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Social Capital Accumulation and the Evolution of Social Participation*

Angelo Antoci† Pier Luigi Sacco‡ Paolo Vanin§

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Abstract

We study the co-evolution of social participation and social capital accumulation, taking the view that the former contributes to the latter, and both contribute to the enjoyment of 'relational goods'. Within this framework, we show that a process of substitution of private for social activities (observable in some advanced, affluent economies), might be self-reinforcing and lead to a Pareto-dominated steady state. We find some scope for policy intervention, but we also acknowledge its difficulty.

JEL-Classification: C73, D62, I31, J22, O41, Z13

Key-words: Social Capital, Well-being, Time Allocation

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1 Introduction

It is intuitively clear, and well acknowledged by social psychologists [see e.g. Moscovici (1993)], that individual well-being depends crucially on social relations. In contrast, most economic models let it just depend on private consumption, or at at most consumption and leisure, typically both interpreted as private goods [see Postlewaite (1998) for a discussion]. In this paper we take the view that socially enjoyed leisure is crucial for well-being, but leaves individuals highly exposed to the external effects of other people's behavior[1]. In a poor social environment, therefore, there is an incentive to shift away from low-rewarding social activities and to invest more time in private ones. If such activities yield goods that enter in GDP records, while socially enjoyed leisure mostly does not, this substitution process may be an engine of economic growth, but at the same time it may lead to social impoverishment. We investigate this mechanism in the context of a dynamic model that studies the co-evolution of social participation and of social capital accumulation.

The economic literature on social capital (defined by Narayan (1999) as "the norms and social relations embedded in the social structures of societies that enable people to coordinate action to achieve desired goals") has provided abundant evidence of two facts: a positive relationship between some forms of social capital and growth, and a recent impoverishment in some countries' stock of social capital[2]; moreover, it has provided a few models explaining certain features of social capital accumulation. For instance, DiPasquale and Glaeser (1999) show theoretically and empirically that homeowners invest more than renters both in social connections and in local amenities; Glaeser, Laibson and Sacerdote (2002) argue that individuals invest in social skills in the same way as they do in human capital; Alesina and La Ferrara (2000) find theoretically and empirically that social participation is higher where income inequality, 'racial' segmentation and ethnic

[1] We prefer to speak of well-being rather than of welfare precisely because we want to focus on its 'social aspects'.

[2] See Sobel (2002) for a critical discussion of this literature and Coleman (1988, 1990) for seminal work. The World Bank (2004) has an excellent electronic library on the subject. Knack and Keefer (1997) and Zack and Knack (2001) present some of the most relevant empirical findings about the relationship between social capital and growth. Putnam (2000) documents in detail the rise and decline of U.S. social capital over the XX century; among others, Costa and Kahn (2003) discuss the causes of this phenomenon.

segmentation are lower; Routledge and von Amsberg (2003) argue that technological change may increase labor mobility and therefore decrease social capital.

There are a number of features that we add to this literature. First, if the positive link between social capital and growth makes people worry about the possible consequences of social impoverishment, we take a stronger position: even if the decline in social capital were matched by higher (rather than lower) growth, or even if it were itself an engine of growth, its overall well-being consequences might be negative; moreover, we find that a problem of social poverty may emerge in an economy in which individuals are identical in terms of preferences, technology and endowments, so that Alesina and La Ferrara's (2000) findings imply that the same problem will be even more serious in highly segmented or unequal societies. Second, we advance the existing literature by explicitly studying the bi-directional link between social participation and social capital accumulation. Third, unlike Glaeser, Laibson and Sacerdote (2002), we do not conceive social capital as a private asset, but rather as a 'social' asset, thus remaining close to Narayan's (1999) above quoted definition. While we share with Routledge and von Amsberg (2003) this focus on the 'social' aspects of social capital[3], we differ from them by emphasizing its 'capital' aspect as well and by explicitly modelling its accumulation. Finally, while in a companion paper [Antoci, Sacco and Vanin (2004)] we study growth and social capital accumulation within a neoclassical framework, starting from the assumption that individuals are fully rational, here we explore the idea that social dynamics may be the result of boundedly rational behaviors (for instance, it may be driven to a large extent by imitation of other people's successful behavior).

The possibility that economic growth brings about the destruction of old patterns of social relationships is an old concern in social sciences, dating back at least to the observers of the effects of the industrial revolution. Although old, it remains extremely actual, since, as Hisch (1976) and Putnam (2000), among others, well document, it may explain important trends of contemporary economies. A new attention is now paid to the idea that this same process may further stimulate economic growth, inducing a substitution of private for social activities. There is an environmental economics literature that focuses on this mechanism: see, among others, Antoci and Bartolini (1999 and 2004). While this literature mostly focuses on natural

[3]See also Bowles and Gintis (2002), and Schiff (1992 and 2002).

resources, our focus is rather on the social environment.

