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# Social Capital, Conflict and Welfare*

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**Abstract**

This paper analyzes the role of external conflict as a force that can create social capital. Hostile inter-group interactions can help to resolve intra-group social dilemmas but these potential gains must be weighed against the insecurity of hostile relations with an out-group. Our central result is that the presence of an outside threat can induce higher levels of social capital either because a protective aspect of social capital comes into play and/or as a reallocation of investments from private to social capital. Given that social capital is potentially subject to free-riding, the threat, by promoting a greater level of social capital, can be welfare improving. When the threat is severe, social capital and welfare is more likely to fall. This effect of an external threat on social capital is stronger in poor economies. These results can shed light on the sometimes contradicting empirical evidence on the relationship between conflict and social capital.

**Keywords:** conflict, social capital, welfare, social cohesion.
**JEL codes:** D74, H41, Z13.



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" *War gives a sense that we can rise above our smallness and divisiveness*,"

Chris Hedges (2002).

# 1 Introduction

Conflictual group relationships are everywhere. As long as limited resources and opportunities exist and antagonistic identities persist, rival communities will clash. But hostile intergroup interactions can have ambiguous effects. Whilst conflict and its anticipation can be costly in terms of diversion, destruction and disruption of productive resources, out-group hostility may help to resolve in-group social dilemmas. An empirical literature has recently emerged which finds evidence of increased pro-social behaviour and collective action in societies that have experienced conflict.[1] A number of field and laboratory experiments corroborate that in-group relations improve as a response to the existence of a rival out-group.[2] This might not be that surprising. As argued by Choi and Bowles (2007) and Bowles (2009), individually costly norms of pro-group behaviour are evolutionary adaptive in hostile environments. Conflict can induce pro-social changes in preferences among members of affected communities (Voors et al., 2012). External threats also kickstart communal coping processes (Lyons et al., 1998), that is, mechanisms of cooperative problem-solving that emerge when a community must confront adversity. In sum, violence and conflict can enhance social capital and potentially compensate the costly diversion of resources and destruction that they bring.

Examples of the positive effect of external conflict on trust and social cohesion abound, from the local to the national level. During the decade-long civil war in Liberia, neighborhood watch schemes became a community response against burglary and related crimes (Sawyer, 2005). Bellows and Miguel (2008) describe how communities in Sierra Leone organized local fighting groups during the civil war; civilians volunteered to these groups which were supplied and funded through local contributions. Similar self-defence forces have emerged in villages in Afghanistan in response to Taliban insurgency (Jones and Muñoz, 2010). At a macro level, sociologists and political scientists have often argued

[1] For a recent survey, see Bauer et al. (2016).

[2] See Erev *et al* (1993), Bornstein *et al* (2002), Bornstein (2003); Halevy *et al* (2008). Voors *et al* (2012) conducted field experiments in Burundi, and Gneezy and Fessler (2012) before and after the 2006 Israel-Hezbollah war.

that interstate war strengthens national identity. For instance, Smith (1981) postulated that Medieval France and Spain owed their sense of national unity to their wars against the English and the Moors respectively. In modern times, interstate war might have contributed to state-building processes such as the German unification of the 19th century (Sambanis et al., 2015).

With this evidence in mind, the present paper explores the role of conflict as a force that can create social capital. This is important because there is persuasive empirical evidence indicating that social capital contributes significantly to growth and development (Knack and Keefer, 1997; Zak and Knack, 2001; Sobel, 2002; Guiso et al., 2004). We build a model that focuses on investments in social and private capital. We analyze how conflict affects the investment decisions made by members of a community threatened by an external entity. Our main argument is that in the absence of conflict, the public good nature of social capital leads to free-riding and under-investment in social capital. Conflict can help overcome this collective action problem because social capital also has a protective facet that helps the community to confront the external threat. As a result, the external threat stimulates social capital as there now exists a protective reason to invest in it, in addition to the productive reason to invest which already existed under autarky.

