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Generalized Trust and Sustainable Coexistence between Socially Responsible Firms and Nonprofit Organizations.

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Generalized Trust and Sustainable Coexistence between Socially Responsible Firms and Non Profit Organizations

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Abstract

In this paper, we focus on a specific component of economically relevant trust, i.e. on what we call 'institutionally produced generalized trust', defined as the amount of widespread trust (which is a public good for the economic system as a whole) endogenously and continuously generated by the interaction of two types of private organizations operating in the economy: for-profit firms and nonprofit organizations. Through an evolutionary model with a trust accumulation equation and two replicator equations (capturing the evolution of economic organizations over time) we show that (1) The fixed point where all the four sub-types of private organizations considered in the model are simultaneously present can be attractive only if 'virtuous' for-profits (i.e. socially responsible firms) and 'virtuous' nonprofits (i.e. actually trustworthy mission-oriented organizations) generate a negative externality on the other organizations of the same type. (2) The fixed point where the level of trust is very low and no socially responsible firms neither trustworthy organizations are present can be attractive; this social configuration interestingly recalls, to some extent, what some prominent social scientists depict as a trend currently occurring in the United States. (3) A socio-economic scenario where four pure population fixed points are simultaneously attractive exists.

1 Introduction

Is trust an economically relevant resource? Insofar as we properly define the boundaries of this notion, it would be hardly deniable that a long-standing, rich

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tradition in both economics and sociology invites us to provide a positive answer to such a question. Though we often tend to take it for granted, *any* market economy, regardless of its degree of inner complexity, calls for a relatively high amount of trust in order to be *sustainable* over time. Trust, this line of thought seems to observe, can be compared to the oxygen we breathe: we tend to take its presence for granted and to get aware of its key role in our daily life only if, for some reasons, its level suddenly decreases and we are prevented from breathing as naturally as before. In order to gain more insight with regard to this critical notion, we claim it is useful to begin by focusing on some of the most interesting economic and sociological studies exploring a form of non-material capital such as *social capital* and its relationships with relevant economic variables. Social capital is often assumed to be accumulated via social participation activities, where 'consumption' and 'investment' in relational goods tend to coincide (unlike what happens with regard to more standard forms of capital, such as physical capital, where consumption and investment are both logically and temporally distinct activities). Several authors directly define social capital in terms of trust. Paldam and Svendsen (2002), for example, identify social capital with "the density of trust within a group". A similar view is the one advanced by Fukuyama (1995a, b), where trust is seen as a key factor determining the industrial structure of a given economic system. Analogously, according to Putnam et al. (1993): " . . . social capital. . . refers to features of social organization, such as trust, norms, and networks that can improve the efficiency of society. . . ".[1] On the same vein, Bowles and Gintis (2002) claim that "Social capital generally refers to trust, concern for one's associates, a willingness to live by the norms of one's community and to punish those who do not". Putnam (2000) asserts that "The touchstone of social capital is the principle of generalized reciprocity – I'll do this for you now, without expecting anything immediately in return and perhaps without even knowing you, confident that down the road you or someone else will return the favour". As Sacco, Vanin and Zamagni (2004) remark, "The basic reason why "a society that relies on generalized reciprocity is more efficient than a distrustful society" (p. 135) is that it saves on considerable transaction costs. Of course, trusting others is efficient only if they are trustworthy: "Generalized reciprocity is a community asset, but generalized gullibility is not. Trustworthiness, not simply trust, is the key ingredient". In the light of these definitions, a first important point is the following: social capital is an economically beneficial resource insofar as we define it in terms of generalized trust. In other words, trust must be sufficiently widespread within a given society in order to display positive effects not only at relational level, by directly improving the quality of interpersonal relationships, but also at economic level,

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[1] Putnam (2000) sees social capital as ". . . connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them". Fukuyama (1997) affirms that "Social capital can be defined simply as the existence of a certain set of informal rules or norms shared among members of a group that permits cooperation among them. The sharing of values and norms does not in itself produce social capital, because the values may be the wrong ones. . . The norms that produce social capital. . . must substantively include virtues like truth-telling, the meeting of obligations, and reciprocity".

by making the market mechanisms more efficient. As far as this idea of generalized trust is concerned, Putnam (2000) introduces the specific notion of *bridging social capital*, by opposing this type of social capital to so called *bonding* social capital. While bridging social capital has to do with anonymous relations at society-wide level, bonding social capital is group-specific and, for this reason, less relevant for (if not detrimental to) the functioning of market forces. Such distinction seems to recall Granovetter's (1973) well-known contribution on the 'strength of weak ties', where he shows that while strong ties can significantly contribute to enhance people's well-being, weak ties are likely to be more crucial with regard to economic development, as they let people belonging to different social groups trust each other, by exchanging information at a higher level than family networks or small (formal or informal) groups. As he explicitly observes, "No strong tie is a bridge ... Whatever is to be diffused can reach a larger number of people, and travel greater social distance ... when passed through weak ties rather than strong" (Granovetter 1973).

The long series of quotations reported above indicates that the generalization of trusting behaviors at societal level (that is, in Putnam's terminology, the accumulation of bridging social capital) seems to play a key role in promoting economic development. In recent years, as far as the relationship between trust and relevant economic indicators is concerned, an important empirical analysis is the one carried out at international level by Knack and Keefer (1997). The two authors assess the impact on economic growth of trust, civic norms and associational activity by means of data from the World Value Survey for 29 market economies between 1981 and 1991. The two variables utilized in that study (TRUST and CIVIC) turned out to be highly positively correlated one to the other and "both of them are designed to capture generalized trust and cooperative attitudes, rather than social capital at the level of a specific group. Therefore, we can consider them as indicators of society-wide relational orientation" (Sacco, Vanin and Zamagni 2004). In their contribution, Knack and Keefer find a strong correlation between trust and civic association on the one hand and economic performance on the other hand. But this work is interesting also for another result they obtain: by focusing on the density of horizontal networks in a society (GROUPS), they discover that associational activity is not correlated with economic performance. Therefore, though it remains largely unclear what the origin of trust is, it seems difficult to explain its emergence with reference to associational activity only, due to the observed correlation between trust and economic growth. It is then probably worth exploring whether trust can be generated and sustained over time through the action of formal, organized institutions, rather than via informal channels with low levels of inner organization. This direction of research recalls, to some extent, Knack and Keefer's (1997) finding that "trust and norms of civic cooperation are stronger in countries with formal institutions that effectively protect property and contract rights". Specifically, we decided to focus on a special form of generalized trust, namely the one generated by the market economy itself as an external effect of the dynamic interaction taking place between the two types of private organizations operating within contemporary, advanced economic systems: for-profit

firms and nonprofit organizations. As we will clarify in Section 2, economic organizations' objective functions directly depend on the amount of generalized trust available in the economy as a whole. More specifically, in some of the scenarios explored within the context of the evolutionary model illustrated in the following sections, it is assumed that the overall amount of trust is positively affected by both the proportion of 'true', genuine nonprofit organizations (NPOs) and the proportion of (suitably defined) 'socially responsible' for-profit firms (FPOs). Since the type of trust we take into account in our analysis is a relatively specific (though a crucial) one, we claim that this is equivalent to analyze a form of bridging social capital which can be labelled 'institutionally produced generalized trust', as it represents the specific component of generalized trust produced by the dynamic interaction occurring between nonprofit and for-profit organizations over time. It is then the case that in this model we do not study the emergence of generalized trust as a whole, but the relatively specific but certainly important component of it emerging through formal, economically significant channels. The structure of the remainder of the paper is the following. Section 2 sheds light on the basic features of the evolutionary model. Section 3 illustrates the social dynamics. Section 4 contains analytical results. Section 5 explores three significant contexts where different assumptions are made as to 'trust producers' and 'trust consumers'. Section 6 concludes.

2　The Model

Besley and Ghatak (2003) draw a distinction which is similar to the one drawn in this paper: "We benchmark the behavior of the mission-oriented part of the economy against a 'profit-oriented' sector where standard economic assumptions are made – profit seeking and no non-pecuniary agent motivation". As we specified above, we consider it important in our model not only to distinguish between for-profit firms (FPOs) and nonprofit organizations (NPOs), but also to draw a further distinction by considering the possibility to observe truly 'trustworthy' and 'isomorphic' organizations in the nonprofit sector as well as 'pure' and 'socially responsible' firms within the for-profit sector. On the one hand, as far as for-profit firms are concerned, such profit-oriented organizations can either be classic, 'pure' for-profit actors, totally committed to the pursuit of the highest possible level of profits, or for-profit firms choosing to adopt a socially responsible profile, i.e. opting for the so called 'Corporate Social Responsibility' (CSR). What does it exactly mean, for a private organization, to be 'socially responsible' (while preserving its ultimately profit-oriented profile)? CSR can take many forms, as confirmed by an intense debate currently going on all over the world, but the basic point can be summarized as follows: a socially responsible firm is a profit-oriented firm which decided to systematically pursue, together with the usual profit maximization goal, some well-targeted socially-charged purposes. In particular, a for-profit firm may decide to be socially responsible by opting for so called 'corporate philanthropy', i.e. by regularly financing some nonprofit organizations via direct yearly donations to them (for

example, by devoting to such beneficiary subjects a certain percentage of their profits).

On the other hand, as far as nonprofit organizations are concerned, such actors can either be truly 'trustworthy' organizations, insofar as they actually pursue their social mission over time in a consistent manner, or be 'isomorphic' organizations. The latter scenario occurs when such organizations, though respecting the classic non profit distribution constraint, in fact do not give priority to their social mission and, de facto, end up behaving like for-profit firms. Trustworthy nonprofits can be seen as organizations which, thanks to their genuinely and consistently mission-oriented identity, are capable of generating trust and make this relevant resource available to the economic system as a whole. As we argued above, trust can be seen as a 'public good', that is as a good which generates nonrival and nonexcludable benefits, at least to a certain extent. It is important to specify that even such organizations can raise funds by selling goods and/or services on the market: what is crucial is that such activity has to be clearly and unambiguously instrumental to the pursuit of their social mission. As Schiff and Weisbrod (1991) correctly point out, NPOs can operate on the market, as for-profits do, despite "the negative utility provided to the (nonprofit) managers by producing commercial output". Handy (1997) adds that "NPs are willing to engage in limited profit-maximizing commercial activities simply in order to cross-subsidize their preferred nonprofit activities, leaving any excess demand to be met by FPs". The point is that "FPs alter their behaviour in the face of economic changes outside the control of the consumer. For example, an increase in the probability that a FP will stop operating (because of adverse economic conditions, say) will reduce its supply of the unobservable input to decrease costs. But such probabilities are not, in general, public knowledge. Given the importance of the service in question, consumers who are risk averse and/or have a strong preference for the unobservable input will prefer NPs even if FPs have a good reputation and are more efficient than NPs, providing that FPs – due to changing market conditions – are known to act opportunistically" (Handy 1997).[2] But then, some may wonder, when does it make sense to claim that some nonprofits risk to become more and more similar to FPOs and, therefore, to give birth to the worrying outcome that Weisbrod (1998) labels as 'mission displacement'? Such phenomenon occurs when NPOs, while keeping on respecting a formal constraint such as the non profit distribution constraint, risk in fact to lose their specific mission-oriented identity and not to produce trust anymore in favor of the economic system as a whole. As Handy (1997) remarks, "It is increasingly recognized that the legal constraint of 'nondistribution' of profits is too 'passive' to imply that NPs will be trusted. Managers who cannot have access to profits may choose to distribute profits via increased perquisites. This can provide NPs management with an incentive to increase profits at the expense of the customer. And, of course, the manage-

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[2]She also specifies that "FPs, it has been argued by Chillemi and Gui (1991), remain trustworthy only when the price remains high enough for it to sustain its reputation and thus cannot adequately respond to changing market conditions. This is not the case for NPs" (Handy 1997).

ment of a NP can always ensure that no profits are generated by combining the exploitation of consumer ignorance (or positional weakness) with a low level of work-related effort".

