

**Why is Social Capital a "Capital"?
Public goods, co-operative efforts and the accumulation of intangible
assets.**

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1. Introduction

This chapter argues that social capital (SC) is a productive asset just as physical capital is a productive asset. This approach underscores that an increase in trust-based relations reduce the average cost of transactions, just as an increase in physical capital reduces the average cost of production. In turn this means that several characteristics normally associated with physical capital are also shared by SC. In both cases, a productive assets is created by foregoing a current benefit in return for a probable benefit to be received in the future. We can therefore analyse SC with the same approach as we normally use for physical assets, and in this context we adopt a mixed-public good framework. The suggestion is that SC may be considered the public component of mixed-public capital. As an example, think about a network of firms which invest in R&D and create voluntary agreements aimed at achieving environmental targets in terms of reduced pollution, increased recycling, etc.. Voluntary agreements are the public component of the mixed-public capital R&D.

The aim of the chapter is then to analyse under what conditions there exist incentives for a dynamic increase of SC, considering that the public component of a mixed-public capital creates certain distortions in the private decisions leading to SC accumulation. These decisions, and their distortions, arise out of the following three elements: (i) the nature of benefits yielded to firms; (ii) the structure of internal and external costs and (iii) the firms' expectations.

The concluding section sheds light on the directions of future research.

2. Physical Capital: a brief review.

The role of physical capital, defined as tools, machines and buildings involved in the production of commodities, is in the main well understood. To be specific, without reviewing the massive literature on the subject, we can say that most economists would agree that physical capital has three characteristics. First, physical capital is created by refraining from consuming a portion of current income. This generates savings to undertake the initial investment. Likewise physical capital is maintained in operation by devoting a portion of current income streams to the replacement of broken or worn out parts. Secondly, physical capital is created (that is, investment is undertaken) in direct proportion to the expected benefits to be reaped by building it. This is precisely because the decision to invest implies giving up a current (certain) benefit in return for a future (uncertain) one. As the benefits to be gained by reducing current consumption increase, the proportion of income that individuals will be willing to set aside for the purposes of investment will likewise rise. Conversely, as the probability that the expected benefits will actually materialise declines, the proportion of income diverted from consumption to investment will fall. These two opposing principles, uncertainty and benefits, are extremely important in understanding how physical capital is created. We will argue below (sections 3 and 4) that the same applies to social capital.

The third characteristic of physical capital is its effect on production costs. An increase in physical capital (either *more* machines or *better* machines, it does not matter to our present purposes which, though of course the two are not the same) should reduce the average cost of each unit of output. Indeed, lower production costs are precisely the source of the benefit that induces individuals to save and invest in order to obtain a return. If introducing a machine in a production process lowers per units costs, the difference between the old high cost and the new lower cost constitutes the investor's return. This is true, of course, provided there is a market ready to absorb the product. We will return on this point below.

Two important considerations need to be made here. First, it will be noticed that we said that increasing physical capital "should" reduce costs. That is, until a particular machine has actually been put into operation, it will not be known whether it actually does reduce costs. That is what we meant earlier when we said that the creation of physical capital (that is, the diversion of current income from consumption to savings and thus investment) involves an element of uncertainty. Investors gather information of the functioning of the new machine and form expectations concerning its likely contribution to lower costs. This constitutes their expectation of benefits from their investment, that is, from the sacrifice they make today by refraining from consuming a certain portion of their income. But it needs to be stressed that these expectations

are not necessarily correct, and that even if they are correct external factors may intervene that will cause even the most carefully calculated saving/investment decision to yield much lower benefits (or even no benefits at all but only additional costs to service the new machine) than had been expected. This cannot be known in advance, so all savings/investment decisions have an element of "guessing", that is, of applying past experience to the current problem and extending from what has been observed in the past to what is likely to happen in the future. As will be discussed below, the formation of expectations plays a central role in SC.

The second consideration concerning the effect of physical capital is the following. Usually economists believe that as the amount of capital increases, each additional unit (each new machine, say) will produce less than the previous one. This is known as the "Law of Diminishing Marginal Returns" and it is used to explain why investment is not infinite: at a certain point, the additional costs savings allowed by the additional machine will be well below the benefit foregone¹. At this point, investment stops. As we will see, this too has a correspondence in our discussion of SC.