For a relatively wealthy society, the protective facet of social capital also stimulates investment in private capital as it is made more productive by the increase in social capital. Supposing it is relatively small, the presence of an external threat can actually increase social welfare. To be clear, we are not arguing here that societies should engage in conflict just to increase their social capital and overall welfare. Our theory rather suggests that communities confronting an external threat can resist and in some cases develop relatively successfully. On the other hand, when the threat becomes relatively strong, welfare may fall below the autarkic level. In that case it is difficult to protect capital returns and as a result, capital investment falls in favour of non-expropriable consumption. Our model can thus help to reconcile the existence of the aforementioned evidence showing that conflict is linked to higher social capital together with the evidence showing that conflict can undermine trust, willingness to trade, and associational membership.[3]

We then move to the study of relatively poor societies which are constrained

[3]Rohner et al. (2013) and De Luca and Verpoorten (2015) find this in Uganda; Cassar et al. (2013) in Tajikistan; Becchetti et al. (2014) in Kenya. Besley and Reynal-Querol (2014) find this for a panel of Africa countries.

in terms of how much they are able to invest in all forms of capital. Now, increases in social capital stimulated by the threat come at the expense of a reduction in private capital. As a result, the virtuous knock-on effect for low levels of the threat experienced by unconstrained economies is lost for constrained economies. Poor economies become more social capital intensive than wealthy economies subject to a threat of the same intensity. But these constrained economies are also less able to protect themselves and, as a result, they are less likely to attain full security of property rights.

Our next result refers to the case where social capital has *bonding* elements, defined as forms of connectedness created within homogenous groups (Putnam, 2000). This type of social capital is potentially less productive but easier to form as it based on relations with similar individuals. Rather than modelling several types of social capital, we opt for parsimony and assume that social capital can have consumption-like returns. This is because the returns of the bonding facet of social capital are not easily expropriated and therefore may be very attractive to a community under threat. We show that if the bonding aspect of social capital is sufficiently strong, the level of social capital under the threat is always above the level under autarky. Not only that. The level of social capital is monotonically increasing in the scale of the threat. As the threat intensifies, members of the community divert their investments from expropriable private capital to partially expropriable social capital. Although it may make sense to invest in it because it is not subject to theft, the bonding aspect of social capital might not be productive enough to compensate the reduction in private capital investments and the insecurity that the threat provokes.

There are a number of papers which attempt to model social capital formally despite its dual nature as input and output of social interactions (Durlauf and Fafchamps, 2006). These attempts can be broadly divided into two perspectives. The first one is microeconomic and sees social capital mostly as an output.[4] On the other hand, the macroeconomic perspective tends to see social capital as an input in production. We follow a similar approach in our analysis. In a pioneering contribution, Glaeser et al. (2002) model social capital as an individual characteristic which agents invest in and that has positive externalities for the rest of society. The closest paper to ours within this literature is Beugeldisijk

[4]That output can be quality of the neighborhood (Di Pasquale and Glaeser, 1999), participation in associational activities (Alesina and LaFerrara, 2000), the prevalence of friendly trade (Routledge and von Amsberg, 2003) or the proportion of trustworthy individuals in society (François and Zabojnik, 2005).

and Smaulders (2009) who consider several forms of social capital. Costly investments in one of these types can protect individuals from the expropriation efforts of other agents. In a similar line to our findings, they show that certain forms of social capital can crowd out economic growth.[5]

In the next section, we discuss various sources of evidence for our model, which we present in section 3. In section 4 the model is applied to expropriable social capital in a relatively wealthy economy. This represents the core part of the paper. In section 5, we offer four extensions of the benchmark model. Section 6 contains some additional discussion and concluding comments.

