CRISEI

Centro di Ricerca Interdipartimentale in Sviluppo Economico e Istituzioni

Discussion Paper Series

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Discussion Paper
No. 11
Luglio 2012

ISSN: 2280-9767

CRISEI - Università di Napoli - Parthenope

Università degli Studi di Napoli- Parthenope

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Relative consumption and poverty traps

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Abstract

This paper shows that the interaction between consumption and production externalities generates the emergence of poverty traps in a simple model where individuals care of their relative consumption since holding a relatively advantageous position is instrumental to obtain productive benefits.

Keywords: Relative consumption, status concerns, poverty traps.

JEL-classification: D31, J24, O11

1 Introduction

Recent empirical evidence shows that the concerns for one's relative position influence especially the preferences of the individuals with high levels of income, while the utility of the poorest agents does not appear to be affected by one's relative income or consumption (Akay & Martinsson, 2011; Clark *et al.* , 2008; Dynan & Ravina, 2007; Heffetz, 2011; Ravallion & Lokshin, 2010). One possible reason is that the concerns for one's relative position are not hard-wired in the individuals' preferences, but, instead, that they become active because of the productive gains enjoyed by holding a relatively advantageous position in the society (Cole *et al.* , 1992). Further pieces of empirical research corroborate the existence of multiple growth regimes as a source of the persistence of poverty (Fiaschi & Lavezzi, 2003) as well as estimate that the relative poverty rates have recently increased both in the developing and in the OECD countries (Ravallion & Chen, 2011).

This paper matches these two stylized facts in a simple model in which individuals care of their relative level of consumption with respect to the average level in the population because the consumption over the reference standard is instrumental to achieve productive advantages that augment the individuals' incomes. This idea is investigated by assuming that the individuals with a level of consumption exceeding the average gain an utility premium that depends on the magnitude of the productive benefits accruing by "beating the reference standard" (Barnett *et al.* , 2010). This formalization implies that, although the marginal utility of the consumption is equal for both rich and poor agents, the marginal cost of a reduction in the consumption is higher for individuals close to the reference standard than for very poor agents because the potential utility loss is stronger for the former than for the latter.

As a consequence, the interaction between the consumption and the production externalities[1] induces richer agents, with an income close to the average, to start a race to consume the good over its average level and influences the dynamics of the individuals' incomes causing the rise of multiple equilibria. Hence, the existence of poverty traps is

[1] Liu & Turnovsky (2005) study how consumption and production externalities affect capital accumulation and economic growth, by assuming that a direct connection between the two externalities does not exist.

grounded on the incentives of the individuals to keep up with some reference standard in order to enjoy the productive gains. At this regard, this paper relates to a large literature on the persistence of poverty (Galor & Zeira, 1993; Moav, 2002) and particularly complements recent studies on the relations between the quest for social status and economic growth (Bilancini & D'Alessandro, 2012; Hopkins & Kornienko, 2006; Kawamoto, 2009; Moav & Neeman, 2010, 2012).

The rest of the paper is organized in two sections. Section 2 presents the basic features of the model and highlights the consumption problem; Section 3 studies the consequences for the evolution of the individuals' incomes and characterizes the poverty traps.

2 The model

2.1 Basic structure

A continuum of heterogeneous families, indexed by i and each composed of a parent and a child, is modeled in an overlapping generation economy in which the total population is constant over time. In the first period of their life, children obtain education. In the second period, when old, agents inelastically supply their efficiency units of human capital to the labor market, earn an income and choose how to split their budget constraint between consumption and education for their children.

The production of the final good is assumed to depend linearly on the aggregate stock of human capital; hence, the wage rate is equal to one and the agents' income is equal to the amount of efficiency units of human capital h_t^i supplied on the labor market.