The problem is that nonprofit organizations operating too much on the market risk to pave the way to a 'commercialization' outcome (Weisbrod 1998), i.e. to generate a trend characterized by excessive analogies between NPOs and FPOs' behaviors. The most serious problem is that such trend may jeopardize the ability of NPOs to give systematically priority to their mission, rather than to the profit motive. As Antoci, Sacco and Zarri (2004b) remark, "Nonprofits may rely, in principle, on multiple, distinct sources of funding: beside individual donations, further significant channels are income from the sale of goods and/or services, user fees and (direct and indirect) public subsidies. In the U.S., where nonprofit revenues make up about 10% of the GNP, it is increasingly harder to precisely define the boundaries between for-profit and nonprofit sectors (Arrow 1998) and the essence of such phenomenon is well captured by Weisbrod (1998), as he notices that nowadays "Many nonprofits face increasing financial pressure because the gap between their resources and what they see as social 'need' is growing. (. . .) 'Need' is difficult to define and measure, but if nonprofits search for new revenues, they have few choices: to increase private donations and/or to increase income from the sale of goods or services – that is, 'commercial' activity". The problem is that if nonprofits choose to mainly rely on user fees, i.e. on revenues from the sale of goods or services on the market, they run the risk to lose their specific identity and not to differentiate themselves anymore from for-profit firms, by ending up mimicking their status of private goods sellers and *profit-oriented* organizations. Commenting on this phenomenon, which seems to be characteristic of the current phase of rapid growth of the nonprofit sector in the U.S., Weisbrod (1998) points out that such trend may induce people to perceive nonprofit organizations as 'for-profits in disguise'. Therefore, as to the issue of how to balance nonprofits' pursuit of their institutional mission with growing financial constraints, he argues that such organizations would be really free to autonomously pursue their social missions only insofar as they were able to rely on income from individual donations without being conditioned to any specific behavior in return. By contrast, if they mainly depended on either user fees or subsidies by (local and/or national) Government, they would risk to be forced to re-define their goals and, in the medium-long term, to lose their original identity. Such compromising of mission in the interest of revenue has been described as *mission displacement* (Weisbrod 1998).

2.1 Payoff Functions

How can we formalize the presence of the above described four sub-types of private organizations in the economy? We decided to proceed as follows. Let C_{FPO} be the strategy 'contribute to the funding of NPOs': we assume that the for-profit firms choosing to contribute to the funding of NPOs are de facto 'socially responsible' firms, due to their choice of corporate philanthropy. Let $x(t)$

be the proportion of for-profit firms opting for CSR. Therefore, $1 \geq x(t) \geq 0$ and $1 - x(t)$ represents the proportion of 'pure' for-profits, i.e. the proportion of for-profit firms deciding not to contribute to the funding of non profit organizations (by devoting a certain amount of their yearly profits to them) and to adopt the strategy NC_{FPO}.

As far as nonprofit organizations are concerned, we suppose that $y(t)$ is the proportion of NPOs which turn out to be *actually trustworthy* (T_{NPO}) as they prove to be substantially (and not only formally) *mission-oriented*, by consistently pursuing their social mission. By contrast, $1 - y(t)$ indicates the proportion of organizations which can be formally labelled as NPOs due to the fact that they respect the so called 'Non Profit Distribution Constraint', but that cannot be considered as 'proper' NPO due to their excessive tendency to mimic the behavior of for-profit firms (which, as we pointed out in Section 2, risks to give rise to a socially undesirable consequence such as 'mission displacement'). For this reason, we qualify this type of nonprofit organizations as 'isomorphic', I_{NPO}. In this light, for-profits' and nonprofits' payoff functions are formally expressed as follows.

2.1.1 FPOs' Payoffs

The payoffs of for-profit firms (FPOs) are as follows. As far as for-profit firms choosing CSR, i.e. to contribute to the funding of NPOs, C_{FPO}

$$\pi(C_{FPO}) = -a + b_1 k + c_1 x$$

where the variable k captures the stock of a specific form of social capital, namely the *institutionally produced generalized trust* utilized by the economic system. Furthermore:

1) The parameter $a > 0$ represents the (constant) component of their payoff regarding the cost of contributing, i.e. the cost of their choice of corporate philanthropy.

2) The parameter $b_1 > 0$ captures the positive externality generated by k.

3) The parameter c_1 captures the externality generated by x (the proportion of FPOs choosing CSR). The parameter c_1 may assume positive or negative values, as it is possible that an increase in the proportion of 'virtuous' FPOs creates a competition among FPOs opting for CSR (rather than a positive externality on all of them caused by each socially responsible firm's indirect contribution to the accumulation of trust). Therefore, we assume that $c_1 \gtreqless 0$.

As far as pure for-profit firms, i.e. for-profits choosing not to contribute to the funding of NPOs, NC_{FPO}

$$\pi(NC_{FPO}) = b_2 k + c_2 x$$

where:

i) The parameter $b_2 > 0$ measures the positive externality generated by k. It seems reasonable to suppose that $b_2 \leq b_1$, as socially responsible for-profits are likely to be better able to exploit the existing amount of trust, due to the positive effect on their reputation and reliability (on the part of consumers) which it seems plausible to attribute to the choice of CSR.

ii) The parameter c_2 measures the externality generated by x (the proportion of FPOs choosing CSR). Such parameter can be either positive or negative. We can suppose c_2 to be greater than zero insofar as we claim that FPOs adopting CSR are less competitive than pure FPOs (say, due to their need to charge higher prices in order to make the costly adoption of CSR an economically viable strategy). But the sign could be negative if we assume that, as forms of ethical and responsible consumption spread over on the demand side, the market rewards FPOs with CSR and that this effect counterbalances the loss in competitiveness due to the cost of contributing to the funding of NPOs. In this regard, Ian Davis, worldwide managing director of McKinsey & Company, in the 3 June 2005 issue of The Economist, observes that "Social pressures often indicate the existence of unmet social needs or consumer preferences. Businesses can gain advantage by spotting and supplying these before their competitors. Paradoxically, the language of shareholder value may hinder companies from maximising shareholder value in this respect. Practised as an unthinking mantra, it can lead managers to focus excessively on improving the short-term performance of their business, neglecting important longer-term opportunities and issues. The latter would include not just societal pressures, but also the trust of consumers, investment in innovation and other growth prospects". This seems to be true, in particular, with reference to the role of business in developing countries, where, as Davis remarks, "If companies operating in such environments focus too narrowly on ill-defined local laws or shy from broad debates about their alleged behaviour, they are likely to face mounting criticism over their activities, and face a greater risk of becoming embroiled in local political tensions". Therefore, we assume $c_2 \gtreqless 0$.

2.1.2 NPOs' Payoffs

The payoffs of nonprofit organizations (NPOs) are as follows. As far as 'virtuous' nonprofits which are authentically mission-oriented are concerned, i.e. 'trustworthy' nonprofits, T_{NPO}

$$\pi(T_{NPO}) = i_1 x + l_1 y$$

where we assume that i_1 is such that $i_1 > 0$. We suppose further that $l_1 \gtreqless 0$. In particular, we may have $l_1 < 0$ when trustworthy nonprofits end up competing with each other in order to gain funds from FPOs.

As far as isomorphic nonprofits are concerned, i.e. nonprofits mimicking for-profit firms' behavior on the market, which, as we previously recalled (on

the basis of Weisbrod's analysis) are at risk of 'mission displacement', we refer to their strategy as to I_{NPO} and their payoff function is

$$\pi(I_{NPO}) = m + i_2 x + l_2 y$$

We can interpret I_{NPO} as a 'defensive' strategy that NPOs adopt only insofar as they receive a low level of funding on the part of FPOs. In this light, we assume that, for a given level of y, the difference between $\pi(T_{NPO})$, obtained through the strategy T_{NPO}, and $\pi(I_{NPO})$, obtained through the strategy I_{NPO}, increases as x increases. Such a property can be captured by assuming: $m > 0$, $i_1 > i_2 \geq 0$. For l_2 we have $l_2 \gtreqless 0$. Further, we do not assume any specific relationship between l_1 and l_2. Finally, let us remark that a crucial difference between FPOs' and NPOs' payoff function is that while k directly affects the former, it has no impact on the latter: this is equivalent to assume that only for-profits are 'trust consumers', though asymmetries may exist between virtuous and non-virtuous ones (as we will clarify in Section 5, by distinguishing among three different contexts). As far as 'trust producers' are concerned, we deal with this aspect in the next section.