Our work is also related to Corneo's (2001) finding that television watching and work hours are positively correlated across countries. He explains this fact with a model of time allocation among labor, private leisure and socially enjoyed leisure, with strategic complementarity in the latter and therefore multiple equilibria. Our model is close to it because we focus on a similar time allocation problem, with strategic complementarities in socially enjoyed leisure[4]. In particular, we share his consideration that the latter generates 'relational goods', a concept introduced by Uhlaner (1989) and amounting to a special case of Cornes and Sandler's (1984) joint production model. Relational goods have the peculiar features that they cannot be enjoyed alone and that their enjoyment depends on both own and other people's contribution, so that they are an intermediate case between private and public goods. Examples include social approval, solidarity, friendship, sharing life with another person and creating or reinforcing group identity or the sense of affiliation to a group (possibly through identification with social or ethical norms). What we add to Corneo's analysis is the consideration that relational goods also depend on the social environment in which interaction takes place: at a given level of own and other people's participation, it makes a different whether a history of high participation has generated high trust, shared values and a large amount of opportunities for socially enjoyed leisure, or whether the social environment is poor, so that the incentives for social participation are low. In other words, we let relational goods depend on social capital and we study how its accumulation influences the patterns of time allocation between private and social activities[5].

In this paper, we model social capital as an accumulated externality of social participation that positively affects the enjoyment of relational goods. 'Investment' in social capital takes the form of time investment in social activities, which are pursued with the aim of enjoying relational goods[6]. As

[4]See Cooper and John (1988) for general results on strategic complementarities and multiple equilibria, and Becker (1965) for seminal work on the economics of time allocation.

[5]In principle, relational goods could also depend upon participants' and not participants' identity, but we do not consider this issue because we assume identical individuals. See Akerlof and Kranton (2000) for a deeper discussion about the economic relevance of identity.

[6]The fact that consumption and investment are not opposed here should not surprise, since it is a common feature of various forms of non material capital (e.g., the use of knowledge increases its stock, rather than diminishing it). Such intuition goes back to the Aristotelian analysis of ethical virtues, whose seeds are still to be found in Nussbaum's

discussed, among others, by Paldam and Svendsen (2000), there are several alternative ways to think of social capital: other forms of social capital are surely best modelled in a different way, but we think that our formalization captures concretely observable phenomena that are of crucial relevance for well-being. There is one major aspect that we are neglecting and that deserves discussion: while we are restricting social capital accumulation and enjoyment of relational goods to depend just on social interaction outside of the market, it is clear that both of them may take place, to a certain extent, also through market interaction. Therefore, although useful to make our point clear, our formulation is extreme. Yet, we believe that it captures the right sign, so that our qualitative results would still hold in a more general setting, because the market is primarily private-oriented and does not foster a collective orientation, which appears to be crucial for the accumulation of many forms of social capital and for enjoyment of relational goods[7]. As a final observation, notice that we also neglect here for simplicity the role of investment in any form of private capital; yet, our companion neoclassical paper, which takes it into account, makes us confident that our results can be generalized in this direction.

The remainder of this paper is organized as follows. Section 2 displays the basic features of the model. Section 3 introduces the evolution of social participation taking the stock of social capital as given. Section 4 introduces social capital accumulation. Section 5 discusses the model's outcomes in terms of well-being and growth. Section 6 concludes.

2 The model

We model an economy composed by a continuum (of measure 1) of identical individuals (i.e., with identical preferences and technology), whose well-being depends on three kinds of goods[8]: a private subsistence good (Y), a relational good (B) and a private good which is perfect substitute of the relational good

(1986) investigation of relational goods.

[7]On the relationship between market and non-market forms of interaction see, among the many possible references, Polanyi (1977), Anderson (1990) and Sacco and Zamagni (2001).

[8]In what follows we shall assume for simplicity that there are just three single goods, but it would be easy to generalize to the case of three bundles of goods.

(Y_s)[9]. Every 'day' (we adopt a continuous specification of 'days') individuals choose how to allocate their time endowment (normalized to 1) between production and consumption of private goods, on one side (fraction $1-s$ of their time), and socially enjoyed leisure, on the other side (fraction s). Socially enjoyed leisure yields utility in the form of relational goods, but its returns depend, besides on own choices, also on other people's time allocation and on the opportunities available in the social environment. In what follows we speak indifferently of socially enjoyed leisure and of social activities. For simplicity, we assume that agents have to choose between the two following pure strategies:

(R) a relational-oriented strategy, according to which they spend the fraction $s_H \in (0,1)$ of their time in social activities;

(P) a private-oriented strategy, according to which they spend less time in social activities, $s_L \in (0, s_H)$, and more in production and consumption of private goods.

