

Social capital accumulation and the evolution of social participation

Angelo Antoci^a, Pier Luigi Sacco^b, Paolo Vanin^{c,*}

^a Department of Economics, Università di Sassari, Italy

^b DADI, IUAV, Venice, Italy

^c Department of Economics and Business, Universitat Pompeu Fabra,
Ramon Trias Fargas, 25-27, 08005 Barcelona, Spain

Accepted 21 November 2005

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 socially enjoyed leisure. 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.

© 2006 Elsevier Inc. All rights reserved.

JEL classification: C73; D62; I31; J22; O41; Z13

Keywords: Socially enjoyed leisure; Time allocation

1. Introduction

“I am one and only child to my parents. All my life I wanted to have a brother or a sister. Now it is possible! At this site we will find everybody his/her brother/sister”. This announcement, found on an internet site, is one of the many possible examples of private services providing an imperfect substitute for certain interpersonal relationships.¹ While providing a brother or sister is clearly hard for any private provider (but one’s parents), maybe things are easier for ‘friendship providers’. Indeed, one finds plenty of them in magazines, on the internet and through other channels. What does a friendship provider offer? Essentially, it provides on a market base some services that are

* Corresponding author. Tel.: +34 935422699; fax: +34 935422533.

E-mail address: paolo.vanin@upf.edu (P. Vanin).

¹ The web site is <http://samlev.tripod.com/iwantabrothersister>.

traditionally obtained through relational activities outside of the market.² More generally, we can say that it is now common, especially in affluent societies, to find market substitutes (in general, imperfect substitutes) for given relational services (like friendship, socially enjoyed leisure, and several forms of social participation).³

The diffusion of such substitutes may be interpreted as a sign of their efficiency and of their superiority to traditional social channels. For instance, one may argue that dating services reduce matching costs, that encountering potential ‘friends’ who were pre-selected by some ‘intelligent’ system reduces relationship building costs and that services that automatically remind you of anniversaries reduce relationship maintenance costs. Alternatively, one may argue that an artificial matching or relationship building and maintenance system impoverishes social relationships of their social nature. In the narrowest view, this just amounts to saying that socially provided and market provided relational services are imperfect substitutes. There is some evidence that the substitutes that may be bought with the additional income granted by a stronger private orientation are not sufficient to compensate the welfare loss in relational domains.⁴

Broadening the perspective, one has to recognize that social relationships are characterized, almost by definition, by the fact that individuals are highly exposed to the external effects of other people’s behavior. Some of these externalities have to do with the process of identity building. Although important, as argued by Akerlof and Kranton (2000), we do not tackle them here. Other external effects arise because the ‘production’ process of relational services may be described as ‘joint production’, to use Cornes and Sandler’s (1984) terminology. Further externalities are due to the fact that relational activities shape a social environment, which affects the ‘productivity’ of future social interaction.⁵

A substitution of market for social provision of relational services may bring about a reduction in the exposure to such external effects. We investigate this substitution process and in particular the possibility that it stimulates economic growth and is stimulated by it. To do this, we develop a simple growth model that studies the co-evolution of social participation and social capital accumulation. These concepts and the contribution of our work to the literature are discussed in Section 3, after having presented in Section 2 the main features of our model in a non-technical way. Section 4 presents the formal model, whose dynamics and welfare properties are analyzed in Sections 5 and 6, leaving some final comments for the concluding section.

2. Main features and scope of the model

Several services from social interaction, like friendship and many forms of socially enjoyed leisure, are not recorded by national accounting. By contrast, many of their private substitutes enter

² For instance, the ‘Managed Friendship Service Provider’ offers that “you choose your friends from a network of pre-screened accredited Friendship Providers”; in other words, it is the system that selects your ‘friends’ (from <http://www.funny.co.uk/stuff/art..71-2225-The-Managed-Friendship-Service-Provider.html>).

³ Among the many possible references, see Moscovici (1993) for the psychological importance of social relationships and Postlewaite (1998) for a discussion of the opportunity to include in the utility function objects different from consumption and leisure. Poutvaara and Wagener (2004) study the role of religious groups as friendship providers.

⁴ For instance, Nickerson et al. (2003) provide interesting evidence of the negative impact of the ‘goal for financial success’ on satisfaction with family, friendship, job and with overall satisfaction.

⁵ Eaton et al. (2000) make a similar point, emphasizing the relevance of shared experience for social interaction. While their model is used to explain phenomena like cultural imperialism, superstars and fads, we are rather concerned with social capital accumulation, but we share the view that the time spent in the past by other people in the same activity as ourselves increases returns to our social interaction with them. We thank an anonymous referee for addressing us to this paper.

in GDP records. Therefore, a widespread substitution of market for social provision of relational services may appear in official numbers as economic growth. Moreover, if this substitution is a reaction to changes in social environment that render social activities less rewarding relative to their private substitutes, and if this reaction further worsens the social environment, the result may be a self-feeding process of economic growth and social impoverishment.

We investigate the conditions under which such a process may arise. We then ask whether economists should worry about it or not. To do it, we develop a model in which individual utility depends on two goods, a market provided private good and a socially provided relational service. The acquisition of both goods requires time. We call ‘private activities’ and ‘social activities’ the time devoted to production and consumption of the respective good. For the sake of concreteness, we may think of work (and private consumption) on one side and of socially enjoyed leisure on the other side.

These two activities are substitutes, because individuals are endowed with a fixed amount of time, which may be allocated between them. We consider two alternative forms of time allocation: a more relational-oriented one, with a higher ratio of social to private activities, and a more private-oriented one, with a lower ratio. An example is part-time versus full-time job (or, more generally, a shorter versus a longer working day). In the rest of this paper we measure ‘social participation’ by the proportion of individuals following the relational-oriented strategy. We take the view that social participation changes over time according to an evolutionary dynamics. This means that individuals respond in a boundedly rational way to the incentives they face. Such response is particularly plausible if one thinks that imitation of other people’s successful behavior (or reinforcement of one’s own successful behavior) plays a relevant role in individual choices of time allocation.