2.2 Trust Accumulation

In the light of the considerations developed in the Introduction, let us assume that the variable k captures the stock of a specific form of social capital. In particular, as anticipated before, we suppose that k is a stock variable measuring the level of a peculiar 'public good' for the economy such as the specific form of generalized trust directly produced by a 'virtuous' behavior of both for-profit firms (which act virtuously insofar as they decide to embrace CSR and, therefore, to contribute to NPOs via corporate philanthropy) and nonprofit organizations (which act virtuously insofar as they are 'trustworthy' rather than 'isomorphic', i.e. insofar as they are not only formally but also, and especially, substantially nonprofit subjects). Therefore k is assumed to depend positively on the proportion of both (a) socially responsible firms and (b) trustworthy nonprofit organizations present in the economy. In this light, we claim that the dynamics of trust k can be plausibly described by the following equation

$$\dot{k} = \alpha(\overline{k} - k) - \beta(1 - x) - \delta(1 - y)$$

where $\alpha, \overline{k} > 0$ and $\delta > \beta \geq 0$; $k \in \mathbb{R}$. The parameter $\overline{k}$ indicates the maximum level of generalized trust that the system can generate via institutional channels (i.e. through NPOs-FPOs dynamic interaction), that is the highest level of institutionally produced generalized trust our economy can achieve. As we specified in Section 1, generalized trust can be produced not only via institutional channels but also via social interactions of informal groups (see on this the classical sociological analysis developed by Robert Putnam on the determinants of social capital accumulation and fall, with special reference to the United

States (Putnam 2000)). The above equation implies that such level $\overline{k}$ cannot be reached insofar as either a positive proportion of NPOs are isomorphic or a positive proportion of FPOs are pure profit-maximizing firms (or both). The idea is that the proportion of non-virtuous nonprofit organizations generate a *negative externality* preventing k from reaching its limit value $\overline{k}$. Whenever a positive proportion of NPOs are isomorphic (a behavioral trend which appears to be extremely significant empirically, both in the U.S. (see Weisbrod 1998) as well as in the Italian (see Barbetta, Cima and Zamaro 2003) nonprofit sector (though less clearly), such limit value cannot be reached. Analogously, also the proportion of pure FPOs (the ones abstaining from the costly adoption of CSR strategies), generate a negative externality, producing an effect that can be compared to the one generated by the presence of isomorphic organizations within the nonprofit sector. In principle, then, $k = \overline{k}$ is a feasible scenario only insofar as $x = y = 1$, that is when *all* for-profits adopt CSR and *all* nonprofits are trustworthy. We may equivalently interpret the parameters β and δ as depreciation rates: as (institutionally produced) generalized trust is a form of social capital - and social capital is a form of capital (though it possesses peculiar features that make it qualitatively different from more standard forms of capital, such as natural or physical capital) - it is subject to depreciation over time. In this case, since we are analyzing a socio-economic evolutionary process where generalized trust is accumulated via NPOs-FPOs dynamic interaction, it appears natural to suppose that the depreciation of k depends on the relevance of 'non-virtuous' behaviors in both the for-profit and the nonprofit sector of the economy. In this model we assume that $\beta < \delta$, in that it seems plausible to suppose that virtuous (i.e. trustworthy) NPOs contribute *more* than virtuous (i.e. socially responsible) FPOs to the accumulation of generalized trust in the economy. Finally, let us observe that our formalization of the dynamics of trust differs from the one chosen by other authors focusing on different features of social capital: for example, Antoci, Sacco and Vanin (2004) assume that social capital increases when available social opportunities are effectively exploited (that is, when people enjoy so called 'relational goods', which are typically time-consuming).[3]

3 Social Dynamics

The dynamic system we decided to analyze can then be written as

$$\begin{aligned}
\dot{k} &= \alpha(\overline{k} - k) - \beta(1 - x) - \delta(1 - y) \\
\dot{x} &= x(1 - x)\left[\pi(C_{FPO}) - \pi(NC_{FPO})\right] \\
\dot{y} &= y(1 - y)\left[\pi(T_{NPO}) - \pi(I_{NPO})\right]
\end{aligned} \tag{1}$$

with $k \in \mathbb{R}$, $0 \leq x \leq 1$, $0 \leq y \leq 1$ and where the first equation expresses trust accumulation and the other two equations are *replicator equations*. Following

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[3]By so doing, in their view of social capital they are closer "to an interpretation of social capital in terms of evolution of customs and of social norms rather than in terms of construction of associations and other social organizations" (Antoci, Sacco and Vanin 2004).

Taylor and Jonker (1978) and Hofbauer and Sigmund (1988), we suppose that the dynamics of x and y - that is the adoption process of strategies within the economy - is driven by the so called replicator equations. Replicator dynamics are a widely adopted model of social (as well as natural) selection dynamics characterized by payoff monotonicity, i.e. the most rewarding strategies survive and spread over within the community at the expense of the less successful ones (see Antoci, Sacco and Zarri 2004a for an evolutionary, game-theoretic model based on a similar formal structure). With regard to this selection dynamics, Heckathorn (1996) points out that: "Based on the resulting payoffs, the actors with the most successful strategies proliferate at the expense of the less successful. This process is then repeated, generation after generation, until the system either approaches stable equilibrium or cyclical variation. Biologists employ these approaches to model evolutionary selection. However, the selection process has also been interpreted as reflecting a process of observational learning in which actors compare their own outcomes to those of their peers, imitating peers who do best (Brown et al. 1982; Boyd and Richerson 1985). In essence, actors look around to see who is doing well and take as role models those who appear most successful. When interpreted in this manner, these models can be termed *sideways-looking models of behavior*" (italics added). Therefore, as far as this specific evolutionary model is concerned, we are assuming here that the relative frequencies of sub-types within each population (i.e. 'pure' and 'socially responsible' FPOs within the for-profit sector and 'trustworthy' and 'isomorphic' NPOs within the nonprofit sector) present in the economy are driven by their relative performances within the strategic scenario under study: in such a social learning process, the most rewarding strategies are *imitated* at the expense of non-successful ones (Björnerstedt and Weibull 1996 provide us with some rigorous microfoundations).

We decided to analyze the dynamics of both k and the two types of private organizations operating in the economic system as we maintain that the evolution of generalized trust and the dynamics of NPOs and FPOs do continuously affect each other as time unfolds. This is equivalent to claim that a co-evolutionary process takes place within a complex economic system: on the one hand, as we have shown in the previous section, for-profits' payoff functions depend directly on the level of k, as the higher the level of generalized trust in the economy, the higher the individual benefit for such economic organizations[4]; on the other hand, the evolution of k itself depends, in turn, on the proportions of 'virtuous' and 'non-virtuous' (for-profit and nonprofit) organizations acting in the economy. Therefore, in equilibrium, k, x and y are endogenously co-determined by the evolution of the above described trust accumulation and replicator equations.

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[4]Though the impact of k on pure and socially responsible payoff functions may differ, as we pointed out by assuming $b_2 \leq b_1$.

4 ANALYTICAL RESULTS

4.1 EQUILIBRIA

In the light of our specifications of the payoff functions, the system is equivalently expressed as:

$$\begin{cases} \dot{k} = \alpha\left(\overline{k} - k\right) - \beta\left(1 - x\right) - \delta\left(1 - y\right) \\ \dot{x} = x\left(1 - x\right)\left(-a + bk + cx\right) \\ \dot{y} = y(1 - y)(-m + ix + ly) \end{cases} \tag{2}$$

where: $b := b_1 - b_2 \geq 0$, $c := c_1 - c_2 \lesseqqgtr 0$, $i := i_1 - i_2 > 0$, $l := l_1 - l_2 \lesseqqgtr 0$.

We shall analyze system (2) within a parallelepiped $\Pi = \left[k_1, \overline{k}\right] \times [0, 1]^2$ (k_1 being such that, when $k = k_1$, $\dot{k} > 0$).

System (2) generically admits at most nine fixed points $P_i = (k_i, x_i, y_i)$, $i = 1, .., 9$: four fixed points in the vertices (P_1, P_2, P_3, P_4, always existing), four fixed points on the faces $x = 0, 1$ and $y = 0, 1$, and one interior fixed point (P_9). The situation is summed up by the following table

	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9
k	k_1	k_2	k_3	k_4	k_5	k_6	k_7	k_8	k_9
x	0	1	0	1	x_5	x_6	0	1	x_9
y	0	0	1	1	0	1	y_7	y_8	y_9

where $0 < x_5$, x_6, x_9, y_7, y_8, $y_9 < 1$.

What we can immediately observe from the table above is that P_9 is the only fixed point where all the four sub-types of private organizations are simultaneously present. By contrast P_i, $i = 1, .., 4$, are pure population states where only one type of FPOs and one type of NPOs survive (e.g. in P_3 all FPOs are 'pure' for-profits while all NPOs are 'trustworthy') whereas in correspondence with P_i, $i = 5, .., 8$, three sub-types of private organizations are there (e.g. in P_5 all NPOs are 'isomorphic' and coexist with positive proportions of both 'pure' and 'socially responsible' FPOs).

The Jacobian matrix at the fixed point $P_i = (k_i, x_i, y_i)$ is given by

$$J = \begin{pmatrix} -\alpha & \beta & \delta \\ x_i(1 - x_i)b & (1 - 2x_i)N + x_i(1 - x_i)c & 0 \\ 0 & y_i(1 - y_i)i & (1 - 2y_i)M + y_i(1 - y_i)l \end{pmatrix} \tag{3}$$

where

$$N = -a + bk_i + cx_i \text{ and } M = -m + ix_i + ly_i$$

Then, the following proposition can be easily checked.

Proposition 1 *If $b > 0$, the fixed points $P_1 - P_9$ exist and are attractive if and only if:*

1. P_1: $\overline{k} < \dfrac{a}{b} + \dfrac{\beta}{\alpha} + \dfrac{\delta}{\alpha}$;

2. P_2: $\overline{k} > \dfrac{a}{b} - \dfrac{c}{b} + \dfrac{\delta}{\alpha}$, $i < m$;

3. P_3: $\overline{k} < \dfrac{a}{b} + \dfrac{\beta}{\alpha}$, $l > m$;

4. P_4: $\overline{k} > \dfrac{a}{b} - \dfrac{c}{b}$, $l > m - i$;

5. P_5: $\alpha - cx_5(1 - x_5) > 0$, $b\beta + \alpha c < 0$, $x_5 < \dfrac{m}{i}$, $\overline{k} > \dfrac{a}{b} + \dfrac{\beta}{\alpha} + \dfrac{\delta}{\alpha}$;

6. P_6: $\alpha - cx_6(1 - x_6) > 0$, $b\beta + \alpha c < 0$, $x_6 > \dfrac{m - l}{i}$, $\overline{k} > \dfrac{a}{b} + \dfrac{\beta}{\alpha}$;

7. P_7: $bk_7 - a < 0$, $l < 0$, $0 < \dfrac{m}{l} < 1$;

8. P_8: $bk_8 - a > 0$, $l < 0$, $0 < \dfrac{i - m}{l} < 1$;

9. P_9: $c < 0$, $l < 0$, $\beta b + \alpha c < 0$, $l > \dfrac{\delta ib}{\beta b + \alpha c}$, $0 < y_9 < \dfrac{m - i}{c}$.

Remark If $b = 0$, the system (2) becomes very simple in that $\dot{x}$ depends on x only and $\dot{x}$, $\dot{y}$ do not depend on k. In such a context, if $c \leq a$, x approaches 0 whatever is the initial value x_0 of x; if $c > a$, x approaches 0 if $x_0 < a/c$ and 1 if $x_0 > a/c$. Consequently, no equilibrium with $x \neq 0, 1$ can be attractive.

4.2 NO INTERIOR EQUILIBRIUM

Theorem 2 *If no interior equilibrium exists, all the interior orbits tend to the boundary.*

Proof. In the interior of Π consider the new variables k, $u = \ln \frac{x}{1-x}$, $v = \ln \frac{y}{1-y}$. Hence we can rewrite the system as

$$\begin{pmatrix} \dot{k} \\ \dot{u} \\ \dot{v} \end{pmatrix} = A \begin{pmatrix} k \\ x \\ y \end{pmatrix} - B \tag{4}$$

where A is a third order quadratic matrix and $B \in \mathbb{R}^3$.