We assume a very simple technology for private goods: the relational strategy yields a fixed quantity $\bar{Y}$ of private subsistence goods; the private strategy yields, besides $\bar{Y}$, also yields the fixed amount $\bar{Y}_s$ of those private goods which are substitutes of relational goods. As far as relational goods are concerned, identifying an individual with her chosen strategy, so that $i \in \{R, P\}$, we assume the following technology:

$$B_i(K_s, x) = s_i R(K_s, x), \tag{1}$$

where $s_i = s_L$ if $i = P$ and $s_i = s_H$ if $i = R$; $R(K_s, x)$ represents the opportunities available in the social environment, which depend on the level K_s of social capital and on the aggregate amount of time currently devoted to social activities, which is $[s_H x + s_L(1-x)]$, where $x \in [0,1]$ is the fraction of individuals choosing the relational strategy[10]. K_s captures the accumulated effect of past social participation, whereas x measures its present level. $R(K_s, x)$ is specified as follows:

[9]The assumption that Y_s is a perfect substitute for the relational good is rather optimistic [see Anderson (1990)]. By such assumption, the results about well-being in the next section gain more relevance.

[10]Let us emphasize that $x = 1$ does not mean that individuals spend all of their time in social activities, but rather that all of them spend relatively more time in these activities and relatively less in private ones.

$$R(K_s, x) = [s_H x + s_L(1-x)]^\beta K_s^\gamma, \tag{2}$$

where $\beta > 0$ and $\gamma \in (0,1)$ are parameters[11]. Notice that $R(K_s, x)$ is an increasing function of x. Notice as well that in our model the time not spent in production and consumption of private goods is not itself a final good, but rather an intermediate good, whose value in terms of enjoyed relational goods depends on average social participation and on available social opportunities.

Assuming that individual preferences are represented by the utility function $U = \ln Y + \ln(B + aY_s)$, where $a > 0$ is the marginal rate of substitution between B and Y_s, the payoffs of the two strategies are the following: the relational strategy yields

$$\begin{aligned} U_R(K_s, x) &= \ln \bar{Y} + \ln[B_R(K_s, x)] = \\ &= \ln \bar{Y} + \ln[s_H R(K_s, x)] = \\ &= \ln \bar{Y} + \ln\{s_H[s_H x + s_L(1-x)]^\beta K_s^\gamma\} \end{aligned} \tag{3}$$

and the private strategy yields[12]

$$\begin{aligned} U_P(K_s, x) &= \ln \bar{Y} + \ln[B_P(K_s, x) + a\bar{Y}_s] = \\ &= \ln \bar{Y} + \ln[s_L R(K_s, x) + a\bar{Y}_s] = \\ &= \ln \bar{Y} + \ln\{s_L[s_H x + s_L(1-x)]^\beta K_s^\gamma + a\bar{Y}_s\}. \end{aligned} \tag{4}$$

3 Evolution of social participation

We follow an evolutionary game approach and assume that the time derivative of x, $\dot{x} \equiv \frac{dx}{dt}$, is given by the so called 'replicator equation' [see Weibull (1995)]:

$$\dot{x} = x[U_R(K_s, x) - \bar{U}(K_s, x)], \tag{5}$$

where $\bar{U}(K_s, x)$ is the average payoff

[11] The assumption that $\gamma < 1$ rules out the possibility that the only two possible attractors of dynamics (13) introduced below are $K_s = 0$ and $K_s = \infty$. Indeed, our results can be extended to the case of $\gamma \geq 1$, although this is not very interesting. The extension is anyway available from the authors upon request.

[12] Notice that strategy P reduces exposure to the negative externality of low $R(K_s, x)$.

$$\bar{U}(K_s, x) \equiv U_R(K_s, x)x + U_P(K_s, x)(1 - x). \tag{6}$$

The choice of the replicator dynamics as social selection mechanism does not imply a real loss of generality in a two-strategy setting like the one of the present paper (although the dynamic interaction with social capital accumulation, discussed in the Section 6 below could, at least in principle). As pointed out e.g. by Björnerstedt and Weibull (1996), every payoff-monotonic selection dynamics can be represented in terms of the replicator dynamics (by means of a suitable time and/or strategy dependent factor) and, moreover, such dynamics is consistent with several realistic individual and social learning mechanisms, such as simple forms of reinforcement of successful own behaviors or imitation of observed successful behaviors of others [see also Börgers, Sarin (1997) and Schlag (1998) for deeper insights into the behavioral microfoundations of the replicator dynamics].