We can derive some straightforward but important implications concerning investment and the growth of the stock of physical capital from what we have said so far. First, anything that reduces the *expected* net benefits derived from increasing physical capital will reduce the rate at which investment is undertaken. Thus any increase in uncertainty over the performance of the machinery to be used or over the claims that will be made on the stream of income the machine generates (e.g., taxes), will increase the probability that the benefits obtained from the investment will not match the current sacrifice in consumption. In that case, investment will not be undertaken, as it will not be worth the individual's while to reduce current benefits in expectations of future ones. Secondly, and as a consequence of what we have just stressed, the process by which individuals form expectations about likely future events is crucial: if individuals form expectations by observing what goes on around them and extending their experiences into the future, it is easy to see that the process of capital formation can take one of two characteristics. In one case, high levels of investments mean that there is a ready market for products which in turn means that most investments do pay enough to justify the sacrifice from current incomes. Thus individuals find it worthwhile to save and invest, and the sum of millions of such decisions means that it is in fact worthwhile to save and invest. A virtuous circle is set and kept in motion.

On the other hand, if most investment decisions do not work out, individuals will not invest and thus will not save, except the minimum necessary to keep whatever capital they have in

¹ This is, of course, the interest rate.

working order. Expectations as to the benefits obtained by denying oneself current consumption for the sake of future benefits will be pessimistic, and because few decisions are made to invest and expand few such decisions succeed. The circle is in this case vicious, and society is stuck on a low income/low growth situation. This is of course the reason why dynamic economies such as the USA's tend to grow faster than poor economies, and when poor economies do catch up (e.g., S. Korea) they achieve this by means of establishing clear property rights that favour savings and accumulation.

In conclusion, this section has argued that we can understand physical capital, one of the traditional factors of production, as the response to a set of incentives which encourage current sacrifice for future benefits. While we have seen this as an exclusively private process, which was necessary given the limit on our discussion, there are obviously significant public goods aspects that are involved in the formation of physical capital. This does not vitiate the basic thrust of our analysis, however. Most importantly, this discussion gives us a frame of reference to approach the accumulation of social capital.

3. Social Capital as a productive asset.

The concept of social capital (SC) is troublesome, and there have been innumerable attempts at a coherent definition. We cannot examine them here (see Guttman 2001, Dasgupta and Serageldin 1999, and Portes 1998 for review) beyond saying that the broadest possible agreement appears to be that SC consists of the set of norms that govern social behaviour, and that these norms are in the main unwritten but tacitly understood. No need to stress that such a catch-all assertion raises more questions than it answers, and in particular (as Durlauf 1999 pointed out) that the social cohesion and conformity implicit in such definition are not necessarily morally desirable or socially benevolent. However, in our view, discussing yet again what SC is, and what it is not, would not constitute a productive exercise in a report such as this. We prefer instead to take an extremely pragmatic approach, just as we have taken in the previous section in our discussion of physical capital, and focus instead of what the forces are that lead to its increase or decrease.

To do this, however, we have to have some definition on which to work, but our definition does not attempt to identify what SC *is*, asking instead what it *does*. We begin here to draw an explicit analogy with physical capital: the effect of physical capital, we said, is to reduce the cost of production, and it is this reduction in costs that sets up the incentives for its creation. Likewise, the effect of SC is to reduce some costs of transaction that derive from the fact that individuals cannot easily observe other's intentions or actions at all times. This means that, just as increasing

physical capital allows each unit of output to be produced at a lower cost, so increasing SC allows each transaction to be carried out at a lower cost.

The savings made possible by SC consist of the reduction in monitoring costs resulting from each party trusting the other. Of course "trust" is an ambiguous word, and we shall define it later in greater detail, but at present it is enough to point out that not all transaction costs can be eliminated thanks to trust. Problems of measurement, of legal title, of enforcement, remain no matter how much parties involved in a transaction trust each other. But some savings are obtainable thanks to trust-based relations, and to the extent that such savings reduce the cost of entering into a transaction they have the same effect as an increase in physical capital: they reduce per unit costs.

Another way of saying the same idea is to point out that in practice writing contracts that cover all contingencies is extremely difficult and therefore expensive. If the parties in any given transaction can therefore leave some "gaps" in their contracts because they share an understanding (a "gentlemen's agreement") as to how they will behave in unforeseen circumstances, this will have two cost reduction effects. First, it will be easier and cheaper to negotiate the original agreement, and secondly, if an unforeseen eventuality does arise it will be possible to deal with it without costly re-negotiations. In the limiting case, for example in family run firms or clusters of firms, no contracts are written at all, precisely because there is a clear internal ethos which prescribes mutual rights and obligations in virtually all situations. Needless to say, these firms and/or clusters are extremely flexible.

