and Learning from Others: Human Capital and Technical Change in Agriculture," *Journal of Political Economy*, 103, 1176-1209

[31] Fouarge, D. and R. Layte (2003). "Duration of Poverty Spells in Europe," EPAG Working Paper 2003-47. Colchester: University of Essex.

[32] Galor O. and Zeira. J. (1993) "Income Distribution and Macroeconomics," *Review of Economic Studies*, 60, 35-52

[33] Gilboa I. and D. Schmeidler (2001) *A Theory of Case-Based Decisions,* Cambridge University Press, 210 pages.

[34] Goethals, G.R., & Darley, J. (1977). "Social comparison theory: An Attributional approach" In J.M. Suls & R.L. Miller (Eds.), *Social Comparison Processes: Theoretical and Empirical Perspectives* (pp. 259-278), Halsted-Wiley, Washington, DC.

[35] Graham B. S. and J. R. W. Temple (2004) "Rich nations, poor nations: how much can multiple equilibria explain?," The Institute for International Integration Studies Discussion Paper Series iiisdp017, IIIS

[36] Hardle W. (1990) *Applied Non-parametric Regression, Oxford University Press.*

[37] Heifetz, A. and E. Minelli (2006) "Aspiration traps," mimeo.

[38] Helson, H. (1964) *Adaptation-Level Theory: An Experimental and Systematic Approach to Behavior*. Harper and Row, New York.

[39] Hoff K and P Pandey (2004) "Belief systems and durable inequalities: an experimental investigation of Indian caste," Policy Research Working Paper; no. 3351, The World Bank.

[40] Hoff K. AND A. Sen (2005) "The Kin System as a Poverty Trap?," forthcoming in *Poverty Traps*, eds, Samuel Bowles, Steven Durlauf and Karla Hoff, Princeton University Press., 2006

[41] Jalan J. and M. Ravallion (1998) "Determinants of Transient and Chronic Poverty. Evidence from Rural China," *Policy Research Working Paper* No 1936, World Bank.

[42] Kannan, K. (2000) "Poverty Alleviation as advancing basic human capabilities: Kerala's achievements compared,". In G. Parayil (Ed.) *Kerala: The Development Experience* (pp. 40-65). New York. NY: Zed Books.

[43] Karandikar, D. Mookherjee, D. Ray and F. Vega-Redondo (1998) "Evolving Aspirations and Cooperation," *Journal of Economic Theory* 80, 292-331 (1998).

[44] Kremer M. (1993) "The O-ring Theory of Economic Development," *Quarterly Journal of Economics*, August, 551-575

[45] Lockwood, P., & Kunda, Z. (1997) "Superstars and me: Predicting the impact of role models on the self" *Journal of Personality and Social Psychology*, 73, 91-103.

[46] Loury G. (1981) "Intergenerational Transfers and the Distribution of Earnings," *Econometrica*, 49, 843-867

[47] Nelson R. R. (1956) "A Theory of The Low Level Equilibrium Trap," *American Economic Review*, 46, 894-908

[48] MacLeod Jay (1995) *Ain't no makin' it: Aspirations & Attainment in a Low-Income Neighborhood*, Westview Press, Boulder, Colorado.

[49] Manski, C. E. (1995) *Identification Problems in Social Sciences*, Harvard University Press, 194 pages.

[50] Marmot, M. and R. Wilkinson (Eds). (1999) *Social Determinants of Health*, New York: Oxford University Press.

[51] McGregor D. (1960) *The Human Side of Enterprise*, McGraw Hill Higher Education, pp 256.

[52] Mookherjee D. (2003) "Poverty Persistence and Design of Anti-Poverty Policies," forthcoming in Banerjee, R. Benabou and D. Mookherjee (eds), *Understanding Poverty*, Oxford University Press

[53] Moreira V. (2003) "Poverty and Psychopathology," in Carr S. C. and Sloan T. S. (eds.) *Poverty and Psychology. From Global Perspective to Local Practice*, Kluwer Academic/Plenun Publishers New York.