Incentives to adopt either strategy depend on their relative rewards, which in turn depend on the specific technology we assume. Our main assumption is that private activities are less exposed to external effects than social activities. We assume that this holds for the effects of both past and current social participation. This assumption is crucial and defines the scope of applicability of our model.

It seems natural to assume that rewards to social activities depend more crucially on current social participation than rewards to private activities. For instance, my wage and my private consumption may change a little as a consequence of aggregate changes in social participation, but the pleasure I gain from socially enjoyed leisure is likely to be much more sensitive to them. We go to the extreme and assume no static externalities in private production, whereas current social participation increases individual rewards to social activities.

On the other hand, past choices of time allocation are also likely to affect the relative productivity of private and social activities. This is because they may contribute to private and social capital accumulation, and possibly also to technological development. We neglect here for simplicity the role of investment in any form of private capital, either physical or human; yet, our companion paper (Antoci et al., 2005), which takes it into account, makes us confident that our results can be generalized in this direction.

We rather concentrate on the fact that social capital accumulates when social participation is high enough to maintain existing relationships and create new ones.⁶ We think of social capital here

⁶ Since we consider here social capital as an accumulated externality, we can only speak of investment in a metaphorical sense. Observe, yet, that in many forms of non-material capital consumption and investment are not opposed (e.g., the use of knowledge increases its stock, rather than diminishing it). It is interesting to notice that the idea that the use of a good increases its stock goes back to the Aristotelian analysis of ethical virtues, whose seeds are still to be found in Nussbaum’s (1986) investigation of relational goods.

in terms of relational networks and social norms arising as a by-product of social interaction.⁷ The presence of such norms and networks improves the quality of social environment and increases the opportunities available to social activities. Therefore, it increases their *absolute* return. We assume that it also increases the return to social activities *relative* to private ones. The argument is the same as above. Indeed, even if my productivity at work (and the pleasure I derive from private consumption) might be influenced by existing social norms and networks, my socially enjoyed leisure is likely to be much more sensitive to them. We then go again to the extreme and assume no effects of social capital on the productivity of private activities. We adopt the simplifying assumption of letting social capital and relational services just depend on past and present social interaction outside of the market. By contrast, it is clear, for instance, that social norms and relational networks are also generated through interaction on the job, that colleagues may become friends and that starting a formal job may expand one's social world.⁸ Yet our model is not concerned with the alternative between working and not working. Rather, it is concerned with the option between working more and working less, for instance between full-time and part-time. Here the positive socializing effect of working seems to be dominated by the opposite effects of decreased time availability and of increased stress.⁹ Therefore, our simplification seems well justified. Besides the effects of accumulable factors, there is a technological effect: growth comes together with changes in the technology of both private production and social interaction. Here we abstract from technological change. It is hard to assess on the empirical ground whether such changes increase returns to social activities relative to private ones, or rather decrease them. Indeed, one can think of examples working in both directions. For instance, new technologies like home cinema equipment (LCD projectors, DVD players, surround speakers) and computer sports simulators may provide individuals with better private substitutes for going together to the cinema, musical theater or concert hall and for forming sport teams. On the other hand, the diffusion of the internet may make individuals once again more dependent on the time spent by other people in the same activity.¹⁰ Overall, it is not clear what kind of effects would prevail. While precisely for this reason a deeper investigation of this issue is interesting, it is also beyond the scope of the present study.

In our model there is no engine for long run growth. Growth may only appear in transition towards a steady state. When social participation decreases, the overall time devoted to private activities increases, resulting in registered growth. When the private-oriented time allocation is more rewarding than the relational-oriented one, social participation decreases. Social capital accumulation therefore slows down (indeed, it may even become negative), giving rise to the possibility of a self-reinforcing process. When this is the case, we may face economic growth and social impoverishment at the same time. In the most interesting case, in which there are two dynamic attractors, one with low and one with high social capital, we show that the latter is Pareto-superior to the former. Thus, the low social capital steady state may be thought of as a social poverty trap. We discuss when and how coordination of current strategies, possibly combined with

⁷ Notice that we measure *social participation* by the proportion of individuals following the relational-oriented strategy at a given point in time, whereas *social capital* captures the accumulated effects of past social participation.

⁸ 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).

⁹ Alesina and La Ferrara (2000) show evidence that part-time workers participate more in social activities than both full-time workers and non workers. In general, it seems intuitive that a widespread private orientation favors the relative reward of the private-oriented strategy over the relational-oriented one.

¹⁰ We thank an anonymous referee for these examples.

interventions of social policy, may bring an economy out of such a trap. While we find some scope for policy intervention, we also acknowledge its difficulty. These are the main mechanisms at work in our model, but before turning to them in a more formal way, let us discuss more in detail the related literature.

3. Related literature

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 capital¹¹; 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 et al. (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 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 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 welfare consequences might be negative¹²; 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 et al. (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,¹³ we differ from them by emphasizing its ‘capital’ aspect as well and by explicitly modelling its accumulation. Finally, while in a companion paper (Antoci et al., 2005) 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

¹¹ See Sobel (2002) for a critical discussion of this literature and Coleman (1988, 1990) for seminal work. The World Bank (2006) has an excellent website on the subject. Knack and Keefer (1997) and Zak 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.

¹² See Sharpe (2004) for an articulated perspective on the various bi-directional links between productivity and social development.

¹³ See also Bowles and Gintis (2002), and Schiff (1992, 2002).

effects of the industrial revolution. Although old, it remains extremely actual, since, as [Hirsch \(1976\)](#) 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 \(1999, 2006\)](#). While this literature mostly focuses on natural resources, our focus is rather on the social environment.