Without a certain level of trust, contracting parties will be compelled to edge in and protect their distribution of costs and benefits from any agreement to a much greater extent, that is, they will have to write more complex and less flexible contracts. That is a costly activity, and may simply discourage some potentially beneficial transactions from taking place at all. Thus with low SC each transaction requires more guarantees and protection to take place, that is, more resources. It will, in other words, cost more, just as with low physical capital each unit of output will require a greater amount of effort to produce, that is, will cost more.

The analogy with physical capital is useful precisely because it allows us to frame the issue in the same terms. To continue with our analogy, we turn now to the question of foregoing a current benefit to obtain a future reward. As we have pointed out, that is the mechanism that brings about the construction of physical capital, and any alteration of the relative inducements of that trade-off will affect the rate at which the physical capital stock grows. The same can be said about SC. To be specific, in any transaction there will be a party, A, who will have to make a commitment (in time, money or whatever other resource) before the other, B, can do likewise.

Once this commitment has been made, B then has the opportunity to defect, that is to capture the benefit received and not commit any resources of his own. In this case the benefit jointly obtainable from co-operation remains unrealised, and while B is better off, A is worse off.

It follows that A will make a commitment only if his expectations of B's actions are such that there is a high probability that B will not defect, that is, that B will carry through with his share of the investment (committing time and resources to the joint project in his turn) so that there will in fact be a joint product to be shared at the end. The higher is the amount of monitoring of B that A has to carry out in order to ensure B's co-operation, the smaller will be the net benefit that A will obtain from the joint action. At a certain level of monitoring no net benefits will accrue to A at all, and the joint action will simply not take place.. If A has to monitor B more as the probability that B will defect rises, it follows that when individuals generally expect others to defect (i.e., trust is low) they will refrain from engaging in joint projects because the net benefits will be low, and possibly negative. The level of trust one individual has to place in others in order to engage in a joint project has been rigorously defined and estimated (Galassi 2001).

Like physical capital, then, SC is constructed when the balance of payoffs offers the right inducements. Notice that the steps in its construction are quite similar to those of physical capital: an original commitment (that is, a diversion of resources from current consumption to a project that may yield a benefit in the future) is made if the probability of a certain return is above a minimal "threshold" level. Once again, because A cannot observe B's intentions (just as an investor in physical capital cannot observe the state of the markets or the functioning of the new machine in the future), expectations play a central role in the decision. That is what trust is, in our view, and what SC does. Trust is the expectation that the other party in the transaction will not defect. If expectations are formed by observing events and extending what has been learnt into the future, then just as in the case of physical capital we can imagine two situations. In the first, individuals trust each other (SC is high), so that they will be willing to engage in transactions which require they make commitments in resources. Because most of these transactions work out (that is, produce a joint benefit), large numbers of people share in the benefit of co-operative action. Co-operation is thus seen to pay off, so individuals will be willing to enter into more joint projects and few defections will take place. Few resources have to be devoted to monitoring others, and the social equilibrium is one of co-operative engagement and accumulation.

In contrast, just as in the physical capital case, if trust is low, few joint projects will be undertaken, and those that do will require significant monitoring. But then net benefits will be low and the inducements to engage in co-operation will be correspondingly scarce. Defecting will

then be an attractive option, and expectations will form that co-operation is not a worthwhile approach and that if absolutely necessary it has to be buttressed with significant amounts of strict monitoring. Few joint actions benefits will then be realised and the social equilibrium will be one of stagnation (see François and Zabojnik 2002, for a formalised discussion of the sort of external shocks that can transform the co-operative outcome to a low trust equilibrium). All these phenomena are discussed in greater detail in section 4 below.

There remains one last point to stress in order to complete our analogy between physical and SC. In the main, the benefits generated by an increase in physical capital are privately captured, although obviously there are spillovers and externalities. The construction of SC differs in this case in that what is created is essentially a public good. The benefits from a successful co-operative action will accrue only in part to the individuals concerned, because the demonstration that there are high payoffs to co-operation is in itself a benefit of successful co-operation. Of course, a successful co-operative action will lower the cost for the individuals involved to engage in further co-operation. In this respect, we have here an insight into the formation of industrial clusters (repeated successful co-operative interaction) and the already mentioned high trust equilibria that we will discuss in greater detail below. The point is simply that the public goods aspect of SC is stronger than for physical capital.