2.2 Individuals

At each time t, the preferences of the parents (born at $t-1$) are standard log-linear functions of the second period consumption c_t^i and the children's human capital h_{t+1}^i:

$$u_t^i = \log c_t^i + \alpha \log h_{t+1}^i \tag{1}$$

where $\alpha > 0$ is the degree of altruism of the parents. The consumption of c_t^i over a threshold $\underline{c}$ generates a positive externality in the production of the children's human capital that is formally given by

$$h_{t+1}^i = \chi\left(c_t^i\right)\left(e_t^i\right)^\beta \tag{2}$$

with

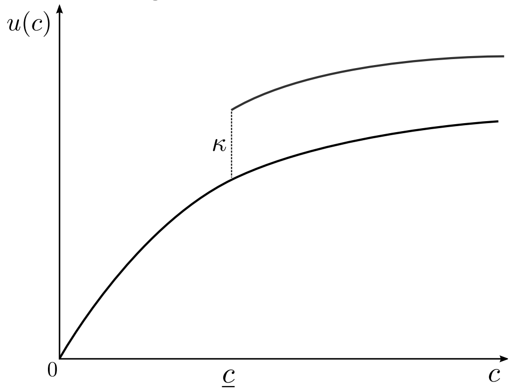
$$\chi\left(c_t^i\right) = \begin{cases} 1 & \text{if } c_t^i \leq \underline{c} \\ \kappa & \text{if } c_t^i > \underline{c} \end{cases} \tag{3}$$

with $\beta \in (0,1)$ and $\kappa > 1$. The human capital of the children (2) depends on the education expenditures of the parents e_t^i. Further, it is augmented by a factor κ as long as the parents consume a sufficiently high amount of the good c_t^i. The consumption of c_t^i over the threshold $\underline{c}$ brings forth a premium κ that measures the degree of the productive gains accruing by exceeding the benchmark. As a working example, one can think of c_t^i as a social participation good, whose consumption over the benchmark $\underline{c}$ produces also some informational advantage that increases the children's human capital[2]. Hence, the reference standard $\underline{c}$ can be interpreted either as a fixed cost of participation or as the benchmark level of some reference group, when endogenized as the average level of consumption (or income) of the individuals. In this latter case, the productive gains (κ) generated by the participation over the benchmark $\underline{c}$ imply a consumption externality that induces the agents to start a race to consume the participation good over its average level. Different from the literature (see for instance Dupor & Liu, 2003)[3], the reference standard does not affect the preference of the individuals directly; as a consequence, also the marginal utility of the consumption of c_t^i does not directly depend on the level of the benchmark. Instead, the reference standard generates a consumption externality because

[2]For instance, social participation allows the creation of social networks, which spread productive benefits that are conducive of absolute gains (Bloch *et al.* , 2004). Yet, the information about job opportunities opened, that complements the educational efforts, can be much segmented across socio-economic classes and closed to poor agents who have no access to the relevant social groups of the society (Calvó-Armengol *et al.* , 2009).

[3]See also Tsoukis (2007) for a review of the different approaches used in the literature to formalize the presence of consumption externalities.

Figure 1: Preference



the benefits of consuming more than the benchmark, the premium κ, cause a discrete change in the parents' utility functions by boosting the accumulation of the children's human capital. This mechanism creates a direct connection between the consumption and the production externalities that implies that the degree at which the individuals' utility is affected by the reference standard is not constant along the income distribution as well as it depends on the extent of the advantages (κ) generated by exceeding the benchmark. In particular, even though the marginal utility of the consumption of c_t^i is equal for both rich, with $c_t^i > \underline{c}$, and poor agents, with $c_t^i \leq \underline{c}$, the marginal cost of a reduction in the consumption is higher for individuals close to the reference standard $\underline{c}$ than for very poor agents, because the individuals' utility presents a discrete jump at the threshold level $\underline{c}$ that depends on the magnitude of the productive gains κ (Fig. 1). Hence, the greater are the productive benefits of exceeding the reference standard (i.e. the higher the premium κ), the stronger is the consumption externality, which induces the individuals to consume more than the benchmark, since the stronger is the potential utility loss. Conversely, the effects of increases in the reference standard depend on the extent of the potential gains accruing by exceeding it. As long as the productive advantages of consuming more than the benchmark are strong enough, an increase in the reference standard increases the potential utility loss of the marginal agents, those with a level of consumption close to the threshold $\underline{c}$, and hence causes a partial substitution of the educational expenditures in favor of c_t^i.