Our work is also related to [Corneo's \(2005\)](#) 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. Here we bond together a higher amount of time devoted to work and private consumption into a single private-oriented strategy. We then focus on a similar time allocation problem, with strategic complementarities in socially enjoyed leisure (or, more generally, in social activities).¹⁴ In particular, we share his consideration that the latter generates 'relational goods', a concept introduced by [Uhlener \(1989\)](#) and amounting to a special case of [Cornes and Sandler's \(1984\)](#) joint production model. Relational goods or, as we called them above, relational services, 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.¹⁵ What we add to Corneo's analysis is the consideration that the relational services one derives from social interaction also depend on the social environment in which interaction takes place.

4. The model

4.1. Technology and preferences

We model an economy composed by a continuum (of measure 1) of identical individuals (i.e., with identical preferences and technology), whose utility depends on the services of a private consumption good, Y , and of socially enjoyed leisure, B . Every 'day' (we adopt a continuous specification of 'days') individuals choose how to allocate their time endowment (normalized to 1) between production of Y (fraction $1 - s$ of their time) and production of B (fraction s).¹⁶ For simplicity, we assume that individuals face a binary choice of time allocation: they may choose $s \in \{s_P, s_R\}$, where $0 < s_P < s_R < 1$. Choice of s_P corresponds to a more private-oriented time allocation; choice of s_R to a more relational-oriented one. This binary choice makes intuitive sense if we think of the alternative between working full time and part time.¹⁷ In what follows a subscript P (R) will denote variables referred to individuals choosing the private-oriented (relational-oriented) time allocation.

¹⁴ 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.

¹⁵ Often quoted 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).

¹⁶ More precisely, we think of fractions s and $1 - s$ in terms of time devoted to both production and consumption of the respective good. We will refer to s indifferently as time devoted to 'social activities' or to 'socially enjoyed leisure'.

¹⁷ In our companion (2005) neoclassical paper we show that allowing s to be a continuous variable does not alter the qualitative results, but in the present evolutionary context a continuous choice space would unnecessarily complicate the analysis, without adding much insight.

We emphasize the private nature of Y by assuming that its production just depends on own choice of time allocation and is greater under the private-oriented choice than under the relational-oriented one: namely, $Y_P > Y_R$.

Socially enjoyed leisure yields services B in an amount that also depends on other people’s time allocation and on the opportunities available in the social environment:

$$B_i(K_s, x) = s_i S(K_s, x), \quad i = P, R. \tag{1}$$

Here $S(K_s, x)$ represents the opportunities available in the social environment, which depend on the level K_s of social capital and on the fraction $x \in [0,1]$ of individuals choosing the relational strategy (i.e., on social participation)¹⁸:

$$S(K_s, x) = [s_R x + s_P(1 - x)]^\beta K_s^\gamma. \tag{2}$$

Here $\beta > 0$ and $\gamma \in (0,1)$ are parameters.¹⁹ The squared bracket is the aggregate amount of time currently devoted to social activities. K_s , in turn, captures the accumulated effect of past social participation. Notice that $S(K_s, x)$ is an increasing function of x . Notice as well that in our model time devoted to social activities is not itself a final good, but rather an intermediate good, whose value in terms of socially enjoyed leisure depends, besides upon own choice of time allocation, also upon available social opportunities. Finally, observe that higher levels of current social participation may substitute to a certain extent for lower levels of past participation (and the other way around), to attain a given level of social opportunities.

An important assumption implicit in Eqs. (1) and (2) is that social capital is an essential factor: for any x , $S(0, x) = 0$ and therefore $B_i(K_s, x) = 0$ for $i = P, R$. We can think of this as a normalization, but it has relevant analytical implications, which we shall mention. We can now summarize individual i ’s payoff as

$$\Pi_i(K_s, x) = F(Y_i, B_i(K_s, x)) = F(Y_i, s_i S(K_s, x)), \quad i = P, R, \tag{3}$$

where function F is assumed to be strictly increasing in both of its arguments and of class C^1 in its second argument.

At the core of our model is the idea that a private-oriented choice of time allocation may work as a self-protection device against a deterioration of social environment. To capture this idea, we assume that a reduction in the social opportunities available $S(K_s, x)$ imposes a greater negative externality on individuals choosing s_R than on those choosing s_P , because the former are more exposed to the effects of other people’s behavior than the latter ones:

$$\frac{\partial \Pi_R(K_s, x)}{\partial S(K_s, x)} > \frac{\partial \Pi_P(K_s, x)}{\partial S(K_s, x)}. \tag{4}$$

This condition, which implies that the difference $\Pi_R - \Pi_P$ is increasing in $S(K_s, x)$, may be satisfied by several specifications of F .

¹⁸ 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 time in private ones.

¹⁹ The assumption $\gamma < 1$ rules out the possibility that the only two possible attractors of dynamics (6) introduced below are $K_s = 0$ and ∞ . Indeed, our results can be extended to the case $\gamma > 1$, although this is not very interesting. The extension is available from the authors upon request for a special case of the model.

4.2. Evolution of social participation

Denote the payoff differential between the two choices of time allocation by

$$\Delta\Pi(K_s, x) \equiv \Pi_R(K_s, x) - \Pi_P(K_s, x)$$

and the average payoff by

$$\bar{\Pi}(K_s, x) \equiv x\Pi_R(K_s, x) + (1 - x)\Pi_P(K_s, x).$$

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

$$\dot{x} = x[\Pi_R(K_s, x) - \bar{\Pi}(K_s, x)] = x(1 - x)\Delta\Pi(K_s, x). \quad (5)$$

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. 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 other people’s observed successful behaviors (see also Börgers and Sarin, 1997 and Schlag, 1998 for deeper insights into the behavioral microfoundations of the replicator dynamics).

4.3. Social capital accumulation

Denote the aggregate amount of services provided by social activities by

$$\bar{B}(K_s, x) = xB_R(K_s, x) + (1 - x)B_P(K_s, x).$$

We assume that social capital increases in $\bar{B}(K_s, x)$, because when individuals devote more time to social activities, and jointly enjoy their services, they are not only able to exploit available social opportunities, but they also build new ones in the form of relational networks, associations, organized groups, shared norms, and so on. At the same time, existing social capital depreciates over time, because relationships slowly die out if not taken care of. Therefore, letting $\delta > 0$ be the depreciation rate of K_s and defining $\dot{K}_s \equiv dK_s/dt$, the easiest way to describe social capital accumulation is

$$\dot{K}_s = \bar{B}(K_s, x) - \delta K_s. \quad (6)$$

5. Dynamic analysis

We analyze dynamics (5), (6) in the region of the plane (K_s, x) in which $K_s \geq 0$ and $0 \leq x \leq 1$. Consider first the locus of steady social participation.