To conclude, this section has suggested that the same criteria can be used to analyse physical and social capital. In both cases, we are talking about the accumulation of a productive asset that will be undertaken if current foregone income (=investment) will obtain a return in the future such as to justify the diversion of the income flow. In both cases the asset is maintained by additional "sacrifices", that is, additional diversions of current income streams over time (replacement of worn or broken parts for physical capital, ongoing co-operation for SC, see section 4.1 below). And in both cases the current decision has to be made on a probabilistic assessment of future events, and thus for both physical and social capital extrapolating from past experience to form expectations as to the future state of the world is essential to the successful accumulation. But while the analogy is useful, it is important not to push it too far, in that SC is not a privately owned productive asset as physical capital in the main is, and this has important consequences for its creation and accumulation. To these differences we now turn.

4. On Social Capital: the economic arena and the mixed-public good framework

Previous sections show that social capital can be analysed with the same approach we normally use for physical assets. Particularly in this context, following the work by Mancinelli and Mazzanti (2002), the aim is to analyse social capital in a mixed-public good framework, in

which the interrelations between economic agents are investigated in a dynamic scenario where both market and non-market benefits are jointly relevant.

First of all, let us be clear about what is meant by "mixed-public good". In the economic literature², a mixed-public good, or impure public good, is a good which jointly gives private and public benefits. A typical example is that of an individual who, by being inoculated against an infectious disease, confers both a private benefit on himself and a public benefit by reducing the risk of spreading the disease through the community. In this case inoculation is the mixed-public good.

In this chapter, the economic agents are firms and the social capital is the public component of a mixed-public capital. As an example, we may think about a network of firms which invest in R&D and create voluntary agreements aimed at achieving environmental targets in terms of reduced pollution, increased recycling, etc. Voluntary agreements are the public component of the mixed-public capital R&D and it can be considered the SC in which each firm chooses to invest. Actually, in this example SC is consistent with the main aspects that in literature are usually highlighted, those of "trust" and "ease of co-operation"³.

On this subject, moreover, La Porta et al (1997), in their analysis of trust in large organisations, claim that trust should be associated with greater co-operation, and is even more essential in ensuring co-operation between strangers rather than among people who interact frequently and repeatedly. This means that trust is most needed to support co-operation in large and voluntary associations (networks of firms), where members interact infrequently to achieve private goals, whose achievement nonetheless need common forms of capital.

Our intention is just to focus on those two elements, trust and co-operation, specifically focussing on the voluntary nature of actions undertaken and on the incentives schemes that support investment decisions in environment where both market and non market returns are present.

More generally, the situation faced by firms may be depicted as follows: on the one hand a firm has the option of investing either in standard technology or in incremental innovations which

² See Cornes-Sandler (1986).

³ Paldam (2000) specifically provides the following definitions, revolving around the notion of trust, cooperation and network:

Definition 1 on Ease of cooperation: "Social capital is the ability of a person belonging to a population to work voluntarily together with others (belonging to the same population), for a common purpose in groups and organizations"

Definition 2 on Trust: "Social capital is the quantity of trust a person (belonging to a population) has in other members of the same population"

Moreover, Paldam assesses: "It would appear that trust is primary to most cooperation. However, by working together people further build trust, so the two concepts have some interactive simultaneity. Trust and the ease of voluntary cooperation are thus two interlinked concepts." (Paldam, 2000, p. 636).

do not require co-operative efforts within the network (the firm internalises investments and associated returns). Both options may be termed as Business-As-Usual (BAU) scenarios. On the other hand, the firm may invest in R&D involving radical innovations: in other words, innovations that involve structural breaks from the BAU (discrete changes concerning technological/organisational development) or that involve skills, knowledge and competencies, which the firm only partially owns. In both cases, the innovation requires a co-operative effort, and the investment is one on an impure public good, where the ratio between private and public components of welfare may be assumed constant. Each unit of investment in the mixed-public good produces some percentage units of private benefits and some percentage units of public benefits; the opportunity cost of the “radical co-operative innovative” capital is, in the short run, the value of investing in BAU options.

The framework as presented above may characterise different real-world situations where inter-firm co-operation is the primary and leading key to successful performance of the network. This can also be referred to, without opening up a debate over taxonomy, as either a “cluster” or a “district” of firms. What matters is that at some point firms need to join their efforts to achieve benefits which derive from, and build on, public-like forms of investments.