The rest of the model is fairly simple. Agents choose $c_t^i \geq 0$ and $e_t^i \geq 0$ to maximize utility in (1) subject to (2), (3) and the budget constraint

$$c_t^i + e_t^i \leq h_t^i \tag{4}$$

The solutions are given by the first order conditions

$$c_t^i = \frac{h_t^i}{1+\gamma},\ e_t^i = \frac{\gamma}{1+\gamma} h_t^i \tag{5}$$

with $\gamma \equiv \alpha\beta$. Since the marginal utility does not directly depend on the benchmark $\underline{c}$, the solutions to the maximization problem are the standard optimal choices implied by a homothetic utility function. Notwithstanding, the next section illustrates that the non-convexity in the preference generated by the premium κ influences the dynamics of the individuals' incomes. At this end, it is assumed that the reference standard is equal to the average level of consumption of the good c_t^i over the whole population; formally, $\underline{c} \equiv (1+\gamma)^{-1}\bar{h}_t$, where $\bar{h}_t$ is the average income of the population.

3 Dynamics

The evolution of the incomes across the generations depends on the accumulation of human capital, which in turn depends on the expenditures in education and on the premium κ. This latter depends, further, on the relative income of the parents; indeed, from (5), it derives that agents with an income higher than the mean income, namely those with $h_t^i > \bar{h}_t$, gain the premium κ, which boosts the accumulation of the children human capital. Hence, the transition equation of the children human capital is given by

$$h_{t+1}^i = \begin{cases} \delta \left(h_t^i\right)^\beta & \text{if } h_t^i \leq \bar{h}_t \\ \kappa\delta \left(h_t^i\right)^\beta & \text{if } h_t^i > \bar{h}_t \end{cases} \tag{6}$$

with $\delta = (\gamma/(1+\gamma))^\beta$. The transition equation presents a discrete jump, corresponding to the discrete jump in the indirect utility function of the individuals, at the level of the average income threshold. This formalization implies that rich agents, the ones with

$h_t^i > \bar{h}_t$, have a comparative advantage with the respect to the poor agents - those with $h_t^i \leq \bar{h}_t$, in the accumulation of human capital due to an informational benefit coming from the social participation. The dynamical system in (6) depends on two state variables; the individuals' income and the mean income across the population. Defining the following variables

$$\hat{h}_t \equiv \frac{h_t^i}{\bar{h}_t}, \text{ and } g_t \equiv \frac{\bar{h}_{t+1}}{\bar{h}_t} \tag{7}$$

where $\hat{h}_t$ is the relative income of the individual i and g_t the growth rate of the mean income, the dynamical system in (6) can, thus, be rewritten as

$$\hat{h}_{t+1} = \begin{cases} \dfrac{\delta}{g_t \bar{h}_t^{1-\beta}} \hat{h}_t^{\beta} \equiv \phi^p\left(\hat{h}_t\right) & \text{if } \hat{h}_t \leq 1 \\ \kappa \phi^p\left(\hat{h}_t\right) \equiv \phi^r\left(\hat{h}_t\right) & \text{if } \hat{h}_t > 1 \end{cases} \tag{8}$$