## 2 Illustrative examples

The theory we propose is that external conflict is a force that can create social capital and, under some circumstances, increase social welfare. Under our definition, social capital has four key attributes. First, it can increase the productivity of private capital. Second, it has a public good nature (Coleman, 1988), so it is typically underprovided. Third, as suggested by the aforementioned lab and field experiments, social capital can enhance collective action and social cohesion in response to the presence of an out-group. Finally, social capital is costly to produce; its formation requires significant investments of time and effort (Bourdieu, 1994).

Under this definition, we argue that the presence of an external threat can increase previously under-provided social capital because social capital helps the community to protect itself. The increase in social capital can have a positive effect on private investments and overall welfare. But a very intense external conflict might reduce social capital and welfare because in that case the community cannot successfully thwart the risk of expropriation.

Our task in this section is to discuss a number of environments in which this theory most readily applies and where we believe our model can shed light on empirical or case study findings. We proceed from the neighborhood level to interstate relations.

**Neighborhood watch schemes** Such schemes began in the US in the 1970s and were exported to other countries such as the UK. Of course, their use is not confined only to industrialised countries. Sawyer (2005) describes how citizens

[5] Other papers following a macro approach to social capital are Bisin and Guiatioli (2002), Chou (2006), Estrella-López (2003) and Sequeira and Ferreira-Lopes (2011)

of Monrovia created neighborhood watch schemes as a community response against burglary and related crimes committed by members of state security forces during the Liberian civil war (1989-2003). Families organized make-shift alarms to alert each other when assaulted; these alarms brought bands of neighbors armed with machetes and other weapons. The bulk of empirical research on neighborhood watch schemes is on their effectiveness in reducing crimes (Bennett et al., 2006). In relation to our analysis, we are also interested in the following question: What is the relationship between participation in neighborhood watch schemes, which generates social capital, and the actual threat of crime? Kang (2015) in a study of Seattle neighborhood watch schemes in the 1990s, finds that 'individuals living in more residentially stable neighborhoods and having lower crime rates of assaults are more likely to participate.' (p. 207). This finding is in line with a literature on social disorganisation that finds that poor, disadvantaged communities are less likely to promote community actions. Disadvantaged communities are also likely to be the ones that experience higher crime and Kang's study confirms this. In terms of our model, a relatively low threat of crime can trigger a neighborhood watch scheme which increases social capital, which may in turn improve neighborhood security. For relatively high levels of threat of crime, the neighborhood watch schemes struggle to form implying lower levels of social capital, security and welfare.

**Local infighting** Kalyvas (2006) investigates empirical puzzles in civil war and one of the most puzzling is the finding that societies rich in social capital were also the most likely to denounce each other when conflict arises in their neighborhood. He labels this as an example of 'the dark side of social capital'. So as argued, communities may find social cohesion as a response to low level threat, but this very social cohesion can be turned against the community when conflict actually arrives and the threat is very real and severe. The consequence is lower social capital, security and welfare. This observation links to two other examples where we believe our theory has relevance.

Nunn (2008) and Nunn and Wantchekon (2011) establish a negative effect of the slave trade on long-term economic development. They demonstrate that individuals whose ancestors were heavily raided are less trusting today. Nunn (2008) shows that it was usually the most prosperous societies that selected into slave trades. This suggests that slave raids were an intense threat capable of breaking social ties and trust even in communities with arguably higher levels of social capital. In fact, the acquisition of slaves was largely conducted within

communities against fellow neighbors. This violence undermined local trust. The diminution of social capital stock due to the high threat level caused by the slave trade is still felt in low trust and economic performance today.

A similar effect is reported by Cassar et al. (2013) who find that exposure to violence reduced local trust in Tajikistan. The Tajik civil war (1992-1997) was fought mainly at the village level. The absence of observable markers and the complexity of rivalries and alliance networks made distinguishing friend from foe virtually impossible. Cassar et al. (2013) find that this detrimental effect of violence on local trust only holds in villages with a level of infighting above the median. This is consistent with our prediction of very intense external threats leading to lower levels of social capital, security and welfare.