This need to establish voluntary co-operative schemes by which to achieve goals specific to the network, but appropriable by participants, characterises most forms of (i) voluntary agreements, (ii) inter-firms intra district co-operation, (iii) inter-firms inter-district co-operation. The relevance of (i)-(iii) as engines for innovation and growth at regional level has increased over the last decades, following both the less prominent role of the state as “regulator” (top down approach) and the reshaping of governance and business strategies within the post-Fordist society. Socio-economic changes occurring in the post Fordist era shift the focus of interest from man made forms of capital to human, environmental and social capital assets (Gerelli, 1999). Further, market and non-market “horizontal” networks play a major role with respect to “vertical” and hierarchical relationships, bringing about a new scenario described by a cultural change in local and national production. Finally, intentional (multilateral) externalities replace standard Marshallian “unintentional” externalities in explaining growth and innovation processes. Positive network externalities are realised, however, unlike unintentional exogenous spillovers, the voluntary and intentional production of joint social benefits is costly. Therefore, incentives matter.

Thus, the role of “intentional cooperative strategies” emerges as clearly relevant in the demand for “new institutions” -rooting out new rules-, endogenously created and bottom up driven. Those bottom up coalitions share the risks of investing in community specific knowledge

(vs firm specific assets). Moreover, coalitions should usually rely on informal rules and non coercive incentives for sustaining *effective and efficient* agreements.

The public element of welfare function of a firm participating to the network agreement is, in our framework, the stock of SC on which the decision of action relies. SC is nonetheless strictly entangled to private components of welfare (it is not a pure “independent” public good⁴). The scenario is common to most situations characterising the post Fordist - post Keynesian era, where the hierarchical nature of economic activities has been (partially) replaced by horizontal - market-network- structures and the role of the state as a third party enforcer has decreased in importance, leaving more space to voluntary schemes. This entails a stronger co-operative effort for producing private-public elements of benefit⁵. As Oughton and Whittam (1997, p.4) sharply point out: “*it is evident that the relative decline in the significance of internal economies of scale in production and the associated movement way from large scale production toward flexible small production has been one of the factors associated with the change in the size distribution of firms (...) at the same time there are clear signs that external economies of scale are playing an increasingly important role in some regional economies (...)*”. Co-operation between firms may generate gains via the establishment of collective external economies.

Moreover, it is important to underline the voluntary element of the agreements in cooperation and production: SC is *self-enforcing, self-financing*, in opposition to *third - party enforcement frameworks*.

4.1 The mixed-public good framework

In the situation described above, social capital is the public component of a mixed-public capital which consequently accumulates or de-cumulates depending on the structure of individual incentives (benefits and costs). Moreover, SC is subject to decay as a renewable “collective resource”. In fact, decay depends on endogenous factors as easy riding (non consistent actions of investment between agents) and on exogenous factors as well⁶. Depreciation occurs for a lack of strategic investment (reduced investment) in co-operation in any period of time, rather than for

⁴ Piselli (2001) e Bagnasco (2001) incorrectly defines SC as a public good. Nonetheless, they seem aware of the mixed nature of SC. Piselli, following Coleman (1990), points out that SC, as a situational and dynamic good, is a necessary *by product* of other activities, but whose property rights are not assignable to agents outside the common effort they pursue. Further, if we omit the possibility of externalities generated by SC toward “outsiders” the network, the returns are not purely public, since only insiders (investors) benefit from it.

⁵ Thus, the value of SC as here intended increases. It is evident that SC is not a sufficient condition for development and innovation, but is surely a necessary pre-condition.

⁶ The point is emphasised by Piselli (2001), who stresses that SC is created by interactive and dynamic strategies, and is mined by individual behaviour and exogenous factors. Investment flows are thus necessary for maintaining the stock.

“utilisation”. In other words, depreciation derives from “non use” rather than excessive use, as for many forms of collective manmade capital. Depreciation reflects the fact that much of SC investment is community-network specific.

In this framework the steps of voluntary co-operation among firms may be represented as follows⁷: at a first stage firms voluntarily join to share the production costs of a good or service, of private and/or public nature, expecting to receive a vector of dynamic benefits⁸.