A simple way to analyze the dynamics of the individuals' incomes is to assume that the population is composed of two types of agents: a relatively poor agent, with an income below the average ($h_t^p \leq \bar{h}_t$ or $\hat{h}_t^p \leq 1$), and a relatively rich agent, with an income above the average ($h_t^r > \bar{h}_t$ or $\hat{h}_t^r > 1$). The average income is, thus, given by:

$$\bar{h}_t = \frac{h_t^p + h_t^r}{2} \tag{9}$$

Equation (9) implies also that

$$\hat{h}_t^r = 2 - \hat{h}_t^p \tag{10}$$

As follows from (8), the evolution of the relative income of the poor agent is given by

$$\hat{h}_{t+1}^p = \frac{\delta}{g_t \bar{h}_t^{1-\beta}} \left(\hat{h}_t^p\right)^{\beta} \tag{11}$$

and, using (10), that of the rich agent by

$$2 - \hat{h}_{t+1}^p = \frac{\delta \kappa}{g_t \bar{h}_t^{1-\beta}} \left(2 - \hat{h}_t^p\right)^{\beta} \tag{12}$$

Combining (11) and (12), the dynamical system in (8) is, finally, given by

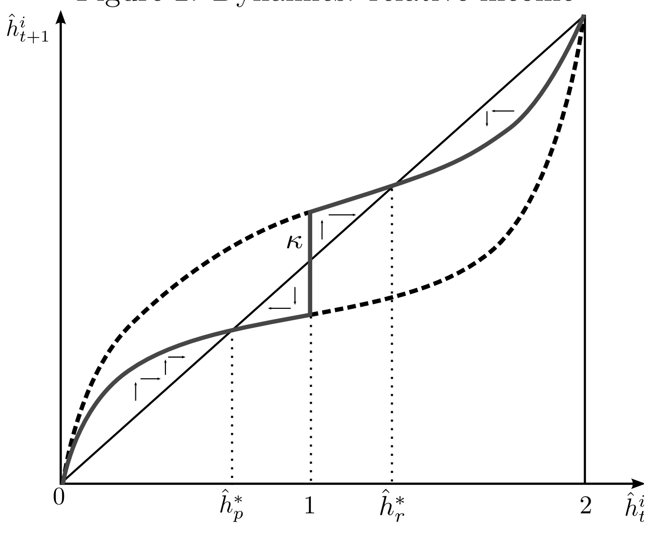
$$\hat{h}_{t+1} = \varphi\left(\hat{h}_t\right) = \begin{cases} \frac{2\hat{h}_t^{\beta}}{\hat{h}_t^{\beta}+\kappa\left(2-\hat{h}_t\right)^{\beta}} \equiv \varphi^{p}\left(\hat{h}_t\right) & \text{if } \hat{h}_t \leq 1 \\ \frac{2\kappa\hat{h}_t^{\beta}}{\kappa\hat{h}_t^{\beta}+\left(2-\hat{h}_t\right)^{\beta}} \equiv \varphi^{r}\left(\hat{h}_t\right) & \text{if } \hat{h}_t > 1 \end{cases} \tag{13}$$

Proposition 1. *The dynamical system in* (13) *admits one locally unstable* ($\hat{h} = 1$) *and two locally stable interior steady state equilibria* $\hat{h}^* = [\hat{h}_p^*, \hat{h}_r^*]$, *with* $\hat{h}_p^* = 2/(1+\kappa^{\frac{1}{1-\beta}})$ *and* $\hat{h}_r^* = 2\kappa^{\frac{1}{1-\beta}}/(1+\kappa^{\frac{1}{1-\beta}})$.

Proof. It follows from the properties of the system in (13); $\varphi(0) = 0$, $\varphi(2) = 2$, $\varphi^{r}(\hat{h}_t) > \varphi^{p}(\hat{h}_t)$, $\varphi(\hat{h}_t)' > 0$ and $\varphi(\hat{h}_t)'' \lesseqgtr 0$ for $\hat{h}_t \lesseqgtr \tilde{h}$ (see Appendix). □

Relatively poor individuals, with an income below the average, converge to the low stable equilibrium $\hat{h}_p^*$, while relatively rich individuals, with an income higher than the average, converge to the high stable equilibrium $\hat{h}_r^*$ (Fig. 2).