Equation (5) may be rewritten as follows:

$$\dot{x} = x(1 - x)\Delta U(K_s, x), \tag{7}$$

where $\Delta U(K_s, x)$ is the payoff differential

$$\begin{aligned} \Delta U(K_s, x) &\equiv U_R(K_s, x) - U_P(K_s, x) = \\ &= \ln \frac{s_H[s_L + (s_H - s_L)x]^\beta K_s^\gamma}{s_L[s_L + (s_H - s_L)x]^\beta K_s^\gamma + a\bar{Y}_s}. \end{aligned} \tag{8}$$

In general the evolution of social participation will depend on the dynamics of K_s, but for expositional purposes it is worthwhile to start with a separate analysis of $\dot{x}$ when the stock of social capital is fixed. Throughout the rest of this section we treat consequently K_s as a strictly positive parameter. To classify dynamics (7) when K_s is constant, let us first define[13]

$$K_s^1 \equiv \left[\frac{a\bar{Y}_s}{(s_H - s_L)s_H^\beta}\right]^{\frac{1}{\gamma}}, \tag{9}$$

$$K_s^2 \equiv \left[\frac{a\bar{Y}_s}{(s_H - s_L)s_L^\beta}\right]^{\frac{1}{\gamma}}, \tag{10}$$

[13]It is immediate to notice that $K_s^1 < K_s^2$ and that $\bar{x}$ is increasing in K_s.

$$\bar{x} \equiv \left[\frac{a\bar{Y}_s}{(s_H - s_L)^{1+\beta}}\right]^{\frac{1}{\beta}} \frac{1}{K_s^{\frac{\gamma}{\beta}}} - \frac{s_H}{s_H - s_L}. \tag{11}$$

Proposition 1 *Dynamics (7) can be classified as follows:*

- *If $K_s \leq K_s^1$, then, for every initial value $x(0) \neq 1$, the strategy adoption process converges to the fixed point $x = 0$, in which all individuals follow strategy P (see figure 1.a).*
- *If $K_s \geq K_s^2$, then, for every $x(0) \neq 0$, it converges to the fixed point $x = 1$ (see figure 1.b).*
- *If $K_s^1 < K_s < K_s^2$, then both fixed points $x = 0$ and $x = 1$ are locally attracting and their attraction basins are separated by the repulsive fixed point $\bar{x} \in (0, 1)$ (see figure 1.c).*

Proof Notice first that $\dot{x} = 0 \iff \{x = 0 \vee x = 1 \vee \Delta U(x) = 0\}$. Since $\frac{d\Delta U(x)}{dx} > 0 \quad \forall x \in (0, 1)$, this implies that $x = 0$ and $x = 1$ are the only possible attractive fixed points. Since $\Delta U(x) = 0 \iff x = \bar{x}$ and $sgn(\dot{x}) = sgn[\Delta U(x)]$, it follows that
$\bar{x} \geq 1$ [i.e. $\Delta U(x) < 0 \quad \forall x \in (0, 1)$] $\iff K_s \leq K_s^1$;
$\bar{x} \leq 0$ [i.e. $\Delta U(x) > 0 \quad \forall x \in (0, 1)$] $\iff K_s \geq K_s^2$;
$\bar{x} \in (0, 1)$ (i.e. $\exists$ interior repulsive fixed point) $\iff K_s^1 < K_s < K_s^2$. Q.E.D.

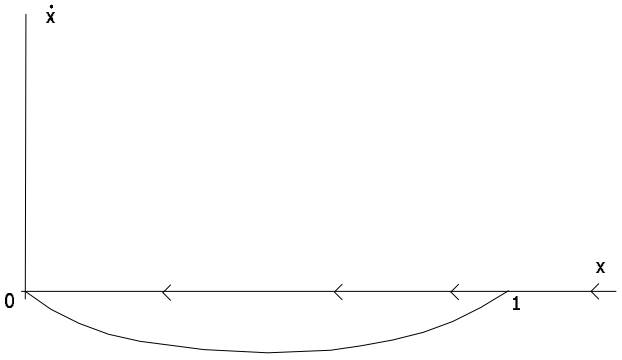

Figure 1a

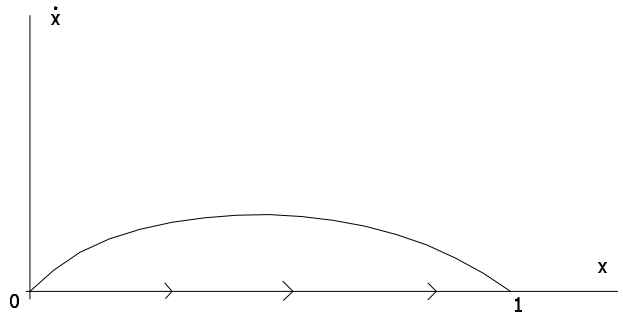

Figure 1b

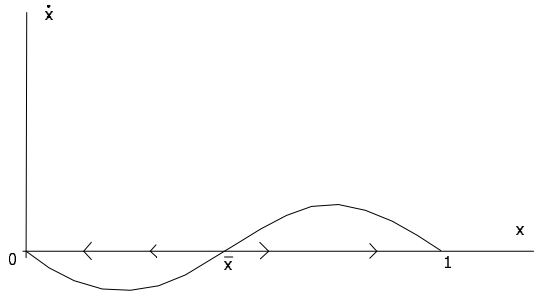

Figure 1c

To establish Pareto-comparisons among the fixed points, let us define[14]