Assume (4) has no equilibrium.

If $\det A = 0$, it is easily seen that some suitable linear combination of k, u, v is increasing (decreasing) with speed bounded away from zero on all the orbits (so the original orbits of (2) tend to the boundary).

Viceversa, suppose A invertible. Define new coordinates

$$\begin{pmatrix} p \\ q \\ r \end{pmatrix} = A^{-1} \begin{pmatrix} k \\ u \\ v \end{pmatrix}$$

It follows

$$\begin{pmatrix} \dot{p} \\ \dot{q} \\ \dot{r} \end{pmatrix} = \begin{pmatrix} k - k_0 \\ x - x_0 \\ y - y_0 \end{pmatrix} \tag{5}$$

So, if (k_0, x_0, y_0) is not interior to Π, one, at least, among the variables p, q, r tends to infinity. Since the vector field on the faces $k = k_1, \overline{k}$ points inside Π, this means that either x or y (or both) tends to 0 or 1. ∎

4.3   HOPF BIFURCATIONS

Replace, first, k by $\left(\overline{k} - k_1\right) k + k_1$, and then pose

$$k' = 1 - k, \ x' = 1 - x, \ y' = 1 - y$$

Renaming the new coordinates and parameters as the old ones, we obtain the system

$$\begin{cases} \dot{k} = -\alpha k + \beta x + \delta y \\ \dot{x} = x\left(1 - x\right)\left(-a + bk + cx\right) \\ \dot{y} = y(1 - y)(-m + ix + ly) \end{cases} \tag{6}$$

where the signs of the parameters α, β, δ, b, c, i, l are the same as the original ones and, further, $\alpha > \beta + \delta$.

Let us assume the system has a unique interior equilibrium $P_9 = (k_9, x_9, y_9)$.

A necessary (and generically sufficient) condition for a Hopf bifurcation to take place is that, at the equilibrium, two eigenvalues are imaginary conjugate.

This means that the characteristic polynomial of J, the jacobian matrix, must take the form

$$P(\lambda) = (\lambda - \lambda_0)\left(\lambda^2 + r^2\right) \tag{7}$$

On the other hand

$$J = \begin{pmatrix} -\alpha & \beta & \delta \\ b & c & 0 \\ 0 & i & l \end{pmatrix} \tag{8}$$

where we renamed as b, c, i, l respectively $bx_9\left(1 - x_9\right)$, $cx_9\left(1 - x_9\right)$, $iy_9\left(1 - y_9\right)$, $ly_9\left(1 - y_9\right)$.

Hence

$$P(\lambda) = \lambda^3 - tr(J)\lambda^2 + H(J)\lambda - \det(J) \tag{9}$$

where

$$H(J) = -\alpha(c + l) + cl - b\beta$$

Thus (7) is equivalent to

$$\begin{cases} H(J) > 0 \\ \\ \det(J) = tr(J) \cdot H(J) \end{cases} \tag{10}$$

Straightforward computations show that conditions (10) are incompatible with c, $l < 0$, which is a necessary condition for the attractiveness of P_9.

Therefore, by recalling (10), it follows, in particular, that no attractive limit cycle, arisen from a Hopf bifurcation, can exist.

However, Hopf bifurcations where a saddle-point (with two-dimensional stable manifold) becomes a repellor can exist.

For example, pose in (8)

$$\alpha = 1,\ \beta = 0,\ \delta = \frac{1}{2},\ b = 2,\ c = 2,\ i = 10,\ l = 3 \tag{11}$$

Then conditions (10) are checked to hold (the same is true, of course, if we take $\beta > 0$ sufficiently small and let the other parameters vary accordingly). As to the equilibrium, we can choose, for example, $k_9 = \frac{1}{4}$, $x_9 = y_9 = \frac{1}{2}$.

4.4   NO CYCLE ON THE BOUNDARY

Theorem 3 *On the invariant faces $x = 0, 1$, $y = 0, 1$ of the parallelepiped Π no cycle (i.e. non-trivial periodic orbit) exists.*

Proof. *Let us refer to the system written in form (6). Then $\Pi = [0, 1]^3$.*

Consider the invariant faces $x = 0, 1$, $y = 0, 1$ (when $k = 0, 1$ and $x, y \neq 0, 1$ the vector field points inside Π).

a) When $x = 0, 1$, the system on the corresponding invariant rectangle, say F, takes the form

$$\begin{cases} \dot{k} = -\alpha k + \delta y + \widetilde{\beta} \\ \dot{y} = y(1-y)(-\widetilde{m} + ly) \end{cases} \tag{12}$$

Hence along all non-trivial orbits $y(t)$ either increases or decreases.

b) Let, now, $y = 0, 1$ and consider on the corresponding invariant rectangle, say F again, the system

$$\begin{cases} \dot{k} = -\alpha k + \beta x + \widetilde{\delta} \\ \dot{x} = x\,(1-x)\,(-a + bk + cx) \end{cases} \tag{13}$$

The case $b = 0$ is straightforward. Let us assume $b > 0$. If no interior equilibrium exists, by the **Poincaré - Bendixson Theorem** all the orbits tend to the boundary. Suppose, viceversa, there exists an interior equilibrium $P = (k_0, x_0)$. We can suppose it to be unique, otherwise a segment of equilibria exists and clearly no non-trivial orbit can be periodic.

By changing k into rk, with $r = \sqrt{\frac{\beta}{b}}$, we can assume, after renaming the parameters, $b = \beta$.

Hence, denoting the jacobian matrix at P as J,

$$sign(\det J) = sign(-\alpha c - \beta^2) \neq 0 \tag{14}$$

If $\det J < 0$, P is a saddle-point and no cycle can surround it.

So, assume

$$-\alpha c - \beta^2 > 0 \tag{15}$$

implying $c < 0$.

Posing $u = \ln \frac{x}{1-x}$, we can rewrite the system, in the interior of F, as

$$\begin{cases} \dot{k} = -\alpha(k - k_0) + \beta(x - x_0) \\ \dot{u} = b(k - k_0) + c(x - x_0) \end{cases} \tag{16}$$

where $x = x(u) = \frac{e^u}{e^u + 1}$.

Consider the function

$$G\,(k, u) = \frac{k^2}{2} - k_0 k + \ln\,(e^u + 1) - x_0 u \tag{17}$$

Then, along any orbit of (16),

$$\frac{d}{dt} G\,(k, u) = -\alpha(k - k_0)^2 + 2\beta(k - k_0)(x - x_0) + c(x - x_0)^2 \tag{18}$$

It follows from (15) that, along any non-trivial orbit of (16),

$$\frac{d}{dt}G\left(k,u\right) < 0 \tag{19}$$

Recalling that we analyze (16) in the stripe $\left[0,\frac{1}{r}\right] \times \left(-\infty,+\infty\right)$, we observe that the vector field points inward along the lines $k = 0, \frac{1}{r}$, while

$$\lim_{u\to\pm\infty} G\left(k,u\right) = +\infty, \tag{20}$$

since $0 < x_0 < 1$.

This implies that $G\left(k,u\right)$ is a Lyapunov function and that P is a global attractor in the interior of the invariant rectangle F. ∎

4.5 GLOBAL ATTRACTIVENESS OF P_9

Let us assume, now, that the interior equilibrium in $\Pi = \left[k_1,\overline{k}\right] \times \left[0,1\right]^2$, P_9, exists and is unique. Then, taking in the interior of Π coordinates

k, $u = \ln\frac{x}{1-x}$, $v = \ln\frac{y}{1-y}$, we can rewrite system (2) as

$$\begin{pmatrix} \dot{k} \\ \dot{u} \\ \dot{v} \end{pmatrix} = A \begin{pmatrix} k - k_9 \\ x - x_9 \\ y - y_9 \end{pmatrix} \tag{21}$$

where

$$A = \begin{matrix} -\alpha & \beta & \delta \\ b & c & 0 \\ 0 & i & l \end{matrix} \tag{22}$$

We analyze system (21) in the stripe $\Sigma = \left[k_1,\overline{k}\right] \times \left[-\infty,+\infty\right]^2$.

Our goal is to give a sufficient condition for P_9 to be globally attractive in Σ (i.e. in the interior of Π).

In fact the following result holds:

Theorem 4 *Let*

$$B = \frac{1}{2}(A + A^t) \tag{23}$$

Then, if B is negative definite, P_9 is a global attractor in Σ.

Proof. *Consider the function*

$$G\left(k,u,v\right) = \frac{k^2}{2} - k_9 k + \ln\left(e^u + 1\right) - x_9 u + \ln\left(e^v + 1\right) - y_9 v \tag{24}$$

and pose

$$Z = \begin{pmatrix} k - k_9 \\ x - x_9 \\ y - y_9 \end{pmatrix}$$

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Hence it follows, through straightforward computations, that along every non-trivial orbit of (21)

$$\frac{dG}{dt} = Z^t B Z < 0, \qquad (25)$$

if B is negative definite.

*By the same arguments as in the proof of **Theorem 3**, one can observe that $G(k, u, v)$ tends to $+\infty$ when u or/and v tend to $\pm\infty$, whereas the vector field points inside Σ for $k = k_1, \overline{k}$.*

Furthermore, suppose C is a compact non-trivial invariant set in Σ. Therefore G has a minimum in C. However at a minimum point $\frac{dG}{dt} < 0$, thus yielding a contradiction.

We can conclude that $G(k, u, v)$ is a Lyapunov function and P_9 is a global attractor in Σ. ∎

Remark It is not difficult to prove that, under our assumptions, the above condition '*B is negative definite*' can be replaced by the weaker one '*B is negative semi-definite*' (in fact, it is easily checked that, being A non-singular, no line or plane through P_9, in the (k, x, y) space, can be invariant).

5 Contexts

In this section we take a step further and make our analysis more specific, by explicitly inserting into the picture three distinct scenarios characterized by relevant intra-organizational and/or inter-organizational asymmetries, that is behavioral asymmetries present either within one or both organizational types (i.e. between trustworthy and isomorphic NPOs and/or pure and socially responsible FPOs) or between NPOs and FPOs. In particular, we draw a distinction between 'trust producers' and 'trust consumers', by assuming that within a single scenario only some of the organizations involved are able to produce generalized trust and that, at the same time, only some of them (not necessarily coinciding with the former) can be labelled as 'consumers' of the trust provided by the former. In our view, considering such differences with regard to the provision and consumption of an invisible but crucial public good such as generalized trust makes the whole framework more realistic, in the light of several recent theoretical as well as empirical contributions focusing on the links between trust production, trust consumption, CSR and nonprofit organizations' role within advanced economies (see e.g. Weisbrod 1998; Becchetti, Federico and Solferino 2005; Sacco and Zamagni 2001). Needless to say, analyzing different contexts depending on the organizational nature of trust producers helps us shedding further light on the notion of 'institutionally produced generalized trust' which is the specific form of economically relevant social capital considered in our model. The three contexts under study have been labelled as follows, with respect to the features attributed to CSR in each of them: (A) Symmetry in Trust Consumption. (B) Asymmetry in Trust Consumption without Competition Effects. (C) Asymmetry in Trust Consumption with Competition Effects.