Figure 2: Dynamics: relative income



Increases in the premium κ have two effects on the distribution of incomes. On a side, increases in κ rise the high stable steady state equilibrium $\hat{h}_r^*$ through their straightforward positively effect on the income of the relatively richer agents. On the other hand, increases in κ also decrease the low stable steady state $\hat{h}_p^*$ via their effect on the mean income. As a consequence, increases in the premium bring forth an increase in the relative economic distance between the two groups (i.e. inequality). In order to conclude this short paper, it can be remarked that the technological non-convexity alone would have been not sufficient to generate multiple equilibria. While most of the literature has coupled this mechanism with either credit market imperfections (Galor & Zeira, 1993) or preference non-homotheticity (Moav, 2002), the channel that here produces the poverty traps hinges on the incentives of the individuals in retaining a relatively preferential position in the society.

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Appendix

Properties of the dynamical system in Eq. (13)

$$\left.\frac{\partial \hat{h}_{t+1}}{\partial \hat{h}_t}\right|_{\hat{h}_t \leq 1} = \frac{4\beta\kappa}{\left[\hat{h}_t\left(2-\hat{h}_t\right)\right]^{1-\beta}\left[\hat{h}_t^{\beta}+\kappa\left(2-\hat{h}_t\right)^{\beta}\right]^2} > 0$$

and

$$\left.\frac{\partial \hat{h}_{t+1}}{\partial \hat{h}_t}\right|_{\hat{h}_t > 1} = \frac{4\beta\kappa}{\left[\hat{h}_t\left(2-\hat{h}_t\right)\right]^{1-\beta}\left[\kappa\hat{h}_t^{\beta}+\left(2-\hat{h}_t\right)^{\beta}\right]^2} > 0$$

since $\hat{h}_t < 2$ by definition. Further,

$$\left.\frac{\partial^2 \hat{h}_{t+1}}{\partial \hat{h}_t^2}\right|_{\hat{h}_t \leq 1} = \frac{8\beta\kappa\left[\hat{h}_t^{\beta}\left(\hat{h}_t-\beta-1\right)+\kappa\left(2-\hat{h}_t\right)^{\beta}\left(\hat{h}_t+\beta-1\right)\right]}{\left[\hat{h}_t\left(2-\hat{h}_t\right)\right]^{2-\beta}\left[\hat{h}_t^{\beta}+\kappa\left(2-\hat{h}_t\right)^{\beta}\right]^3}$$

and

$$\left.\frac{\partial^2 \hat{h}_{t+1}}{\partial \hat{h}_t^2}\right|_{\hat{h}_t > 1} = \frac{8\beta\kappa\left[\kappa\hat{h}_t^{\beta}\left(\hat{h}_t-\beta-1\right)+\left(2-\hat{h}_t\right)^{\beta}\left(\hat{h}_t+\beta-1\right)\right]}{\left[\hat{h}_t\left(2-\hat{h}_t\right)\right]^{2-\beta}\left[\kappa\hat{h}_t^{\beta}+\left(2-\hat{h}_t\right)^{\beta}\right]^3}$$

In both cases, simulations available upon request show the followings

$$\frac{\partial^2 \hat{h}_{t+1}}{\partial \hat{h}_t^2}\begin{cases} < 0 & \text{if } \hat{h}_t < \tilde{h} \\ > 0 & \text{if } \hat{h}_t > \tilde{h} \end{cases}$$

with $\tilde{h} > \hat{h}_p^* \, (\hat{h}_r^*)$ for $\partial^2 \hat{h}_{t+1}/\partial \hat{h}_t^2\big|_{\hat{h}_t \leq 1}$ $(\partial^2 \hat{h}_{t+1}/\partial \hat{h}_t^2\big|_{\hat{h}_t > 1})$.