$$K_s^3 \equiv \left[\frac{a\bar{Y}_s}{s_H^{1+\beta} - s_L^{1+\beta}}\right]^{\frac{1}{\gamma}}. \tag{12}$$

Proposition 2 *The fixed point $x = 1$ Pareto-dominates the fixed point $x = 0$ if and only if $K_s > K_s^3$. When the interior fixed point $\bar{x}$ exists, it Pareto-dominates $x = 0$ and it is Pareto-dominated by $x = 1$.*

[14]It is immediate to notice that $K_s^3 < K_s^1$.

Proof Notice that in $x = 0$, $x = 1$ and $x = \bar{x}$ each individual has the same utility level $\bar{U}(x)$, [defined in (6)], respectively equal to $U_P(0)$, $U_R(1)$, and both $U_R(\bar{x})$ and $U_P(\bar{x})$. Now, $K_s > K_s^3$ just amounts to a re-writing of $U_R(1) > U_P(0)$. Recalling that $U_R(x)$, $U_P(x)$ and $\bar{U}(x)$ are all strictly increasing in x, the last result, which means $\bar{U}(1) > \bar{U}(\bar{x}) > \bar{U}(0)$, immediately follows. Q.E.D.

Proposition 2 implies that if the fixed point $x = 1$ is locally attractive, it always Pareto-dominates the fixed point $x = 0$, even when the latter is locally attractive. Furthermore, even if $x = 0$ is the unique attracting fixed point, it may be Pareto-dominated by $x = 1$; in particular, this is the case when $K_s^3 < K_s \leq K_s^1$. When the economy converges to $x = 0$, an increasing proportion of individuals build their well-being on private rather than on social sources; aggregate production and consumption of private goods increases and so there is economic growth. Proposition 2 therefore says that economic growth may lead to a low well-being trap. In such case, it is the undesirable effect of a coordination failure.

4 Social capital accumulation

In the above section, social capital K_s has been taken as a parameter; we have seen that such parameter plays a key role in determining the relative performance of strategies R and P and the well-being properties of attracting fixed points under dynamics (7). However, the assumption of stationarity of K_s is restrictive; therefore, in this section we augment dynamics (7) by an equation describing social capital accumulation:

$$\begin{aligned} \dot{K}_s &= B_R(K_s, x)x + B_P(K_s, x)(1-x) - \delta K_s = \\ &= [s_H x + s_L(1-x)]R(K_s, x) - \delta K_s, \end{aligned} \tag{13}$$

where $\delta > 0$ is the depreciation rate of K_s. Equation (13) assumes that social capital increases when available social opportunities are effectively exploited, i.e., individuals devote time to social activities and enjoy relational goods. We are closer here to an interpretation of social capital in terms of evolution of customs and of social norms rather then in terms of construction of associations and other social organization; however, these are just two aspects of a same process, so that our assumption does not appear to be very

restrictive; moreover, a 'learning-by-doing' mechanism as the one formalized by equation (13) seems relevant for both forms of social capital. By plugging (2) into (13) we obtain

$$\dot{K}_s = K_s\{[s_L + (s_H - s_L)x]^{1+\beta} K_s^{\gamma-1} - \delta\}. \tag{14}$$

We analyze dynamics (7), (14) in the region of the plane (K_s, x) in which $K_s \geq 0$ and $0 \leq x \leq 1$. Let us define

$$K_s^L \equiv \left[\frac{\delta}{s_L^{1+\beta}}\right]^{\frac{1}{\gamma-1}}, \tag{15}$$

$$K_s^H \equiv \left[\frac{\delta}{s_H^{1+\beta}}\right]^{\frac{1}{\gamma-1}}. \tag{16}$$

Proposition 3 *Dynamics (7), (14) has two possible asymptotic attractors,* $(K_s^L, 0)$ *and* $(K_s^H, 1)$*. If* $K_s^L > K_s^2$*, only the latter one is present; if* $K_s^L < K_s^2$ *and* $K_s^H > K_s^1$*, both of them; if* $K_s^H < K_s^1$*, only the former one. Along the trajectories leading to* $(K_s^L, 0)$*, the economy experiences private growth at the expenses of social participation and ends up in a state of social poverty; along the paths towards* $(K_s^H, 1)$*, expansion of social participation leads to social prosperity, but at the expenses of private growth.*

Proof See Appendix.