5.1 Context A. Symmetry in Trust Consumption

First we consider the following form of inter-organizational asymmetry (i.e. between nonprofit and for-profit organizations), by assuming that, as far as NPOs are concerned, only trustworthy NPOs are trust producers, whereas, on the demand (of trust) side, FPOs only act as consumers of trust. In other words, we are supposing here that trust is a crucial resource for the market to properly work, display its beneficial effects and be sustainable over time, but that FPOs are not able to directly provide (and not even to partially contribute to the provision of) such peculiar public good to the market economy they are embedded in. By contrast, 'true' mission-oriented organizations such as trustworthy NPOs can be reasonably seen as organizations endowed with the set of pro-social goals as well as workers' and volunteers' intrinsic motivations (see e.g. on this Mirvis 1992 and Leete 1999) that make them capable of contributing to the provision of generalized trust (regardless of their ability to understand this and measure this specific form of positive externalities, for example by means of proper social accountability tools). Analytically, this is equivalent to assume that $\beta = 0$, as now the accumulation of k is supposed to be positively affected by the proportion of trustworthy NPOs but not by the proportion of socially responsible FPOs present in the economy. As far as FPOs are concerned, we suppose that a symmetry exists between pure and socially responsible for-profits in terms of trust consumption, by assuming that $b = 0$ (which means that k has the same impact on the two trust consumers' payoff functions). This symmetry may be interpreted as follows: with regard to the demand side of the market, consumers know that trust is important but also that only 'virtuous' NPOs, and not FPOs, do contribute to its accumulation; therefore, they decide not to 'reward' for-profit firms opting for CSR when they buy goods and/or services on the market. In other words, we argue that consumers' behavior towards for-profits may be plausibly related to the fact that such organizations are not trust producers but only trust consumers, in a sense acting as 'free riders' with regard to trustworthy nonprofits, with respect to trust consumption. As a consequence, here CSR, far from acting as a competitive advantage factor, turns out to be an ineffective strategy for the firms adopting it.

Within such context, $\dot{x}$ depends on x only and $\dot{x}$, $\dot{y}$ do not depend on k. So, if $c \leq a$, x approaches 0 whatever the initial value x_0 of x is; if $c > a$, x approaches 0 if $x_0 < a/c$ and 1 if $x_0 > a/c$. Consequently, no equilibrium with $x \neq 0, 1$ can be attractive.

Within the plane $x = 0$, the following dynamics can be observed:

a) If $m \geq l$, then $y \to 0$ and $k \to \overline{k} - \delta/\alpha$;

b) If $m < l$, then $y \to 0$ and $k \to \overline{k} - \delta/\alpha$ if the initial value y_0 of y satisfies the condition $y_0 < m/l$ while $y \to 1$ and $k \to \overline{k}$ if $y_0 > m/l$.

Within the plane $x = 1$, the following dynamics can be observed:

c) If $m - i \geq \max(0, l)$, then $y \to 0$ and $k \to \overline{k} - \delta/\alpha$;

d) If $m - i \leq \min(0, l)$, then $y \to 1$ and $k \to \overline{k}$;

e) If $0 < m - i < l$, then $y \to 0$ and $k \to \overline{k} - \delta/\alpha$ for $y_0 < (m-i)/l$ while $y \to 1$ and $k \to \overline{k}$ for $y_0 > (m-i)/l$;

f) If $0 > m - i > l$, then $y \to y_8 = (m-i)/l \in (0,1)$ and $k \to k_8 = \overline{k} - \delta(1 - y_8)/\alpha$ for every $y_0 \neq 0, 1$.

Note that P_1 is always attractive, regardless of the values assumed by c and l: this means that for any combination of competitive pressures/cooperative relations within for-profit and nonprofit sector, a positive probability always exists for convergence to occur on the 'worst' social configuration where the level of k is very low, all for-profits are pure FPOs and all nonprofits are isomorphic NPOs.

Furthermore, P_4 can be attractive and this happens when both c and l are high enough. However, whenever competitive pressures prevail either within the nonprofit sector or within the for-profit sector (or in both), then convergence to the most desirable social outcome (where the level of trust is high and all for-profits and nonprofits present in the economy belong to the 'virtuous' organizational sub-type) is ruled out. It is also interesting to remark that P_1, P_2, P_3 and P_4 can be all simultaneously attractive. In this context, it happens also that P_5, P_6, P_7 (coexistence among three sub-types) and P_9 (coexistence among four sub-types) can never be attractive, regardless of the values assumed by c and l. In other words, this context is not favourable to the stable coexistence of more than two sub-types at a time. The only exception is represented by P_8, that can be attractive under some conditions (conditions (f)). As an example, we can consider the case showed in **Figure 1**, where continuous lines (respectively, dotted lines) indicate attracting (respectively, non attracting) fixed points. Observe that, for negative values of l and the specified values of the other parameters, P_1 and P_8 can be simultaneously attractive fixed points.

We can also notice that, since $b = 0$, whenever $c \leq a$ (competition effects prevailing in the for-profit sector), only the fixed points P_1 and P_3 can be attractive. This means that in such context, where consumers do not reward for-profits choosing CSR, if competition effects prevail within the for-profit sector, then no attractive fixed points with a positive proportion of socially responsible for-profits can emerge. In such context, where only trustworthy nonprofit organizations are assumed to be trust producers whereas the two sub-types of FPOs are symmetrically trust consumers, CSR turns out to be only a cost, rather than a competitive advantage factor (as it does not affect consumers' choices), so that being pure FPOs pays off more than being socially responsible. The sub-case $c \leq a$ and $l \leq m$, in which only P_1 is attractive, brings about a social context where history does not matter and, regardless of initial conditions, society converges to the 'unpleasant' and economically unsustainable $x = y = 0$ equilibrium.

If in the context $b = 0$ we assume that both 'virtuous' NPOs and 'virtuous' FPOs do positively affect the dynamics of bridging social capital (i.e. $\beta > 0$), the dynamics of $\dot{x}$ and $\dot{y}$ coincide with the dynamics for $\beta = 0$ (in that $\dot{x}$ and $\dot{y}$ do not depend on k). Though (ceteris paribus) in the former context the
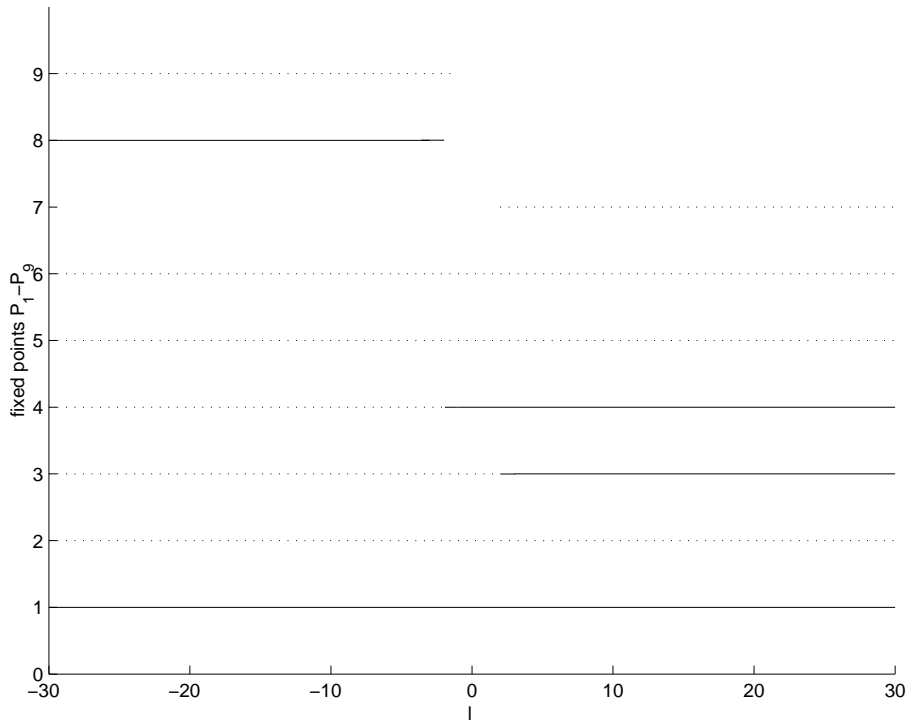
Figure 1: Scenario A_1 e A_3, with parameters: $\alpha = 3$, $\beta = 0$, $\delta = 30$, $a = 3$, $b = 0$, $c = 5$, $m = 2$, $i = 4$, $l = 5$, $\overline{k} = 5$

value of $\dot{k}$ is lower than in the latter (for $x < 1$), a lower k-accumulation has no feed-back effect on the evolution of x and y and, consequently, on the fixed point values of x and y.

5.2 Context B. Asymmetry in Trust Consumption without Competition Effects

In this section we assume $b > 0$, i.e. that, with respect to pure for-profits, socially responsible firms are better able to exploit k thanks to the higher reputation level they have in front of consumers, as a direct consequence of their strategic choice of Corporate Social Responsibility. In other words, it appears plausible to suppose that a given stock of institutionally produced generalized trust k (provided by trustworthy NPOs) displays a different effect on pure and socially responsible FPOs' payoff functions. This is the scenario that those who believe in CSR are particularly interested in analyzing as we are able to study what happens when it is the case that consumers attribute a positive value to

CSR and 'reward' socially responsible firms through their consumption choices, by properly acknowledging their positive role in enhancing the level of trust in the economy as a whole (insofar as we suppose that CSR is commonly known and observable, as it is often the case, and that its adoption indirectly favors trust accumulation, i.e. $\beta > 0$). In other words, consumers can be assumed to be both informed (about the different effects of for-profits' strategies on the dynamics of trust) and consistent in their market behavior: when such 'post-industrial' economic agents buy goods and services, they do not simply compare the options available by considering their price and physical quality, but are also sensitive to immaterial assets such as the contributions provided by the firms producing those goods with regard to the accumulation of trust in the economy, as they are aware of the importance of such intangible resource for the market economy to work efficiently and be sustainable over time. As Becchetti, Federico and Solferino (2005) maintain, by reflecting on the post-industrial turn occurring on the demand side of the market (and, consequently, on its dynamic effects on the supply side), "the ongoing process of globalisation and economic integration generated by the integration of electronics and telecommunications has reduced distances among different cultures. This phenomenon has increased interdependence among countries and enhanced issues related to the provision of global public goods. As a consequence, the sensitiveness of the public opinion toward ethical issues such as the preservation of the environment and the fight to poverty in less developed countries is getting higher than before. This increased awareness has generated a series of 'grassroot' welfare initiatives which focus on socially responsible (or socially concerned) saving and consumption". Here CSR acts as a competitive advantage factor in favor of those FPOs which have decided to lucidly 'invest' in an intangible asset such as corporate identity: the point is that such investment is particularly rewarding right within a social context where consumers, far from interacting generically with any for-profit firm providing a given good or service, are ready to buy the good or service they search by selectively rewarding those for-profits which seem to have invested more in setting up a credible socially responsible corporate profile. The fact that CSR is costly in the short run and that such information is common knowledge among the different actors of the economy may then be seen as a sufficient guarantee inducing such 'post-industrial' consumers to reward such firms and to buy goods there, rather than searching for pure FPOs operating within the same market.