[54] Mullainathan S. (2006) "Development Economics through the lens of Psychology," mimeo.

[55] Parducci, A. (1995) Happiness, *Pleasure, and Judgment: The Contextual Theory and Its Applications*. Erlbaum, Hillsdale.

[56] Putnam R. (2000) *Bowling Alone: The Collapse and Revival of American Community*. New York, NY: Simon and Schuster.

[57] Quah D. T. (1993) "Empirical cross-section dynamics in economic growth," *European Economic Review*, 37, 426-434

[58] Quah D. T. (2005) "Growth and Distribution," mimeo, LSE.

[59] Ray, D. (2003) "Aspirations, Poverty and Economic Change," in A. Banerjee, R. Benabou and D. Mookherjee (eds) *Understanding Poverty*, Oxford University Press

[60] Rao, V. and M. Walton (2004) "Culture and Public Action: Relationality, Equality of Agency, and Development," in V. Rao and M. Walton (eds.), *Culture and Public Action*, The International Bank for Reconstruction and Development, The World Bank, Washington, DC.

[61] Selten, R. (1998). "Aspiration Adaptation Theory." *Journal of Mathematical Psychology* 42 (2-3), 191-214.

[62] Sen, A. (2004) "How Does Culture Matter?," in V. Rao and M. Walton (eds.), *Culture and Public Action*, The International Bank for Reconstruction and Development, The World Bank, Washington, DC.

[63] Simon, H. (1955). "A Behavioral Model of Rational Choice." *The Quarterly Journal of Economics* 69 (1), 99-118.

[64] Stark, O. and J.E. Taylor (1991) "Migration Incentives, Migration Types: The Role of Relative Deprivation," *Economic Journal,* 101, 408 1163-78

[65] Stark O (2006) "Status Aspirations, Wealth Inequality, and Economic Growth," *Review of Development Economics*, 10, 1, 171-176

[66] Stern N., J-J. Dethier and F. H. Rogers (2005) *Growth and Empowerment. Making Development Happen*, Munich Lectures in Economics, The MIT Press, Cambridge, Massachusetts, and London, England.

[67] Stutzer, A. (2004) "The role of income aspirations in individual happiness," *Journal of Economic Behavior & Organization*, vol. 54(1), pages 89-109

[68] Torvik R. (1993) "Talent, growth and Income Distribution," *Scandinavian Journal of Economics,* 95, 4, 581-596.

[69] Walker, R (1995), "The dynamics of poverty and social exclusion" in Room, G (ed), *Beyond the Threshold*, Bristol: Policy Press.

[70] Wilson, W. J., (1987), *The Truly Disadvantaged*, Chicago: University of Chicago Press.

[71] Wood, J.V. (1989). "Theory and research concerning social comparisons of personal attributes" *Psychological Bulletin*, 106, 231-248.

[72] World Bank (1998) "Assessing Aid: What Works, What Doesn't and Why?," *World Bank Policy Research Report*, Oxford University Press.

[73] World Bank (2002) *Empowerment and Poverty Reduction: A Sourcebook*, preliminary draft, pp. 280.

Appendix

Proof of Proposition 1:

Fix $\theta' \geq \theta$ and $g' \geq g$. Note that the inequality

$$b\left(\theta', g'\right) - b(\theta, g') \geq b\left(\theta', g\right) - b(\theta, g)$$

holds if and only the inequality

$$v\left(\frac{\theta' - g'}{\theta'}\right) - v(\frac{\theta - g'}{\theta}) \geq v\left(\frac{\theta' - g}{\theta'}\right) - v(\frac{\theta - g}{g}) \quad (A)$$

also holds. There are several cases to consider:

(i) $\theta > g'$: Then, (A) holds as by assumption $v(.)$ is concave over gains;