Lemma 1. *We have $\dot{x} = 0 \Leftrightarrow \{x = 0 \vee x = 1 \vee \Delta\Pi(K_s, x) = 0\}$. There are only two possible cases.*

- (a) *If there exists a pair (K_s, x) such that $K_s > 0$ and $\Delta\Pi(K_s, x) = 0$, then this latter equation implicitly defines a function $\tilde{K}_s(x)$, which is strictly decreasing and whose graph coincides with a level curve of $S(K_s, x)$. We have $\dot{x} > 0$ above this graph and $\dot{x} < 0$ below it.*

(b) If there does not exist any pair (K_s, x) such that $K_s > 0$ and $\Delta\Pi(K_s, x) = 0$, then $\forall (K_s, x)$, $\Delta\Pi(K_s, x) < 0$, meaning that the private-oriented time allocation strictly dominates the relational-oriented one, and we have $\forall K_s \geq 0, \forall x \in (0, 1), \dot{x} < 0$.

Proof. The first condition follows immediately from Eq. (5). For case (a), if there exists a value $\bar{S} > 0$ of $S(K_s, x)$ which satisfies $\Delta\Pi(K_s, x) = 0$, then this latter equation is satisfied by any combination of K_s and x along the level curve $S(K_s, x) = \bar{S}$. This level curve defines a function $\check{K}_s(x) \equiv \{\bar{S}[s_P + (s_R - s_P)x]^{-\beta}\}^{1/\gamma}$, whose derivative is $d\check{K}_s(x)/dx = (\partial S(K_s, x)/\partial x)/(\partial S(K_s, x)/\partial K_s) < 0$ and whose graph coincides with the graph of the function $\check{K}_s(x)$ implicitly defined by $\Delta\Pi(K_s, x) = 0$.

For case (b), if $\Delta\Pi(K_s, x) \neq 0$ for any value $\bar{S} > 0$ of $S(K_s, x)$, then it must be the case that $\forall (K_s, x), \Delta\Pi(K_s, x) < 0$, i.e., $\Pi_R(K_s, x) < \Pi_P(K_s, x)$. To see this, observe that when $K_s = 0$ this inequality holds $\forall x$, since $S(0, x) = 0, Y_P > Y_R$ and F is strictly increasing in both arguments, so that $F(Y_P, 0) > F(Y_R, 0)$. Then by continuity of F in its second argument, and of B_P and B_R in their arguments, the fact that $\Delta\Pi(K_s, x)$ never crosses zero implies that it must always be negative.

Finally, the signs of \dot{x} in the various regions in both cases (a and b) follow from condition (4). \square

In words, social participation does not change over time if either the entire population chooses the same time allocation (be it the relational or the private one), or it splits between the two allocations in such a way that everybody is indifferent between her own choice and the alternative one. The relational choice is more rewarding than average, and therefore spreads over, when available social opportunities are higher than a given threshold. In case (a), such threshold is finite and it may be attained by any combination of social capital and of social participation on the graph of the decreasing function $\check{K}_s(x)$.²⁰ In case (b), the threshold is infinite and the private choice always spreads over.²¹

Comparative statics on the curve $\dot{x} = 0$ is easy: if, given s_R and s_P, Y_R increases and comes closer to Y_P , then the curve $\dot{x} = 0$ shifts to the left, expanding the set of (K_s, x) pairs such that $\dot{x} > 0$; if, given Y_R and Y_P, s_P increases and comes closer to s_R , then the curve shifts to the right, expanding the area where $\dot{x} < 0$. In other word, a reduction in $(Y_P - Y_R)$ and an increase in $(s_R - s_P)$ both favor an expansion of social participation. Consider now the locus of steady social capital.

Lemma 2. We have $\dot{K}_s = 0 \Leftrightarrow \{K_s = 0 \vee K_s = \hat{K}_s(x)\}$, where $\hat{K}_s(x)$ is the strictly increasing function

$$\hat{K}_s(x) \equiv \left\{ \frac{[s_P + (s_R - s_P)x]^{1+\beta}}{\delta} \right\}^{1/1-\gamma}$$

We have $\dot{K}_s > 0$ below its graph and $\dot{K}_s < 0$ above it.

Proof. The result follows immediately from the definition of $\bar{B}(K_s, x)$ and from plugging Eqs. (1) and (2) into (6). \square

²⁰ Recall that K_s and x are substitutes in generating social opportunities.

²¹ The fact that we do not have a case in which the relational choice always spreads over is due to continuity and to the assumption that social capital is an essential factor.

According to (6), decay is linear in social capital, whereas the aggregate amount of services provided by social activities is a concave function of K_s , for any given level of x . Therefore, \hat{K}_s is an inverted U shaped function of K_s , crossing zero twice, at the origin and at some value $K_s > 0$, which depends positively on x as described by the function $\hat{K}_s(x)$.²² An increase in s_P , in s_R or in $(s_R - s_P)$, and a decrease in δ , all shift the graph of $\hat{K}_s(x)$ to the right, expanding the area of positive social capital accumulation. We can now consider the fixed points of dynamics (5), (6).