In order to make the analysis more complete, we explore both the case in which socially responsible firms do actually, though indirectly, contribute to the accumulation of trust ($\beta > 0$) and the case in which they do not contribute (not even indirectly) to such dynamics ($\beta = 0$).

In this section, we analyze the dynamics of the above described scenario under the further assumption that both $c \geq 0$ and $l \geq 0$, i.e. by assuming that competition does not prevail within neither sector. Note that, if $c < 0$, then the FPOs being 'socially responsible' would generate a negative externality on FPOs belonging to the same 'virtuous' sub-type. By contrast, if $c > 0$, self-enforcing effects characterizing the dynamics of x prevail. Similarly, if $l < 0$, 'trustworthy'

NPOs would generate a negative externality on the NPOs belonging to the same 'virtuous' sub-type; if $l > 0$, self-enforcing effects characterizing the dynamics of y prevail. The negative externality in the nonprofit sector can be explained if we think of effects due to competition as far as fund-raising efforts are concerned (let us further recall that the sign of parameters c and l represents the 'sum' of positive and negative externalities and that the fact that the sign is positive or negative depends on which of such effects does prevail). The negative externality in the for-profit sector can be explained if we think of standard competition effects prevailing among FPOs.

In this context, according to **Proposition 1**, we have that the coexistence fixed points $P_5 - P_9$, where three or four organizational sub-types coexist, can never be attractive. This means that whenever positive externalities prevail both within the nonprofit and the for-profit sector, no more than two organizational sub-types will survive in the medium-long run. As to the vertices P_i, $i = 1, .., 4$, one can wonder whether they can be simultaneously attractive. The answer is positive. For example, let us assume $i < m < l$ and $\dfrac{a}{b} - \dfrac{c}{\alpha} + \dfrac{\delta}{\alpha} < \overline{k} < \dfrac{a}{b} + \dfrac{\beta}{\alpha}$. In **Figure 2** we show a scenario where the above inequalities hold.

Furthermore, let us observe that, in **Context B**, the fixed point P_1 may be non-attractive (which is the case if $\overline{k}$ is high enough), unlike what happens in **Context A**.

Figure 2 shows a scenario in which history, that is the initial values of x, y and k, plays a crucial role in determining the outcome of social dynamics; each equilibrium P_i, $i = 1, .., 4$ can be interpreted as a social convention that the economy can reach whenever economic interactions start sufficiently close to it; economies with identical payoff functions can reach different outcomes starting from different initial sub-type distributions, x and y, and a different trust accumulation level k.

In **Figure 3**, a numerical exercise is worked out to show how the dynamics represented in **Figure 2** changes if we let the parameter b vary in the interval $[0, 4]$, with the remaining parameters being kept fixed at the values of **Figure 2**. This exercise shows what happens if the degree of asymmetry between virtuous NPOs and pure FPOs (in taking advantage from the accumulation of k) increases.

Figure 4 shows how the dynamics represented in **Figure 2** changes if the parameter β varies in the interval $[0, 19]$, with the remaining parameters being fixed at the values of **Figure 2**. This simulation aims at describing how the scenario illustrated in **Figure 2** gets modified by an increase in the relevance of virtuous NPOs as trust producers in the k-accumulation process.

5.3 Context C. Asymmetry in Trust Consumption with Competition Effects

In this section we keep on assuming, like in **Context B**, that $b > 0$, i.e. that, with respect to pure for-profits, socially responsible for-profits are better able to
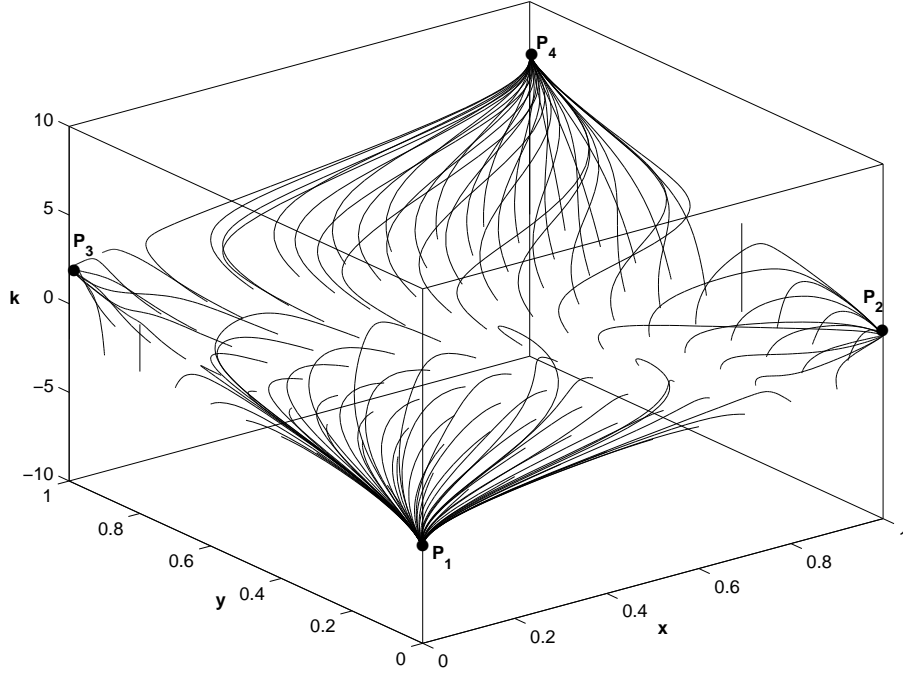
Figure 2: Fixed points $P_1 - P_4$ simultaneously attractive, with parameters:$\alpha = 3$, $\beta = 15$, $\delta = 20$, $a = 3$, $b = 1$, $c = 5$, $m = 4$, $i = 2$, $l = 5$, $\overline{k} = 7$

exploit k thanks to the higher reputation level they have in front of consumers due to their strategic choice of CSR. However, unlike in **Context B**, we suppose that here either $c < 0$ or $l < 0$ (or both), i.e. that competition occurs either within the for-profit sector or within the nonprofit one (or in both).

In **Context C**, the coexistence fixed points P_5, P_6, P_8 and P_9 can be attractive; in particular, from **Proposition 1**, we can observe that necessary condition for P_5 and P_6 to be attractive is that $c < 0$, i.e. that the FPOs being 'socially responsible' generate a negative externality on FPOs belonging to the same 'virtuous' sub-type (let us recall that in P_5 we have $0 < x < 1$, and that, therefore, the two alternative strategies coexist within the for-profit sector). By contrast, if $c > 0$, self-enforcing effects characterizing the dynamics of x prevail ruling out the coexistence between the two sub-types.

Furthermore, in order for the point P_8 to be attractive, it is necessary that $l < 0$, that is that the 'trustworthy' NPOs generate a negative externality on the NPOs belonging to the same 'virtuous' sub-type (let us recall that in P_8 we have $0 < y < 1$, and that, therefore, the two alternative strategies that NPOs can adopt coexist within the nonprofit sector). As we pointed out before, a negative externality can be explained if we think of effects due to competition as far as
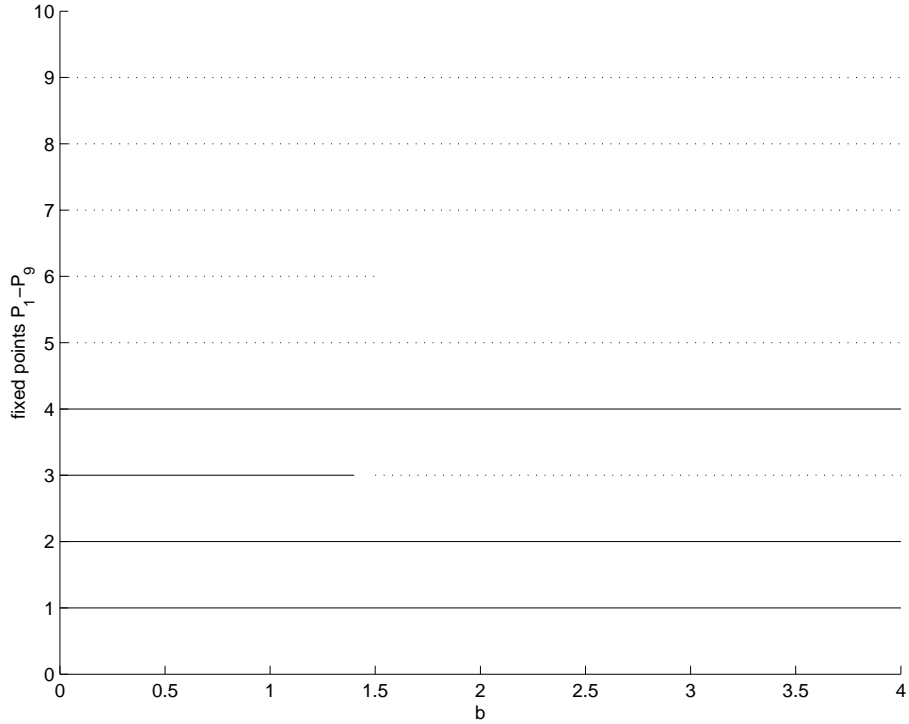
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Figure 3: Parameters kept fixed at the values of Figure 2, but with $0 \leq b \leq 9$

fund-raising efforts are concerned. If $l > 0$, self-enforcing effects characterizing the dynamics of y prevail.

By **Proposition 1**, we can also see that:

a) P_3 (where $x = 0$ and $y = 1$) is never attractive if $l < 0$.

b) P_7 (where $x = 0$ and $0 < y < 1$) is never attractive.

c) P_1 (where $x = 0$ and $y = 0$) and P_5 (where $0 < x < 1$ and $y = 0$) are never simultaneously attractive.

d) P_2 (where $x = 1$ and $y = 0$) and P_4 (where $x = 1$ and $y = 1$) are never simultaneously attractive if $l < 0$.

e) P_3 (where $x = 0$ and $y = 1$) and P_6 (where $0 < x < 1$ and $y = 1$) are never simultaneously attractive.