Figures 2a, 2b and 2c give a graphical representation of the possible dynamics[15].

[15] In the figures, sinks are represented by full dots •, sources by open dots ∘ and saddle points by drawing their stable and unstable manifolds.

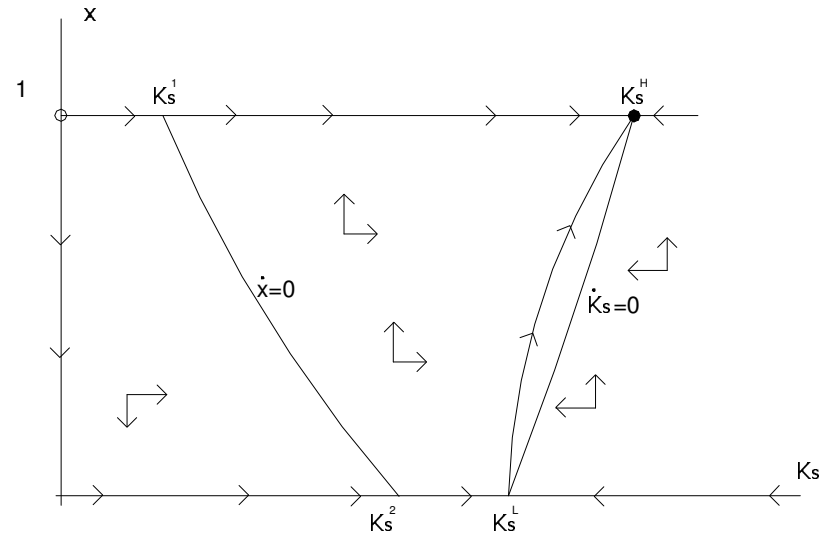

figure 2a

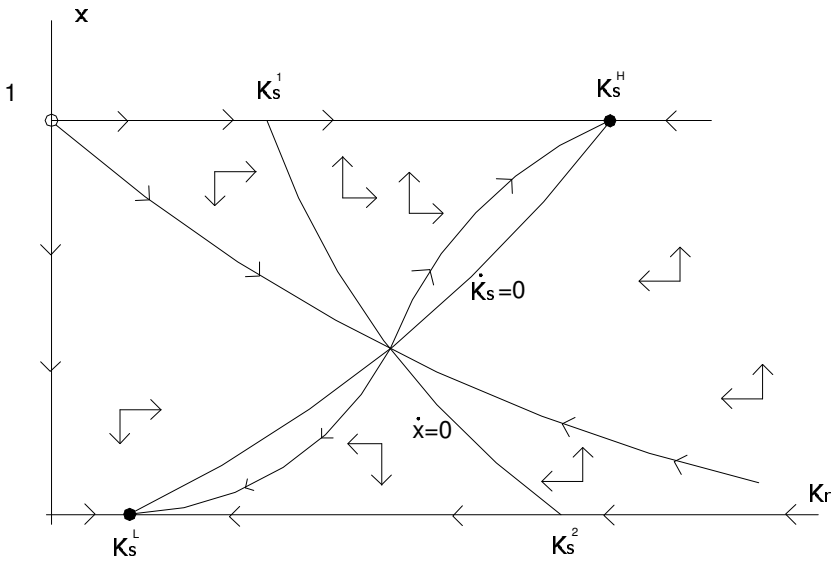

figure 2b

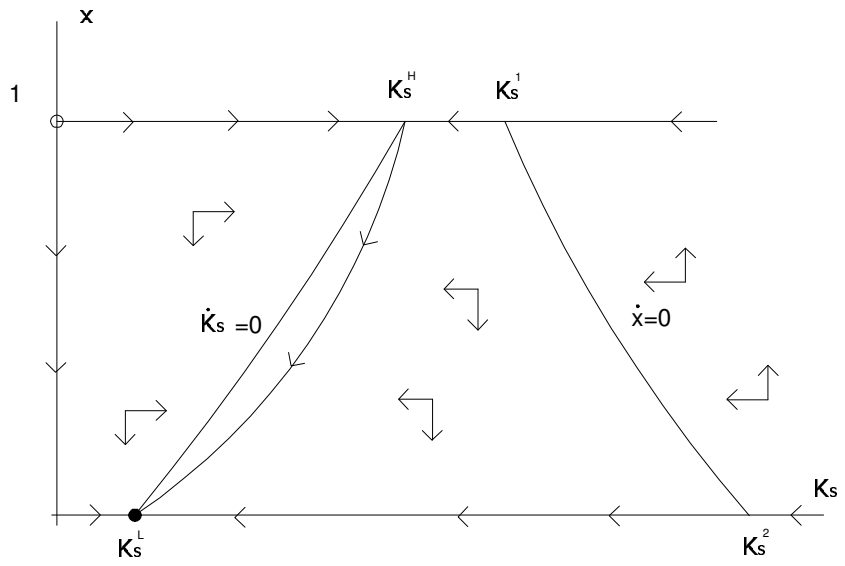

figure 2c

5 Well-being and social poverty traps

We next consider the well-being properties of the two asymptotic attractors $(K_s^L, 0)$ and $(K_s^H, 1)$ and of the other fixed points of dynamics (7), (14).