(ii) $\theta' < g$: Then, (A) holds iff $\frac{\partial^2}{\partial\theta\partial g} v\left(\frac{\theta - g}{\theta}\right) \geq 0$ whenever $\theta - g < 0$ which by computation can written as

$$\frac{\partial^2}{\partial\theta\partial g} v\left(\frac{\theta - g}{\theta}\right) = \frac{1}{\theta^2}\left[-v''\left(\frac{\theta - g}{\theta}\right)\frac{g}{\theta} + v'\left(\frac{\theta - g}{\theta}\right)\right]$$

Now $-v''\left(\frac{\theta-g}{\theta}\right)\frac{g}{\theta} + v'\left(\frac{\theta-g}{\theta}\right)$ can be written $-v''(x)(1-x) + v'(x)$ for all $x = \frac{\theta-g}{\theta} < 0$. Therefore, (A) holds whenever assumption 1 holds.

(iii)$g \leq \theta'$: Then (A) holds by loss aversion. ■

Proof of proposition 2:

By continuity of $u(a, g, \theta_0)$ in a and by the compactness of A, $a(g, \theta_0)$ is non-empty. For $a' \geq a$ and $g' \geq g$, note that

$$\begin{aligned} & \left[u\left(a', g, \theta_0\right) - u\left(a, g, \theta_0\right)\right] - \left[u\left(a', g, \theta_0\right) - u\left(a, g, \theta_0\right)\right] \\ = & \int_{\theta\in\Theta} \left[p(\theta, a', \theta_0) - p(\theta, a, \theta_0)\right]\left[b\left(\theta, g'\right) - b\left(\theta, g\right)\right] d\theta \\ \geq & \ 0. \end{aligned}$$

The first equality follows by computation. The second inequality follows from the assumption that $p(\theta, a', \theta_0)$ first order stochastically dominates $p(\theta, a, \theta_0)$ and $b\left(\theta, g\right)$ satisfies increasing differences in θ, g.

By continuity that $a(g,\theta_0)$ is non-empty and as payoffs satisfy increasing differences in (a,g), it follows that there exists a maximal and minimal element in $a(g,\theta_0)$ which is increasing in g.

As $p(\theta,a',\theta_0)$ first order stochastically dominates $p(\theta,a,\theta_0)$ for $a' \geq a$, $\pi(a,\theta_0)$ is increasing in a. Therefore, by Tarski's fix point theorem, $E(\theta_0)$ is non-empty and there exists a maximal and minimal element in $E(\theta_0)$.■

Proof of Proposition 3:

Note that $v(a,\theta_0)$ is continuous in a and as A is compact, $M(\theta_0)$ is non-empty. By definition, any two distinct standard solutions must yields the same payoff. Finally, as at a standard solution, the individual is maximizing over consistent pairs of a,g, the payoff at each standard solution has to be (weakly) greater the maximal payoff in a behavioral solution which corresponds to the payoff at the maximal behavioral solution.■

Proof of Proposition 4:

By definition, (a^*,g^*), for all $a' \in A$, $u(a,g,\theta_0) \geq u(a',g,\theta_0)$ for $g = \pi(a,\theta_0)$. By (C), for all $a' \in A$, $u(a,g,\theta_0) \geq u(a',g',\theta_0)$, $g' = \pi(a',\theta_0)$. It follows that $(a^*,g^*) \in M(\theta_0)$. Next, suppose, by contradiction, $(a^*,g^*) \in M(\theta_0)$ but (C) doesn't hold. As $(a^*,g^*) \in E(\theta_0)$, for all $a' \in A$, $u(a,g,\theta_0) \geq u(a',g,\theta_0)$ for $g = \pi(a,\theta_0)$. As, by assumption, (C) doesn't hold there exists $a' \in A$ such that $u(a,g,\theta_0) \geq u(a',g,\theta_0)$ but $u(a,g,\theta_0) < u(a',g',\theta_0)$, $g' = \pi(a',\theta_0)$. But, then, $(a^*,g^*) \notin M(\theta_0)$, a contradiction. ■

Proof of Proposition 5:

Note that at a standard solution it is the case that

$$0 \in \left\{ \begin{array}{c} \left(\int_{\theta\in\Theta} \partial_a p(\theta,\hat{a},\theta_0) b(\theta,\hat{g})\, d\theta\right) - \partial_a c(\hat{a},\theta_0) \\ + \left(\int_{\theta\in\Theta} p(\theta,\hat{a},\theta_0)\partial_g b(\theta,\hat{g})\, d\theta\right)\left(\int_{\theta\in\Theta} \partial_a p(\theta,\hat{a},\theta_0)\theta d\theta\right) \end{array} \right\}$$

while the "first order condition" characterizing a behavioral solution is equivalently,

$$0 \in \left\{ \left(\int_{\theta\in\Theta} \partial_a p(\theta,a^*,\theta_0) b(\theta,g^*)\, d\theta \right) - \partial_a c(a^*,\theta_0) \right\}$$

and

$$g^* = \left(\int_{\theta\in\Theta} p(\theta,a^*,\theta_0)\theta d\theta \right)$$

Clearly, in this setting, condition (C) is equivalent to requiring that

$$0 \in \{\partial_g u(a^*,g^*,\theta_0)\partial_a \pi(a^*,\theta_0)\}$$

or equivalently,

$$0 \in \left\{ \left(\int_{\theta\in\Theta} p(\theta,a^*,\theta_0)\partial_g b(\theta,g^*)\, d\theta \right)\left(\int_{\theta\in\Theta} \partial_a p(\theta,a^*,\theta_0)\theta d\theta \right) \right\}$$

an inclusion that cannot hold in our model as $b(.)$ is assumed to satisfy the property of increasing differences in θ and g, and $p(\theta, a, \theta_0)$ is assumed to first order stochastically dominate a' whenever $a > a'$.■

Proof of Proposition 6:

As $c(a, \theta_0)$ satisfies decreasing differences in a, θ_0, it follows that

$$\begin{aligned} & \left[u\left(a', g, \theta_0'\right) - u\left(a, g, \theta_0'\right)\right] - \left[u\left(a', g, \theta_0\right) - u\left(a, g, \theta_0\right)\right] \\ = & -\left[\left(c\left(a', \theta_0'\right) - c\left(a, \theta_0'\right)\right) - \left(c\left(a', \theta_0\right) - c\left(a, \theta_0\right)\right)\right] \geq 0. \end{aligned}$$

and $\pi\left(a, \theta_0'\right) \geq \pi\left(a, \theta_0\right)$. Therefore, the maximal and minimal element in $E\left(\theta_0\right)$ are increasing in θ_0. A symmetric argument establishes that there exists a maximal and minimal element in both $M(\theta_0)$ which are both increasing in θ_0.■

Proof of Proposition 8:

Suppose the initial distribution of status is globally dense. Then, by construction, the society is strongly connected. Consider an individual i located at θ_0^i choosing $a = \underline{a}$ with aspiration level $\Delta = 0$. Now suppose there is one individual with k with $p^k \geq \hat{p}\left(\theta_0^k\right)$. This individual k will choose $a = \overline{a}$. Moreover, as the society is strongly connected, there is a finite chain linking k to every other individual j, $j \neq k$ i.e. there is a finite chain of individuals $i_0, i_1, ..., i_{\hat{n}}$ with $i_0 = k$ and $i_{\hat{n}} = j$ such that i_n belongs to the cognitive neighborhood of i_{n+1}, $n = 0, ..., \hat{n} - 1$. Therefore, each i_n, $n = 0, ..., \hat{n}$, chooses $a = \overline{a}$ and aspiration level $\Delta = \Delta'$. It follows that if there exists one individual k with $p^k \geq \hat{p}\left(\theta_0^k\right)$, all individuals will choose $\overline{a}$. More generally, the probability that all individuals will choose all individuals in it choose $\overline{a}$ is $\max_{k \in N} 1 - G(\hat{p}\left(\theta_0^k\right))$ where $G(.)$ is the cdf that determines the initial beliefs p of any one individual in the society. ■