With regard to the existence of coexistence fixed points, it is easy to check that the fixed points $P_5 - P_8$ exist only if the value of the maximum level of institutionally produced generalized trust $\overline{k}$ is neither too high nor too low.

The fixed point P_9, where all four sub-types of private organizations present in the economy coexist, can be attractive only if $c < 0$ and $l < 0$. That is, P_9 can be attractive only if the 'virtuous' organizations operating in the two
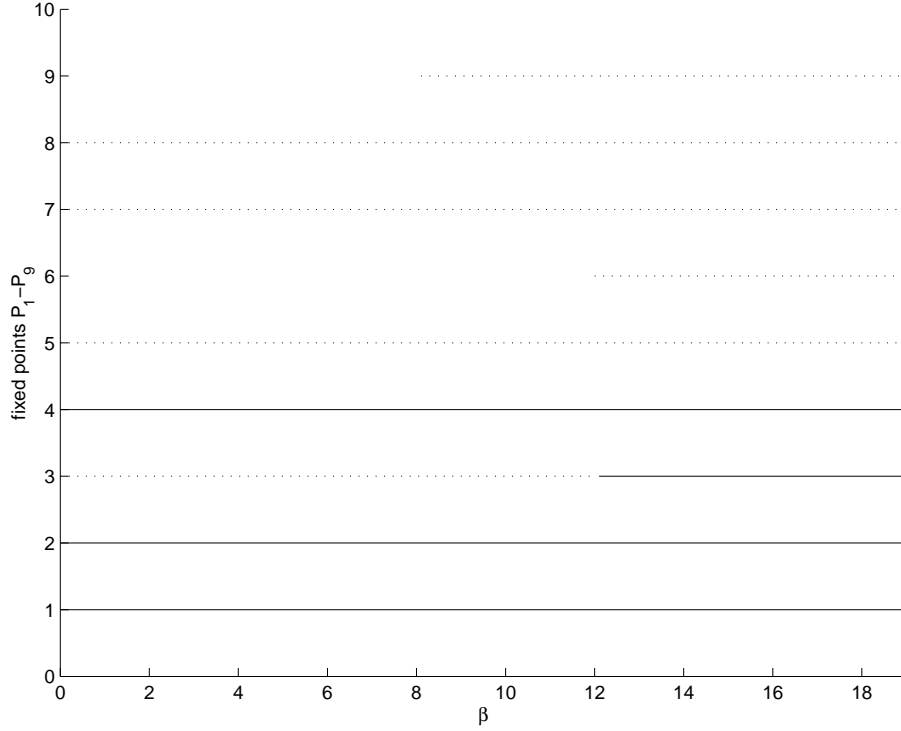
Figure 4: Parameters kept fixed at the values of Figure 2, but with $0 \leq \beta \leq 19$

sectors generate negative externalities on the organizations belonging to the same sub-type. Since the coordinates of P_9 are

$$k_9 = \frac{a - cx_9}{b}$$

$$x_9 = \frac{m - ly_9}{i}$$

$$y_9 = \frac{\alpha(i(a - b\overline{k}) - cm) - b\beta(m - i) + \delta bi}{-\alpha cl - \beta bl + \delta bi}$$

Let us observe that, if $b \neq 0$, for $\overline{k}$ high enough, the value of y_9 becomes greater than 1 or lower than 0; therefore, the interior fixed point P_9 does not exist. Consequently, all coexistence fixed points $P_5 - P_9$ do not exist if, ceteris paribus, the value of the maximum level of institutionally produced generalized trust $\overline{k}$ is either high or low enough.

Figure 5 illustrates the dynamics with a parameter specification satisfying P_9 global attractiveness conditions of **Theorem 4**; this context is characterized

by the fact that history (i. e. the starting point of dynamics) affects transition dynamics only, whereas it has no influence on the final outcome of social dynamics, which is always P_9. In this context, the economy cannot reach the undesirable scenario P_1; however, it can neither reach the outcome P_4, where all the existing sub-types are virtuous.
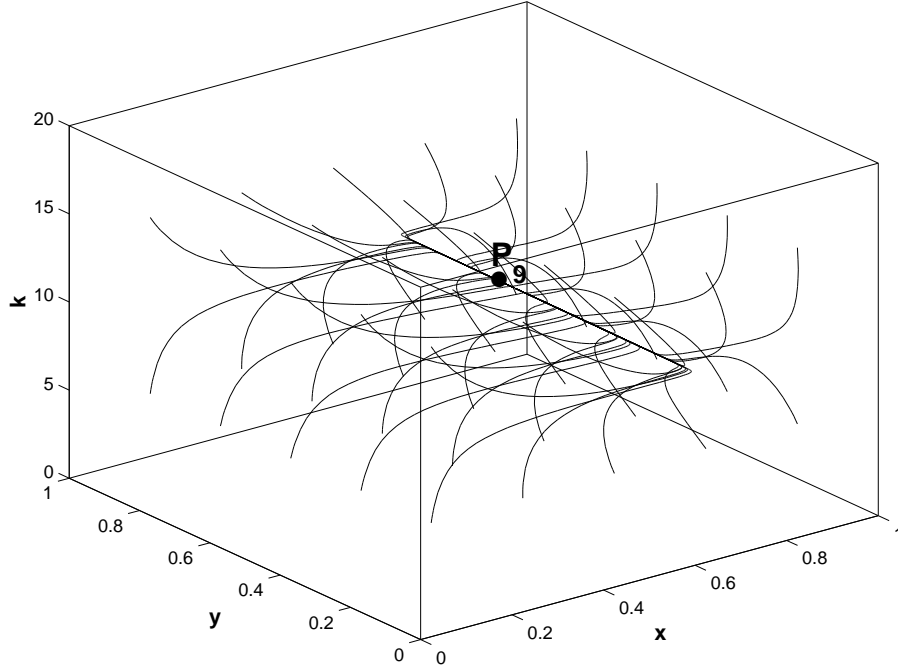

Figure 5: Interior fixed point P_9, with parameters: $\alpha = 30$, $\beta = 1$, $\delta = 1.5$, $a = 5$, $b = 3$, $c = -38$, $m = 4$, $i = 7$, $l = -1$, $\overline{k} = 10$

Figure 6 shows how the dynamics represented in **Figure 5** gets modified by letting the parameter b vary in the interval $[0, 5]$, with the remaining parameters being kept fixed at the values of **Figure 5**.

Since all the coexistence fixed points $P_5 - P_9$ exist only if the value of the maximum level of institutionally produced generalized trust $\overline{k}$ is neither too high nor too low, the coexistence outcomes which characterize **Context C** can be observed for 'intermediate' values of $\overline{k}$ only; otherwise, only the fixed points $P_1 - P_4$ can be reached. **Figure 7** shows how the dynamics represented in **Figure 5** gets modified by variations of the parameter $\overline{k}$ in the interval $[5, 15]$, with the remaining parameters being kept fixed at the values of **Figure 5**.
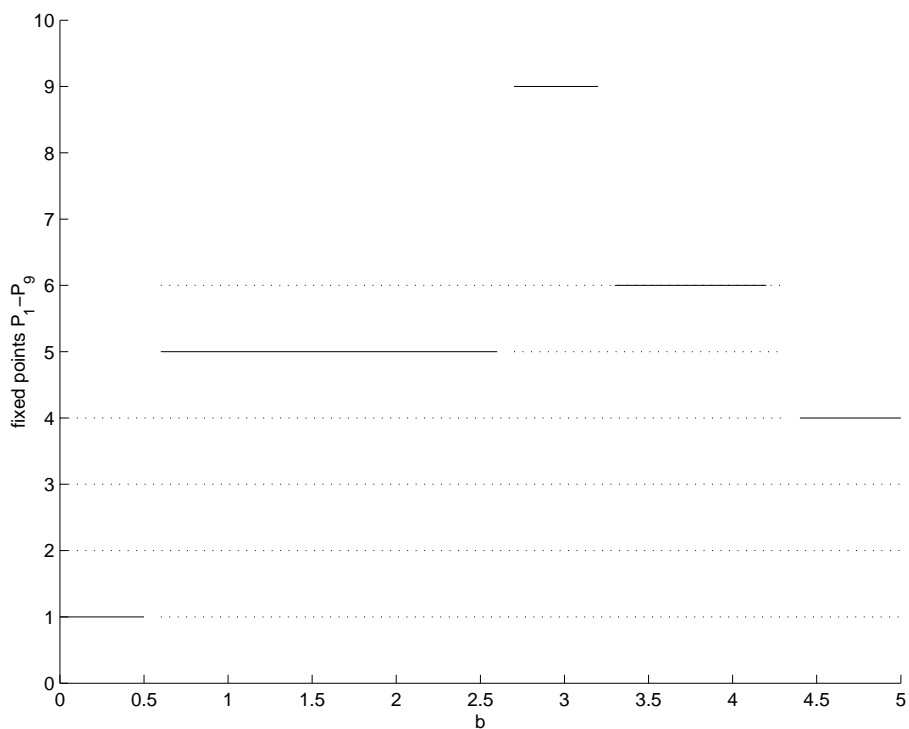
Figure 6: Parameters kept fixed at the values of Figure 5, but with $0 \leq b \leq 5$

6 Concluding Remarks

For-profits and nonprofits represent the two types of private organizations operating within contemporary advanced economic systems. In this light, we thought it was extremely important to study the conditions under which such economic institutions, by dynamically interacting over time, are capable of producing an economically vital form of social capital such as generalized trust. As we argued in the introductory section, by recalling several classical and recent studies on the link between market economy and pre-market social values, generalized trust acts as a public good playing a critical role for the functioning as well as the long-term sustainability of market forces. When the level of trust is eccessively low, the market mechanism cannot work properly and its foundations are weak. In the history of economic thought, the strand of literature focusing on the 'magic' transformation of private 'vices' into public 'virtues' (see also Mandeville's fable of the bees) adopted the view according to which relying on individual's self-interest (private vices) was a sufficient guarantee for the achievement of widespread well-being or the common good (public virtues).
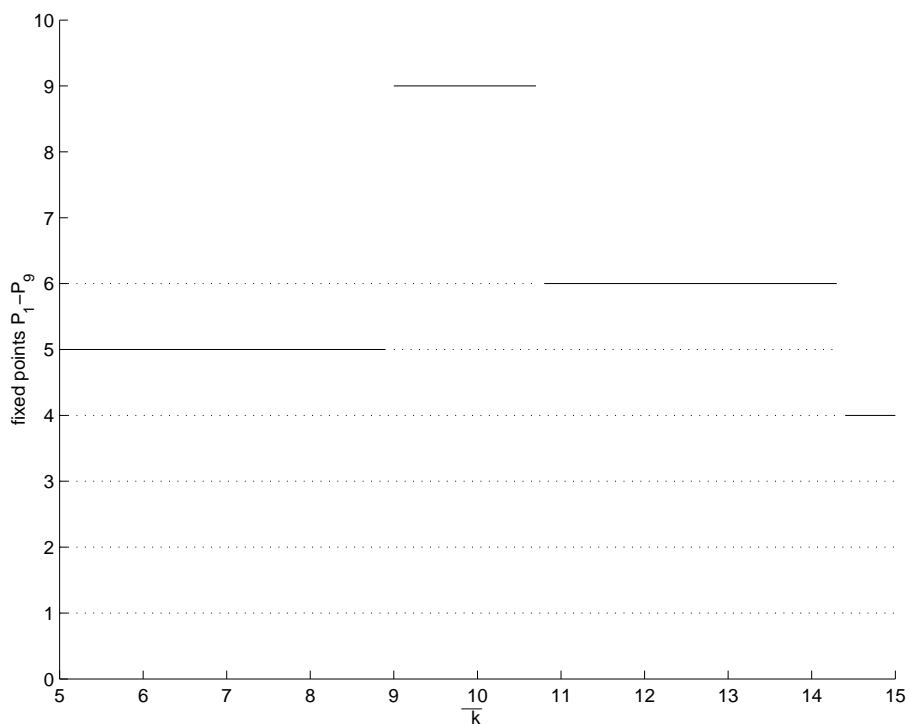
Figure 7: Parameters kept fixed at the values of Figure 5, but with $5 \leq \overline{k} \leq 15$