Lemma 3. *In the plane (K_s, x) , points $(0,0)$, $(0,1)$, $(\hat{K}_s(0), 0)$ and $(\hat{K}_s(1), 1)$ are always fixed points of dynamics (5), (6). If the two curves $\hat{K}_s(x)$ and $\tilde{K}_s(x)$ cross at some $x^* \in (0,1)$, then there exists an interior fixed point (K_s^*, x^*) with $K_s^* = \hat{K}_s(x^*) = \tilde{K}_s(x^*) > 0$. If an interior fixed point exists, then it is unique.*

Proof. Uniqueness follows from the fact that $\hat{K}_s(x)$ is strictly increasing and $\tilde{K}_s(x)$ strictly decreasing. The other results follow from Lemmas 1 and 2. \square

The stability properties are established in the following proposition.²³

Proposition 1. *Dynamics (5), (6) has two possible asymptotic attractors in the plane (K_s, x) : points $(\hat{K}_s(0), 0)$ and $(\hat{K}_s(1), 1)$.*

- In case (a) of Lemma 1, there are three subcases:
 1. if $\hat{K}_s(0) > \tilde{K}_s(0)$, then only $(\hat{K}_s(1), 1)$ is an attractor;
 2. if $\hat{K}_s(0) < \tilde{K}_s(0)$ and $\hat{K}_s(1) < \tilde{K}_s(1)$, then both $(\hat{K}_s(0), 0)$ and $(\hat{K}_s(1), 1)$ are attractors;
 3. if $\hat{K}_s(1) < \tilde{K}_s(1)$, then only $(\hat{K}_s(0), 0)$ is an attractor.
- In case (b) of Lemma 1, only $(\hat{K}_s(0), 0)$ is an attractor.

Proof. If the interior fixed point (K_s^*, x^*) exists, it is easy to show that it is always a hyperbolic saddle. Therefore, there cannot be limit cycles around it, and by Poincaré-Bendixson theorem all trajectories converge to a fixed point. Then the results follow from Lemmas 1–3. \square

Figs. 1–3 give a graphical representation of the three possible dynamic regimes.²⁴

Observe that, whatever the payoff function F , if the relational choice of time allocation is not strictly dominated by the private one—i.e., in case (a) of Lemma 1, it is possible to achieve any of the three dynamic regimes by changing the depreciation rate of social capital δ .

The most interesting case in our model is the one depicted in Fig. 2, in which both attractors are present. Recall that, since the function $\hat{K}_s(x)$ is strictly increasing, the attractor $(\hat{K}_s(0), 0)$ is characterized not only by a lower social participation than the attractor $(\hat{K}_s(1), 1)$, but also by a lower level of social capital. We refer to them as to the ‘private’ and to the ‘social’ attractor, respectively. Whether the economy converges to either of them depends on the initial value of social capital K_s^0 and of social participation x^0 .

Along the trajectories leading to $(\hat{K}_s(0), 0)$ from any $x > 0$, the economy experiences private growth (an expansion in the output of Y) at the expenses of social participation and ends up in a state of ‘social poverty’; along the paths towards $(\hat{K}_s(1), 1)$ from any $x < 1$, expansion of social participation leads to ‘social prosperity’, but at the expenses of private growth.

²² Both analytically and conceptually, x plays here for social capital a role similar to the one played by the saving rate for physical capital in Solow’s growth model.

²³ We omit the non-robust cases in which functions $\hat{K}_s(x)$ and $\tilde{K}_s(x)$ cross in either $x = 0$ or 1.

²⁴ In the figures, sinks are represented by full dots ●, sources by open dots ○ and saddle points by drawing their stable and unstable manifolds.

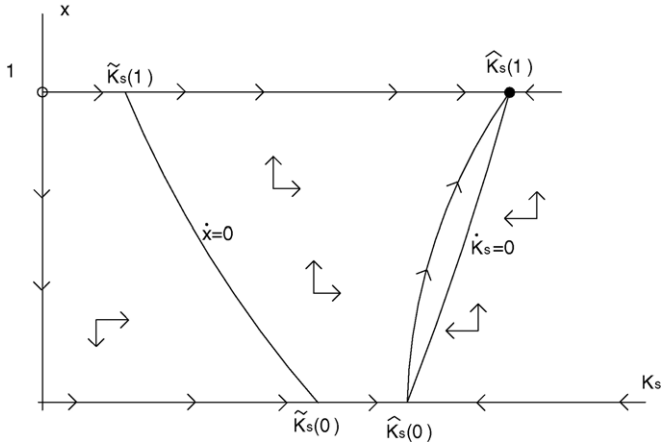


Fig. 1. Case a.1: only the social attractor is present.

6. Welfare and social poverty traps

We next consider the welfare properties of the two asymptotic attractors $(\hat{K}_s(0), 0)$ and $(\hat{K}_s(1), 1)$ and of the other fixed points of dynamics (5), (6).

Proposition 2. *Whenever it is an attractor, $(\hat{K}_s(1), 1)$ Pareto-dominates every other fixed point. In particular, when both attractors are present, it Pareto-dominates $(\hat{K}_s(0), 0)$. Moreover, it may Pareto-dominate all other fixed points even when it is not an attractor.*

Proof. Since $\Pi_i(K_s, x)$ is strictly increasing in both arguments for $i=P, R$, it follows that under all dynamic regimes $\Pi_R(\hat{K}_s(1), 1) > \Pi_R(0, 1)$, that $\Pi_P(\hat{K}_s(0), 0) > \Pi_P(0, 0)$, that $\Pi_i(\hat{K}_s(1), 1) > \Pi_i(\hat{K}_s(0), 0)$ for $i=P, R$; moreover, in the case of Fig. 2 we have $\Pi_i(\hat{K}_s(1), 1) > \Pi_i(K_s^*, x^*) > \Pi_i(\hat{K}_s(0), 0)$ for $i=P, R$. The result is then implied by the fact that $\Pi_R(\hat{K}_s(1), 1) > (\hat{K}_s(1), 1) > (\hat{K}_s(0), 0)$ in the case of Fig. 1 and that $\Pi_R(\hat{K}_s(1), 1) >$

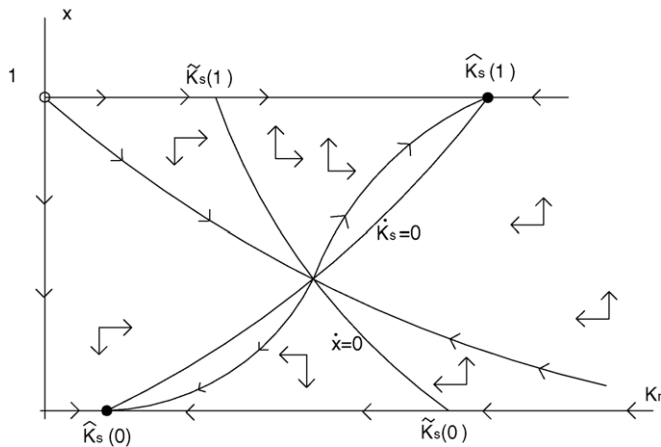


Fig. 2. Case a.2: both the social and the private attractor are present.