Proposition 4 *When both attractors are present,* $(K_s^H, 1)$ *always Pareto-dominates* $(K_s^L, 0)$*. More generally, whenever it is an attractor,* $(K_s^H, 1)$ *Pareto-dominates every other fixed point. When* $(K_s^L, 0)$ *is the only attractor, it may be Pareto-dominated by some other fixed point: in particular,* $K_s^H > K_s^3$ *is a sufficient condition for* $(K_s^L, 0)$ *to be Pareto-dominated by* $(K_s^H, 1)$*.*

Proof We work out the proof only for the first sentence of Proposition 4. Since the proof of the other results works exactly the same way, we omit it. Recall from Proposition 2 that, given K_s, $\bar{U}(K_s, 1) > \bar{U}(K_s, 0) \Leftrightarrow K_s > K_s^3$. Given x, $\bar{U}(K_s, x)$ is a strictly increasing function of K_s. When both attractors are present, we have that $K_s^3 < K_s^1 < K_s^H$, so that $\bar{U}(K_s^H, 1) > \bar{U}(K_s^H, 0) > \bar{U}(K_s^L, 0)$. Q.E.D.

As already mentioned, in $(K_s^L, 0)$ the economy reaches the highest level of expansion of private wealth at the expenses of social participation. Along the

trajectories leading the economy to such traps we observe economic growth driven by the destruction of social opportunities and by their replacement with private goods.

The above considerations do not however imply that it is always 'optimal' for individuals to coordinate their choices on the strategy R. The problem is analogous to that of interpreting Solow's *Golden Rule* as a normative device. To consider it, we have to study how individuals could rationally deviate from the dynamics assumed in the replicator equation (5).

Proposition 5 *Let $K_s^0 > 0$ be the initial endowment of social capital in the economy and suppose that all individuals coordinate on strategy R.*

- *If $K_s^0 > K_s^3$, strategy R is individually 'optimal' both in transition and in the steady state $(K_s^H, 1)$. Therefore, social poverty traps may be interpreted as a result of coordination failure.*
- *If $K_s^0 < K_s^3$, strategy R is individually 'optimal' only if agents are patient enough (or enough altruistic towards future generations), and social poverty traps may be interpreted as the combined result of coordination failure and of impatience (or lack of altruism towards future generations).*

Proof Just observe that when $K_s^0 > 0$, any strategy passing through $(K_s^0, 1)$ converges to $(K_s^H, 1)$ (the case of $K_s^0 = 0$ is trivial). Then the results of Proposition 5 follow from Proposition 2. Q.E.D.

Although Proposition 5 points at a coordination failure problem[16], clear-cut policy conclusion are hard to draw, especially because the present model is concerned with social capital provided by the civil society rather than by the government[17]. Nevertheless, there may be some scope for policy because the government could provide a set of rights, laws, incentives and services, that help individuals to coordinate efficiently. In general, government and civil society may be seen as complementary in generating the conditions for social capital accumulation, but, as argued by Narayan (1999), if either of them does not work properly, the other one may play, to a certain extent, a substitutive role. Examples of possible interventions, frequent in the literature, are promotion of association rights, improvement of communication

[16] See Cooper and John (1988).

[17] Collier (1998) appropriately distinguishes between these two sources of social capital.

systems and infrastructures, facilitating 'cross-cutting ties' among different social groups (for instance through school assignment regulation), and labor time regulation. What the state cannot do, and in this we share Paldam and Svendsen's (2000) conclusion, is to enforce social capital top-down, since the latter emerges essentially out of a self-enforcing process, that can be stimulated with adequate incentives, but not substituted for.

6 Concluding remarks

This paper develops a dynamic model of the co-evolution of social participation and social capital accumulation, to study the mechanism through which individuals in a growing economy may be led to substitute private for social activities, thus inducing a social impoverishment which reinforces the same mechanism. While previous research finds that a decline in an economy's stock of social capital may decrease its growth, we emphasize that, even under the optimistic hypothesis that it stimulates growth, it may nevertheless have negative consequences for well-being. In particular, we find that the economy may converge either to a steady state characterized by a high level of private activities and by a low level of social capital and social participation, or to one characterized by the opposite features. When both outcomes are possible, the former is Pareto-dominated by the latter. The actual patterns of convergence will then display path dependence. Taking into account that convergence to a 'social poverty trap' may be due to both coordination failure and to impatience, we acknowledge the difficulty of policy intervention, but at the same time we find some scope for it.