If this were true, people could live happily within society even if they had no direct positive relationships with each other: altruism and other pro-social motivations (and, therefore, also expectations of other persons' help and generosity) would turn out to be completely unnecessary for the successful pursuit of social well-being. Thanks to the invisible hand, every one would be free to simply pursue his own self-interest, without worrying about others' goals and needs. But is this a sound view not only in anthropological terms but also about how successful economies and societies really work? Are we sure that agents' consistent pursuit of their self-interest is sufficient for the achievement of important social goals such as collective well-being and sustainability of both social and economic institutions over time? The problem is that a rigorously individualistic interpretation of Smith's, Mandeville's and other classic scholars' writings does not consider the possibility of tragic 'dynamic paradoxes' that may arise as a consequence of such anthropological perspective: insofar as people are only seen as selfish utility maximizers, economic and social interaction gradually ends up eroding the so called 'bond of society', i.e. that invisible but decisive social network of values and informal norms that represents the real 'cement' of soci-

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eties, that is that set of principles on the basis of which societies cohere (see on this Elster 1989). When such crucial form of social capital gets eroded, markets themselves are less and less capable of producing their socially beneficial effects and even of existing over time.[5] Analogously, Axelrod (1986) observes that "Economists are becoming interested in the origin and operation of norms as they have come to realize that markets involve a great deal of behavior based on standards that no one individual can determine alone". On the same vein, Vaggi (1991) affirms: "To exist societies need consensus on some general laws and rules of behaviour, human society requires compliance and respect for social norms, which have emerged from the observance of the mutual behaviour of its members. Indeed these rules and norms are the core and the very essence of human societies. The market itself is a system of rules, of relationships, of customs, and even of beliefs and of personal dispositions, whose formation may take centuries".[6]

In the light of all these considerations on the connections between values and market institutions, the lack of trust in the economy may be seen as a fundamental form of 'market failure': markets do need trust (they are 'trust consumers'), but, at the same time, it is unclear if and how they can autonomously generate the type and amount of trust they need in order to work efficiently. In other words, while markets can certainly be regarded as very good 'trust consumers', we do not know whether they can also be considered as efficient 'trust producers'. Sociologists have shown that trust can emerge out of several non-economic forms of social interaction, such as the activity of various informal groups active at the civil society level. While this type of analysis is undoubtedly of great interest and relevance, we claim that it would be extremely important for economists to understand whether our economic systems can generate *autonomously* - through the endogenous activation of virtuous, trust-generating mechanisms - a certain, relatively high and stable level of generalized trust. In other words, we believe that it would be interesting to see whether contemporary, complex market economies are sustainable and self-enforcing not only in strictly material terms but also from this fundamental (though non-material)

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[5] As Sacco and Zarri (2002) point out, "It would be hardly deniable that market economies do have all the necessary potential to achieve significant results in terms of efficiency, as well as to create sustainable economic institutions. However, neither of these factors (efficiency and stability) lends itself to be analyzed from a purely non-historical perspective. By contrast, they both crucially depend on evolutionary processes closely related to the culturally-specific reference context. Economic systems do not develop in a sort of vacuum closed to any non-economic influence, but, on the contrary, seem to be embedded within dense social networks where interpersonal relations, values and institutions interplay and affect both their structural features as well as the performance levels they can reach".

[6] Market institutions also call for the existence of non-market institutions generating specific values which are crucial for the existence and stability of market organizations: "Market exchange per se cannot bring about efficient pro-social interaction, but rather requires it as a precondition for optimal functioning. (...) In this vein, it is important to keep in mind that market systems are compatible with many cultures defined as tractable patterns of behaviour. In turn, the degree of compatibility of market systems with cultures is not without effects upon the global efficiency of the systems themselves. Thus, one should expect that a culture of individualism will produce different results, in welfare terms, from a culture of reciprocity" (Sacco and Zamagni 2001).

viewpoint, i.e. with respect to the capability to endogenously generate the amount of trust that they need in order to work efficiently as time unfolds. In the attempt to provide some preliminary answers to such complex questions, the dynamic analysis illustrated in the previous sections has shown, in line with similar models on the evolution of pro-social behaviors (see e.g. Antoci, Sacco and Vanin 2004 and Antoci, Sacco and Zarri 2004a, b), that history matters: in this model, initial conditions are often critical in order to understand where the economic system will converge in the medium-long run, as to the level of institutionally produced generalized trust k and the proportions of 'virtuous' FPOs (x) and NPOs (y).

More specifically, we have shown that **Context A** (where $b = 0$, i.e. k has the same impact on the two trust consumers' payoff functions) has the following features. The fixed point P_1 is always attractive, regardless of the values assumed by c, l and $\bar{k}$: this means that for any combination between competitive pressures/cooperative relations within for-profit and nonprofit sector, a positive probability always exists for convergence to occur on the 'worst' social configuration where the level of k is very low, all for-profits are pure FPOs and all nonprofits are isomorphic ones; further, convergence to the most desirable social outcome P_4 (where the level of trust is high and all for-profits and non-profits present in the economy belong to the 'virtuous' organizational sub-type) is possible if both c and l are high enough; the fixed points P_1, P_2, P_3 and P_4 can be simultaneously attractive; the fixed points P_5, P_6, P_7 (coexistence among three sub-types) and P_9 (coexistence among four sub-types) are never attractive, regardless of the values assumed by c and l. In other words, this context is not favorable to the stable coexistence of more than two sub-types at a time. The only exception is represented by P_8, that can be attractive under some conditions.

We have also seen that, if $b = 0$, whenever $c \leq a$, only the fixed points P_1 and P_3 can be attractive. This means that in such context, where consumers do not reward for-profits choosing CSR, if competition effects prevail in the for-profit sector, then no attractive fixed points with a positive proportion of socially responsible for-profits can emerge. The sub-case $c \leq a$ and $l \leq m$, in which only P_1 is attractive, brings about a social context where history does not matter and, regardless of initial conditions, society converges to the 'unpleasant' and economically unsustainable $x = y = 0$ equilibrium.

As far as a socio-economic scenario such as P_1 is concerned, we can observe that this social configuration seems to recall, to some extent, what several scholars depict as a trend currently occurring in the United States: in P_1 the stock of social capital is low and all nonprofits are 'isomorphic'; these two features seem to characterize the current phase of socio-economic development in the U.S., as, according to Putnam (2000), the last decades are characterized by a decline in the stock of social capital and, according to Weisbrod (1998), the American non profit sector is more and more 'commercial'. As Antoci, Sacco and Zarri (2004b) observe, by referring to Weisbrod's analysis, "This is why the growing tendency, in the U.S., for nonprofits to receive less and less support in the form of private donations (with a fall in their relative importance as a source of funding from

53% to 24% in less than thirty years) and to conversely obtain more and more of their income from the sale of goods and services on the market sounds as a somewhat worrying perspective to many observers".

In **Context B** ($b > 0$, c and $l \geq 0$, i.e. socially responsible for-profits are better able to exploit k and no competition effects prevail neither within for-profit nor within nonprofit sector), we have shown that the coexistence fixed points $P_5 - P_9$ are never attractive. This means that whenever positive externalities prevail both within the nonprofit and the for-profit sector, no more than two organizational sub-types will survive in the medium-long run. As to the vertices P_i, $i = 1, .., 4$, they can be simultaneously attractive (**Figure 2**); in such case, history, that is the initial values of x, y and k, plays a key role in determining the outcome of social dynamics; each equilibrium P_i, $i = 1, .., 4$ can be interpreted as a social convention that the economy can reach insofar as it starts sufficiently close to it; economies with identical payoff functions can reach different outcomes starting from different initial sub-type distributions, x and y, and a different trust accumulation level k. The interesting feature of the context depicted in **Figure 2** is that the system can reach the socially desiderable outcome P_4 by any coordination device letting the economy start from an initial position near enough to P_4; when P_4 is reached, then no public intervention is necessary to maintain the economy in P_4, in that it is locally attractive.

In **Context C** ($b > 0 > c$, l), we have shown that the coexistence fixed points P_5, P_6, P_8 and P_9 can be attractive; in particular, a necessary condition for P_5 and P_6 to be attractive is that $c < 0$, i.e. that the FPOs being 'socially responsible' generate a negative externality on FPOs belonging to the same 'virtuous' sub-type. Furthermore, in order for the point P_8 to be attractive, it is necessary that $l < 0$, that is that the 'trustworthy' NPOs generate a negative externality on the NPOs belonging to the same 'virtuous' sub-type. The fixed point P_9 can be attractive only if the 'virtuous' organizations operating in the two sectors generate negative externalities on the organizations belonging to the same sub-type.

With regard to the existence of coexistence fixed points, they emerge only if the value of the maximum level of institutionally produced generalized trust $\overline{k}$ is neither too high nor too low. So, intermediate values of $\overline{k}$ favor coexistence among organizational sub-types in **Context C**, while favoring the regime in which $P_1 - P_4$ are simultaneously attractive (**Figure 2**) in **Context B**. For high or low enough values of $\overline{k}$, only the pure population fixed points $P_1 - P_4$ can be reached by social dynamics in both **Contexts B** and **C**.

From a strictly analytical point of view, we have provided necessary and sufficient conditions for the attractiveness of the fixed points and a sufficient condition for global attractivity of the coexistence fixed point P_9. We have shown that if P_9 does not exist, then orbits approach the boundary of the phase space and no periodic orbit can exist in the planes $x = 0, 1$ and $y = 0, 1$. Furthermore, we have proved that no attracting limit cycle can be generated by a Hopf bifurcation.

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