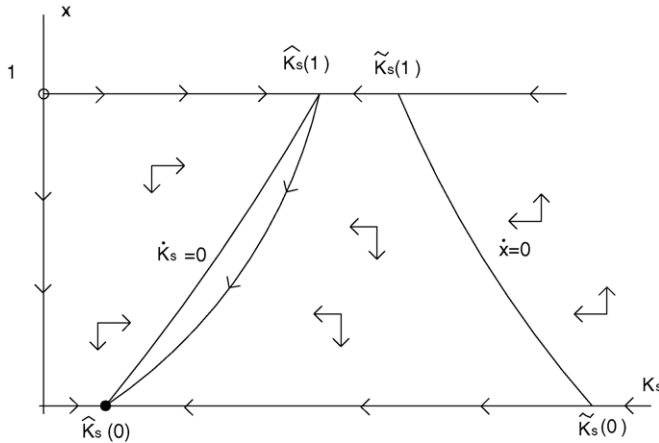


Fig. 3. Cases a.3 and b: only the private attractor is present.

$\Pi_R(K_s^*, x^*) = \Pi_P(K_s^*, x^*) > \Pi_P(\hat{K}_s(0), 0)$ in the case of Fig. 2. Finally, in the limit case (between Figs. 2 and 3) in which the two curves $\hat{K}_s(x)$ and $\tilde{K}_s(x)$ cross at $x=1$, we have $\Pi_R(\hat{K}_s(1), 1) = \Pi_P(\hat{K}_s(1), 1)$, so that $(\hat{K}_s(1), 1)$ still Pareto-dominates all other fixed points. Therefore, by continuity of the function F , the same must be true for sufficiently small shifts of the curves $\dot{x} = 0$ and $\dot{K}_s = 0$, which lead to the dynamic regime of Fig. 3. \square

When the only attractor is the social one, as in Fig. 1, the economy converges by itself to the steady state characterized by the highest welfare and there is no need for policy intervention. This is likely to happen when, given s_P and Y_P , δ is low, s_R is sufficiently higher than s_P and Y_R is sufficiently close to Y_P . This means that shifting from the private to the relational strategy does not imply a high cost in terms of forgone private consumption, but it implies high gains in terms of socially enjoyed leisure; moreover, it means that social capital is easy to accumulate, because relationships do not die out too fast.

This case might be a reasonable description of some traditional and closed societies, highly based on shared social practices, and possibly with relevant redistribution systems. In such societies, opting for a private oriented strategy has high relational costs, which are not likely to be compensated by increased private consumption. Therefore, even if the private strategy is adopted by some people who experiment its virtues, it is unlikely to spread over.

Suppose that, starting from this traditional and closed society, social mobility increases and renders social relationships more fragile and less long lasting. Suppose further that, given s_P and s_R , the consumption premium to the private strategy increases, i.e. $(Y_P - Y_R)$ rises. At some point along this process we pass to the dynamic regime of Fig. 2. Here both attractors are present and welfare is higher in the social than in the private one. We can therefore call the latter a ‘social poverty trap’.

This may be the case of a society or of a city with an intermediate level of social mobility, in which there is a strong incentive to work more and consume more, but at the same time, if social capital and social participation are initially high enough, there is also a strong incentive to devote a relevant fraction of time to socially enjoyed leisure. By contrast, if social capital and social participation are initially low, this latter incentive is weak and the economy may converge to a social poverty trap. Barcelona and Milan might exemplify these two possibilities.

When both attractors are present, there is clearly path dependence, since initial conditions are crucial for long run results. The initial stock of social capital is a historical heritage. It can change only slowly over time through social participation. Policy has therefore no direct bite on it.²⁵ By contrast, the initial level of social participation is a matter of current choices by individuals, who could in principle be influenced or coordinated. When both attractors are present, for any initial stock of social capital, there is a threshold level of initial social participation, above which the economy is able to escape from the social poverty trap. The lower the initial level of social capital, the higher such threshold. If policy intervention is able to induce an initial jump in social participation above this threshold, it may drive the economy to a Pareto-superior steady state. We next investigate this kind of policy, which is essentially a way of solving a coordination failure problem, and suppose that the government is able to coordinate initial choices so that $x^0 = 1$.²⁶

When $K_s^0 > \hat{K}_s(1)$, the relational strategy is individually more rewarding than the private one once universally adopted, so that the initial intervention would then be self-sustaining. Yet, when $K_s^0 > \hat{K}_s(1)$, policy intervention may be harder because the relational strategy is at the beginning less rewarding than the private one even with $x = 1$. Individuals have therefore an incentive to deviate. They should in some sense be patient, and keep trusting the government, to shift to the relational strategy at the beginning and then to stick with it.

Notice that coordinating x^0 requires that the government has the ability to make a substantial fraction of individuals deviate from their usual way of deciding how to allocate their time, a way that we assumed governed by the replicator dynamics. Notice further the possibility that the relational strategy is not optimal over the entire transition to the social attractor, but only eventually. Then, if the welfare criterion incorporates some time discounting, for very low initial levels of social capital there will be a time discount rate, above which the transitional cost of intervention would not be compensated by steady state gains, even if policy intervention succeeded to always coordinate social participation at the highest possible level $x = 1$. This latter case illustrates how policy intervention on x^0 may not be desirable, or, even when in principle desirable, may be difficult to implement. On the other hand, when initial social capital is not too low, a good coordination policy may be easier to implement, because it adds gains in transition to gains in steady state, and it may thus successfully drive an economy out of social poverty.