**Externally inflicted civil violence** Bellows and Miguel (2009), Jones and Muñoz (2010) and Gilligan et al. (2014) find that violence in Sierra Leone, Afghanistan and Nepal respectively increased collective action and civic engagement. A characteristic shared by these conflicts is that violence originated from outside communities. In response, villages created cooperative coping mechanisms whose positive effects on social capital are still felt today. During the decade-long civil war in Sierra Leone (1991-2002) violence was initially exerted by the Revolutionary United Front (RUF). The RUF committed violent acts throughout the country and against all ethnic groups. In response, large numbers of young villagers mobilised for purposes of civil defense (Richards et al., 2004). Professional hunters trained these young men on how to track and ambush RUF forces. Later, many students and displaced farmers volunteered too. These civil forces were successful in countervailing the RUF and helped farmers to repopulate the countryside. Similarly in Afghanistan, local defence groups have emerged around the traditional policing institution of the *arkabai* in order to defend their villages from the Taliban (Jones and Muñoz, 2010). These groups of villagers thwart insurgents' demands for money, new recruits, food and fuel, and impede Taliban attempts to close schools and ban music festivals and other cultural manifestations. The *arkabai* also help insurgents to reintegrate in their communities and thus may have a positive effect on their long-run levels of social capital.

During the Nepalese civil war (1998-2006), violence was mostly inflicted by Maoists. In her account of Nepalese daily life during the war, Pettigrew (2004) describes several communal coping strategies that villagers enacted in response to the threat of Maoist violence. Villagers tracked the movement and

numbers of troops approaching their village and shared this information with others. Younger neighbors offered company and protection to elder villagers in exchange for accommodation in their quarters. The conflict also increased the civic engagement of marginalised groups. For instance, women in the village of Kwei Nasa took over the management of a day-care centre and ran it successfully after the staff fled in fear of the insurgents. External threats had a similar effect on Southern Sudanese villages during its second civil war (1982-2005). Deng (2010) shows that social capital increased in areas threatened by Arab militias. Mutual labor assistance arrangements became widespread and household composition changed to incorporate non-relatives.

**Nationalism** For our final example we turn to Snyder (2000) and his comprehensive analysis of the link between democratisation and the creation of belligerent nationalist identity. He classifies four types of nationalism. Counter-revolutionary nationalism is identified with Germany in the 19th and early 20th centuries as the old elites use nationalism as a means to stave off internal threats caused by demands for democracy. Democracy was a threat, and the promotion of nationalism was used to divide potential rivals. It was successful but undermined itself because the excessively belligerent nature of German nationalism led ultimately, in Snyder's analysis, to World Wars One and Two. It is clear how this fits with our model. Nationalism is created as a response to the threat of democracy and thus increases social capital. However, a dynamic is set in motion such that a bigger threat than democracy emerges in the form of war with other nation states. Ultimately, social capital levels may be higher because of nationalism, but Germany became insecure and welfare was lower due to war than if there had been no conflict. Belligerent and destructive nationalism is to be found in two of Snyder's other classifications; revolutionary nationalism as in France after the revolution and ethnic nationalism as in pre World War One Serbia. In both cases nationalism was used as a socially cohesive rallying call, but in both cases led to destructive and self-defeating conflict that would seem to offset any gains that may have come from increased social capital. Finally, Snyder analyses civic nationalism which was developed in Britain as a productive form of nationalism. Admittedly, it was also belligerent and also led to conflict, but Snyder argues that British conflict was nearly always calculated. To that extent, British nationalism (which also was a response to threat) could be viewed as welfare-improving because it was not allowed to get out of control and spark the excessive threats that lead to overextension and military defeat.