At a second stage the firms, which have previously formed a network, consider both private and public benefits arising jointly from co-operation. In our example, each firm invests in two kinds of capital. The first one has private characteristics only (it has no effects on the other firms inside the network). The second one, on the contrary, has the characteristic of a mixed-public good: it has either a private component (which has no effects on the other firms) and a public component (which has effects also on the other firms). We can think of the investment in the private kind of capital as an investment in what we have previously termed BAU (business as usual) capital stock, and at the investment in the “mixed-public” capital as investment in R&D involving radical innovations. In this case we can consider technological amelioration appropriable by the firm only as the private component, and the already mentioned formation of voluntary agreement among firms to achieve environmental targets as the public component. Hence, the public component is SC in the meaning of “co-operation” and “trust”.

It is then possible to assert that whenever a firm invests in one unit of R&D, its investment is in some percentage the creation of a private asset and in some percentage the creation of a social capital and the two components of the stock are complements. Since each firm’s choice about SC has effects both on its own benefits and on other firms’ benefits, a contribution by one firm of an extra unit of the mixed-public capital (R&D) has three effects: (i) an increase in the firm’s private benefit due to the private component (ii) an increase in the firm’s benefit due to the public component (SC); (iii) an increase in the total amount of the public component, SC, available to any firm. And this is true for every firm inside the network, so that each firm’s benefits depend also⁹ on all other firms’ choices about SC.

Since social capital is considered as a public-collective good, the possibility of sub optimal provision must be considered. Actually each firm choosing its own contribution to SC aims only aimed to reach the maximum of its own benefits, net of costs, without internalising the benefits

⁷ For an analytical treatment of what follows see Mancinelli-Mazzanti (2002).

⁸ Notice that in this framework the analysis about SC concentrates on situations wherein an economic relationship among agents exists.

⁹ Besides, of course, her choices about the private component and the social capital.

provided to the other firms of the network by its choice. The investment of the individual firm in SC may hence be less than the optimal social level of investment.

This is consistent with the well-known *free rider* problem¹⁰, in which one individual relies on the public good supplied by another. When a free-rider problem exists the reaction of an individual to the other individuals supply of public good¹¹ is negative, since she relies on the public good provision by the others.

The aim is to highlight what the incentives behind the investment in social capital are, leading toward an individual equilibrium choice with desirable properties in terms of social welfare.

5. Further extensions

In order to reach the purposes highlighted above concerning the analysis of what the incentives for a dynamic positive accumulation of SC are, we will specifically consider some elements which concern (i) the nature of produced benefits yielded to firms (ii) the structure of internal and external costs and (iii) the firms' expectations.

The first issue that, in our opinion, deserves consideration is the *relationship of complementarity* between the private and public components of the good considered as mixed-public (R&D). Complementarity theoretically enhances the probability of achieving a social optimum outcome, affecting the sign and slopes of the reaction curves¹². Intuitively, since, for each firm, the two components of the mixed-public capital are complements, an increase of the other firms' investment on the public component (SC) may induce the single firm to increase its own investment on the complementary private component (technological amelioration appropriable by the firm only) and, hence, on the mixed-public capital (R&D). In this way, through the extra investment in R&D, the single firm necessarily determines an increase of its investment in SC too. Hence its reaction curve may have positive slope, with evident positive implications on the free-rider problem. It means that each firm inside the network reacts positively to the other firms' investment in SC. None relies on the others' contributions to SC, but, on the contrary, through the relationship of complementarity between the private and the public components of R&D, the investment in SC by each firm is increased by the others'

¹⁰ Which is intrinsic to issues of cooperation and accumulation of public forms of capital.

¹¹ The so-called reaction curve.

¹² Remind that the reaction curve relates the individual firm's choice about SC with the other firms' choices. It is generally characterised by a negative slope, to indicate the free-rider problem, that is the firm's reliance on the SC provision of the other firms.

investments. This necessary leads to an individual equilibrium choice of SC closer to the optimal social choice.

Secondly it is necessary to consider what happens to the investment choices in SC when increasing returns to scale are assumed in the firms net benefit functions. Actually, the problem of the sub-optimality of the individual choice in co-operation is generally analysed in context of decreasing returns to scale of the net benefit function. That is, in situations in which the costs associated to some actions (i.e. the investment in SC) increase more rapidly than the benefits associated to the same actions. On the other hand, it has been shown (Sandler, 1992) that increasing returns to scale establish an incentive for joint production and, hence, joint investment by firms. So, increasing returns to scale should improve also the joint investment by firms in SC. Actually, under this assumption, the costs associated to the investment in SC should increase less rapidly than the benefits, and hence no firm would be satisfied with the level of SC invested by the others. Once again the free-rider problem would not be relevant and the reaction curve of each firm would have positive slope. Moreover we don't think that the assumption of increasing returns to scale in SC investment is such an unwarranted assumption.