Suppose now that social mobility further increases, raising the depreciation rate of social capital. Suppose also that, given s_P and s_R , the consumption premium to the private strategy further increases, i.e. $(Y_P - Y_R)$ further rises.²⁷ At some point we pass to the case depicted in Fig. 3, where only the private attractor is present, and it may or may not be Pareto-dominated by $(\hat{K}_s(1), 1)$.²⁸

²⁵ Observe that this is largely a matter of how one defines social capital. Collier (1998), for instance, distinguishes between social capital provided by the civil society and by the government. We are just concerned with the former one in the present model. Notice further that we do not deny the possibility of sudden changes in social capital, for instance due to a revolution or to other social shocks; but their analysis is out of the scope of the present paper. Finally, depending on the definition and the available data, one encounters several different classifications of countries in terms of their stock of social capital: see Buchan and Croson (2004). This is why we do not give too much emphasis to a specific empirical interpretation of countries with low and high K_s^0 .

²⁶ See Cooper and John (1988).

²⁷ A fall in $(s_R - s_P)$ would lead in the same direction. The difference is that such fall is bounded at zero, whereas a rise in $(Y_P - Y_R)$ is potentially unbounded.

²⁸ The possibility, described in case b) of Lemma 1, that the relational strategy is strictly dominated by the private one for any value of K_s and x , is analogous.

We may think of this case as that of an advanced, competitive society, characterized by high social mobility and by the fact that it offers very high rewards to those who work extra hours and have a higher private consumption. The U.S. might be an example. Indeed, if the economy starts from a high level of social capital, our model predicts that it experiences first an increase and then a decrease in social participation, a pattern that matches U.S. experience.²⁹

In such a society, reaching the steady state $(\hat{K}_s(1), 1)$ is hard even when it Pareto-dominates the private attractor, first because it requires a perfect coordination on $x = 1$, and second because the range of K_s^0 for which, even with $x = 1$, the relational strategy is initially dominated is wider.

Up to now we have discussed policy intervention in the form of coordinating x^0 on a higher level. We have seen that this may be hard to achieve even when it is both possible and desirable. Let us now consider alternative policy measures, aimed at changing the parameters of the model, letting social participation evolve along its autonomous path.³⁰

As observed above, whatever the other parameters, by changing δ it is possible to achieve any of the three dynamic regimes of Figs. 1–3. Lowering the social capital depreciation rate obviously facilitates social capital accumulation and is therefore beneficial in terms of welfare for any x .³¹ Promotion of association rights and improvement of communication systems and infrastructures are examples of concrete actions that may go in this direction. In particular, such measures may counteract the effects of social mobility on the speed of social capital depreciation. Yet δ is not fully a control variable in the hands of politicians either. A combination of different forms of intervention may then be necessary to avoid the risk of social poverty.

Further, an increase in $(s_R - s_P)$ and a decrease in $(Y_P - Y_R)$ both work in favor of the social attractor. In general, they are likely to be positively correlated: the lower the difference in working hours between the two strategies, the lower the consumption premium to the private strategy. Thus, labor time regulations like French “35 h” have indeed the potential to raise social participation and stimulate social capital accumulation, but have also a price in terms of private production and consumption. While public regulation may then play a coordination role, its overall effects and desirability are not trivial to state, especially because they might induce a shift in dynamic regime.

Finally, Narayan (1999) argues that certain forms of intervention, like facilitating ‘cross-cutting ties’ among different social groups (for instance through school assignment regulation), are crucial for social capital accumulation. While we agree, their analysis calls for further research, since they cannot be dealt with in a framework that relies on identical individuals, like the present one.

7. 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

²⁹ Putnam (2000) documents an inverted U shaped time pattern of social participation in the U.S. Yet, we do not want to insist too much on this interpretation. The U.S. example, as well as the previous ones of Barcelona, Milan and of a generic traditional society, are offered to drive intuition, not as substantive analytical tools.

³⁰ We share Paldam and Svendsen’s (2000) general conclusion that the state cannot enforce either social capital or social participation top-down, although it may stimulate the latter and therefore indirectly help accumulation of the former.

³¹ Of course, to complete this judgement one should consider the opportunity cost of lowering δ .

hypothesis that it stimulates growth, it may nevertheless have negative welfare consequences. 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. We discuss some forms of policy intervention, aimed at solving a coordination failure problem and at changing the structural parameters of the model. We acknowledge the difficulty of such interventions, but at the same time we find some scope for them.

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 do³²; 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: this calls for further future research. Third, in our neoclassical companion paper we show that our results do not depend on two specific hypotheses we make in the present context: the absence of private capital and the bounded rationality of our agents.

Acknowledgements

We would like to thank for helpful comments Nicolas Bardsley, Benedetto Gui, Giorgio Rampa, Burkhard Schipper, Avner Shaked, Robert Sugden, the audience to seminars in Buenos Aires, Bologna, Bonn, Padova and Forlì, where earlier versions of this paper have been presented, and two anonymous referees. The usual disclaimer applies.