There are several ways in which the hypotheses we make may be relaxed. First, allowing for population heterogeneity would make social participation more difficult and thus would reinforce our results. Second, while it is not clear that social participation increases productivity in the private sector, other forms of social capital (namely generalized trust and trustworthiness) certainly do[18]; at the same time, social interaction within the market may be itself a source of social capital and of relational goods. The first aspect renders the problem of under-investment in social activities more serious; the second one less serious. Overall, it is hard to see how our results would change. Third, in our neoclassical companion paper we show that our results

[18]See Knack and Keefer (1997), Zak and Knack (2001) and Knack (2003).

do not depend on two specific hypothesis we make in the present context: the absence of private capital and the bounded rationality of our agents.

Appendix

Let us start with the locus $\dot{K}_s = 0$: this holds if either $K_s = 0$ or if

$$[s_L + (s_H - s_L)x]^{1+\beta} K_s^{\gamma-1} = \delta. \tag{17}$$

Equation (17) defines a function

$$K_s = \hat{K}_s(x) \equiv \left\{ \frac{[s_L + (s_H - s_L)x]^{1+\beta}}{\delta} \right\}^{1-\gamma}, \tag{18}$$

which is strictly increasing in x and such that $\dot{K}_s > 0$ below its graph and $\dot{K}_s < 0$ above it, with $\hat{K}_s(0) = K_s^L$ and $\hat{K}_s(1) = K_s^H$, as specified in (15) and (16).

Let us now consider the locus $\dot{x} = 0$. As discussed in Section 5, $\dot{x} = 0 \iff \{x = 0 \vee x = 1 \vee \Delta U(K_s, x) = 0\}$ and $\Delta U(K_s, x) = 0 \iff x = \bar{x}$ [see equation (11)], but now, being K_s no more a fixed parameter, (11) defines a function

$$K_s = \tilde{K}_s(x) \equiv \left\{ \frac{a\bar{Y}_s}{(s_H - s_L)[s_L + (s_H - s_L)x]^{\beta}} \right\}^{\frac{1}{\gamma}} \tag{19}$$

which is strictly decreasing in x and such that $\dot{x} < 0$ below its graph and $\dot{x} > 0$ above it, with $\tilde{K}_s(1) = K_s^1$ and $\tilde{K}_s(0) = K_s^2$, as specified in (9) and (10).

Notice that the points $(K_s, x) \in \{(0,0), (0,1), (K_s^L, 0), (K_s^H, 1)\}$ are fixed points of dynamics (7), (14). In each of them there is no coexistence of the two strategies. The existence of an 'interior' fixed point (i.e. a fixed point where $K_s > 0$ and $0 < x < 1$) depends on the shape of the graphs of $\tilde{K}_s(x)$ and $\hat{K}_s(x)$. It is easy to check that, if the graphs of $\tilde{K}_s(x)$ and $\hat{K}_s(x)$ cross each other, then at their intersection it holds $\frac{d\tilde{K}_s(x)}{dx} > \frac{d\hat{K}_s(x)}{dx}$. Therefore, there exists at most one interior fixed point and, when existing, it is always a hyperbolic saddle[19]. There are therefore three possible cases:

- For $K_s^L > K_s^2$, the interior saddle does not exist, both $(0,0)$ and $(K_s^L, 0)$ are saddle points, $(0,1)$ is a source and $(K_s^H, 1)$ is a sink. Almost all the trajectories approach the sink (see figure 2.a).

[19]The condition $\frac{d\tilde{K}_s(x)}{dx} > \frac{d\hat{K}_s(x)}{dx}$ implies that the determinant of the jacobian matrix evaluated at the interior fixed point is strictly negative; consequently, the associated eigenvalues are both different from zero (i.e. the fixed point is hyperbolic) and have opposite sign (i.e. the fixed point is a saddle point).

- For $K_s^L < K_s^2$ and $K_s^H > K_s^1$, there exists the interior saddle, $(0,0)$ is a saddle, $(0,1)$ is a source, both $(K_s^L, 0)$ and $(K_s^H, 1)$ are sinks. The stable manifold of the interior saddle separates the attraction basins of the two sinks (see figure 2.b).

- For $K_s^H < K_s^1$, the interior saddle does not exist, both $(0,0)$ and $(K_s^H, 1)$ are saddles, $(0,1)$ is a source and $(K_s^L, 0)$ is a sink. Almost all the trajectories approach the sink (see figure 2.c).

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