Finally we want to consider the case of *non-zero conjectures*. The assumption on which the sub-optimality of the individual choice of public goods is grounded is one of zero conjectures. That is the economic agent expects no reaction by the rest of the community to her own change in fundamental variables' choices, as its contribution to the public good (*zero conjectures assumption*). Such assumption can be criticised and found empirically inconsistent. On the contrary, if we introduce the assumption of *non-zero conjectures* in our framework on SC, different results may be reached. We can for instance assume, without no loss of reality, that each firm's expectation is that an increase in its own level of investment in SC will induce the other firms to increase their own level of investments, because of both the complementarity relationship and the increasing returns to scale effects over analysed, or just because imitative effects can exist. Each firm could then be stimulated in investing more in SC, because it would expect that if she invested less it could have negative effects on the other firms' decisions of investment, generating a process of investment adaptation.

The previous analysis enables us to highlight some elements which positively influence firms' accumulation of SC.

The first one is the degree of complementarity between the public and the private component of the mixed-public stock, of which SC represents the public component. From what shown above we can assert that investments in SC by firms increase if they are strictly connected

to factors that increase private benefits too. Hence the probability that a firm invests in trust and co-operation with other firms inside a network increases if this sort of investment is associated to another kind of investment which has merely private characteristics, in the sense that it influences only the private benefits of the firm and has no effects on the other firms of the group. In the example made in the above section each firm invests in voluntary agreements with the other firms of the network for achieving environmental targets not because or, at least, not only because this is a “good thing”, but because this increases her own benefits. Actually, these agreements allow the firm to invest more in technological amelioration appropriable by herself. Another element which incentives SC accumulation by firms is the presence of increasing returns to scale related to social capital investments. Hence, always going back to our example, investments in SC by firms may increase if R&D investment show increasing returns to scale.

Finally, firms’ expectations about the reactions to their own choices on SC play a relevant role. As we have seen, a firm will be positively influenced in investing in SC if she expects that the other firms inside the network will positively react to her investment in SC. Therefore a positive environment is relevant factor to incentive SC accumulation.

6. Conclusions

This chapter achieves some relevant conclusions in the way to approach the economic analysis to social capital.

First of all, it has been suggested that social capital can be analysed with the same criteria normally used for physical capital. Actually it has been shown that SC can be considered a productive asset, as well as physical capital, and that any economic agent invests in both form of capitals if current foregone income will obtain a return in the future such as to justify the diversion of income flows. Expectations about the future state of the world are essential to the successful accumulation of capital, physical or social. The only aspect on which the two forms of capital partially differ is that the public goods characteristic of SC is stronger than for physical capital.

This is the reason why the second part of the chapter focuses the analysis of social capital in a mixed-public good framework. It has been suggested that SC may be considered the public component of a mixed-public capital stock. The example made was that of a network of firms which invest in R&D and create voluntary agreements aimed at achieving environmental targets in terms of reduced pollution, increase recycling, etc. Voluntary agreements are the public component of the mixed-public capital R&D and can be considered the SC on which each firm chooses to invest. Since SC is considered as a public good, the possibility that an individual

relies on the SC invested by others has been considered with the aim of highlighting some elements which positively influence firms' accumulation of SC. Along this line the analysis conducted in the chapter suggests that a relevant factor is the degree of complementarity between SC and the private component of the mixed-public capital stock: the more this sort of investment is linked to another sort of investment which has merely private characteristics, the higher the probability that a firm invests in trust and co-operation (SC) with other firms inside a network. A second relevant element which positively influences SC accumulation by firms is the presence of increasing returns to scale related to investment in SC. Finally each firm's expectations about the reactions of the other firms to her own choices of SC accumulation play a relevant role. If each firm expects that an increase in her level of investment in SC will have positive effects on the other firms' choices, this will induce an increase in her own levels of investment too, because an opposite choice, of relying on the investments made by the others, could have negative effects on the other firms' decisions, generating a process of investment adaptation.

The analysis conducted in the second part of the chapter reinforces what we initially suggested: social capital is a capital and what matters for the physical capital, that is the balance of payoffs and the economic agents' expectations, matters for social capital too.

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