References

- Akerlof, G., Kranton, R., 2000. Economics and identity. *The Quarterly Journal of Economics* CXV (3), 715–753.
- Alesina, A., La Ferrara, E., 2000. Participation in heterogenous communities. *The Quarterly Journal of Economics* CXV (3), 847–904.
- Anderson, E., 1990. The ethical limitations of the market. *Economics and Philosophy* 6, 179–205.
- Antoci, A., Bartolini, S., 1999. Negative Externalities as the Engine of Growth in an Evolutionary Context, *Nota di lavoro* 83/99, Fondazione Eni Enrico Mattei, Milan.
- Antoci, A., Bartolini, S., 2006. Negative Externalities, Labor Input and Economic Growth in an Evolutionary Context, *Environment and Development Economics*, forthcoming.
- Antoci, A., Sacco, P.L., Vanin, P., 2005. On the possible conflict between economic growth and social development. In: Gui, B., Sugden, R. (Eds.), *Economics and Social Interaction: Accounting for Interpersonal Relations*. Cambridge University Press.
- Becker, G., 1965. A theory of the allocation of time. *The Economic Journal* 75 (299), 493–517.
- Björnerstedt, J., Weibull, J., 1996. Nash equilibrium and evolution by imitation. In: Arrow, K., et al. (Eds.), *The Rational Foundations of Economic Behaviour*. Macmillan, London, pp. 155–171.
- Börgers, T., Sarin, R., 1997. Learning through reinforcement and replicator dynamics. *Journal of Economic Theory* 77, 1–14.
- Bowles, S., Gintis, H., 2002. Social capital and community governance. *The Economic Journal* 112 (483), 419–436.
- Buchan, N., Croson, R., 2004. The boundaries of trust: own and others' actions in the US and China. *Journal of Economic Behavior & Organization* 55, 485–504.

³² See Knack and Keefer (1997), Zak and Knack (2001) and Knack (2003).

- Coleman, J., 1988. Social capital in the creation of human capital. *American Journal of Sociology* 94S, S95–S120.
- Coleman, J., 1990. Social Capital. In: Coleman, J. (Ed.), *Foundations of Social Theory*. The Belknap Press of Harvard University Press, Cambridge, Mass., and London England.
- Collier, P., 1998. Social Capital and Poverty, Social Capital Initiative Working Paper no. 4, The World Bank.
- Cooper, R., John, A., 1988. Coordinating coordination failures in key-nesian models. *The Quarterly Journal of Economics* CIII (3), 441–463.
- Corneo, G., 2005. Work and Television. *European Journal of Political Economy* 21, 99–113.
- Cornes, R., Sandler, T., 1984. Easy riders, joint production, and public goods. *The Economic Journal* 94 (375), 580–598.
- Costa, D.L., Kahn, M.E., 2003. Understanding the American Decline in Social Capital, 1952–1998. *Kyklos* 56 (1), 17–46.
- DiPasquale, D., Glaeser, E.L., 1999. Incentives and social capital: are homeowners better citizens? *Journal of Urban Economics* 45, 354–384.
- Eaton C., Pendakur K., Reed C. (2000). Socializing, Shared Experience and Poular Culture, Discussion Paper 00-13, Department of Economics, Simon Fraser University.
- Glaeser, E.L., Laibson, D., Sacerdote, B., 2002. An economic approach to social capital. *The Economic Journal* 112, 437–458.
- Hirsch, F., 1976. *Social Limits to Growth*. Harvard University Press, Cambridge, Mass.
- Knack, S., 2003. Groups, growth and trust: cross-country evidence on the Olson and Putnam Hypotheses. *Public Choice* 117, 341–355.
- Knack, S., Keefer, P., 1997. Does social capital have an economic payoff? A cross-country investigation. *The Quarterly Journal of Economics* CXII (4), 1251–1288.
- Moscovici, 1993. *The Invention of Society: Psychological Explanations for Social Phenomena*. Polity Press, Cambridge, MA, USA.
- Narayan, D., 1999. Bonds and bridges: social capital and poverty, Poverty Group, PREM. The World Bank.
- Nickerson, C., Schwarz, N., Diener, E., Kahneman, D., 2003. Zeroing in the dark side of the American dream: a closer look at the negative consequences of the goal for financial success. *Psychological Science* 14 (6), 531–536.
- Nussbaum, M., 1986. *The Fragility of Goodness: Luck and Ethics in Greek Tragedy and Philosophy*. Cambridge University Press, Cambridge (etc.) (chapter 12, The Vulnerability of the Good Life: Relational Goods).
- Paldam, M., Svendsen, G.T., 2000. An essay on social capital: looking for the fire behind the smoke. *European Journal of Political Economy* 16, 339–366.
- Polanyi, K., 1977. *The Liveliness of Man*. Academic Press, New York.
- Postlewaite, A., 1998. The social basis of interdependent preferences. *European Economic Review* 42, 779–800.
- Poutvaara, P., Wagener, A., 2004. P(r)aying for Friends: Religious Groups and the Market for Social Contacts. University of Vienna, Mimeo.
- Putnam, R., 2000. *Bowling Alone: The Collapse and Revival of American Community*. Simon and Schuster, New York.
- Routledge, B.R., von Amsberg, J., 2003. Social capital and growth. *Journal of Monetary Economics* 50, 167–193.
- Sacco, P.L., Zamagni, S., 2001. Provision of social services: civil economy, cultural evolution and participatory development. In: Mwabu, G., Ugaz, C., White, G. (Eds.), *Social Provision in Low Income Countries. New Patterns and Emerging Trends*. Oxford University Press, Oxford, pp. 53–76.
- Schiff, M., 1992. Social capital, labor mobility, and welfare. *Rationality and Society* 4, 157–175.
- Schiff, M., 2002. Love Thy Neighbor: trade, migration and social capital. *European Journal of Political Economy* 18 (1), 87–107.
- Schlag, K., 1998. Why imitate, and if so, how? A boundedly rational approach to multi-armed bandits. *Journal of Economic Theory* 78 (1), 130–156.
- Sobel, J., 2002. Can we trust social capital? *Journal of Economic Literature* 40 (1), 139–154.
- Sharpe, A., 2004. Exploring the linkages between productivity and social development in market economies, CSLS Research Report 2004–2002.
- Uhlaner, C.J., 1989. Relational goods and participation: incorporating sociability into a theory of rational action. *Public Choice* 62, 253–285.
- Weibull, J., 1995. *Evolutionary Game Theory*. MIT Press, Cambridge.
- World Bank, 2006. Social Capital. <http://www1.worldbank.org/prem/poverty/scapital/home.htm>.
- Zak, P.J., Knack, S., 2001. Trust and growth. *The Economic Journal* 111, 295–321.