An alternative theory, also relevant to our analysis, is that nationalism was employed to increase military effectiveness. In his pioneering study, Posner (1993) argues that developments in military technology during the 19th century required increased cooperation in the battlefield and an enhanced spirit of self-sacrifice. Nationalism, instilled through education, was seen as a response to that problem. A sense of national identity helped to generate soldiers' commitment, training proficiency, and solidarity in combat, but also facilitated the replacement of troops, now severely decimated by the increased firepower of the new military technologies.

# 3 The Model

## 3.1 Autarky

Let us start by considering the case in which there exists just one community $N$ formed by $n$ identical agents indexed by $i = 1, ..., n$. These agents hold an endowment $e$. They can use this endowment for consumption, denoted by $c_i$, investment in private capital $k_i$, or investment in social capital $s_i$. Thus the individual budget constraint is $k_i + s_i + c_i \leq e$. Alternatively, the endowment $e$ can be seen as time, so the amount $e - k_i - s_i$ would be the leisure enjoyed by the individual. The investment in private capital can be thought as investment in economic projects, financial assets or entrepreneurial activities. The investment in social capital can be interpreted as investments in building norms and codes of proper behavior, reciprocal networks of trust, reputation, credit institutions or property rights. It is a form of capital because it is capable of generating a stream of future benefits (Chou, 2006).

Investments in private and social capital generate returns according to a function $f(k_i, S)$ where $S = \sum_{i \in N} s_i$. Note that according to our interpretation and the standard descriptions in the literature, we model social capital as a public good (Coleman, 1988; Glaeser et al., 2002). With some abuse of notation, let us denote by $f_k$ and $f_s$ the marginal return of individual investments in private and social capital respectively.

The returns function $f(k_i, S)$ satisfies a number of standard properties.

**Assumption 1** The returns function $f(k_i, S)$ is twice differentiable, strictly increasing, concave and satisfies $\lim_{k \to 0} f_k \to \infty$ and $\lim_{S \to 0} f_s > 1$.

**Assumption 2** The marginal return of private capital is non-decreasing in the level of social capital, i.e. $f_{ks} \geq 0$

Assumption 1 ensures an individual optimum investment profile exists and that agents invest a positive amount in private and social capital at that solution. Assumption 2 is in line with the definition of social capital: social capital enhances the productivity of other forms of capital, including private capital. This description fits mostly with the form of 'bridging' social capital (Putnam, 2000). Bridging social capital builds trust and networks, reduces the need for monitoring and enforcement activities, and smooths investment opportunities. The idea is that the returns on investments of this type are broad and accessible even to those who are not a member of the group. Assumption 2 does not rule out the case where the returns of social and private capital are separable, i.e. $f_{ks} = 0$. This would correspond to forms of social capital which are exclusionary and accessible only to members of a restricted group (e.g. family, kin). This is often labelled 'bonding' social capital; we will turn our attention to this case in Section 5.2.

We will assume that members of the group $N$ hold utility functions of the following form

$$\begin{aligned} u_i^A &= c_i + f(k_i, S) \\ &= e - k_i - s_i + f(k_i, s_i + S_{-i}), \end{aligned} \tag{1}$$

where the superscript $A$ denotes that this is the autarkic scenario and $S_{-i}$ denotes the sum of social capital investments of members of $N$ different from $i$. Each member chooses a pair $k_i$ and $s_i$ simultaneously in order to maximize (1) taking as given the investment in social capital made by the rest of the group $S_{-i}$. We will be interested in characterizing the Nash equilibrium of the game played by the members of the group. Since social capital is provided through members' voluntary contributions, free-riding will ensue.

Given our assumptions, best responses are uniquely defined and a Nash equilibrium exists. Throughout the paper we will focus on the symmetric equilibrium, which can be characterized by a pair $(k^A, S^A)$. The FOCs which characterize this equilibrium, assuming it is interior, yield the typical equalization of marginal returns across investments

$$1 = f_k(k^A, S^A) = f_s(k^A, S^A). \tag{2}$$

Note that the first best solution, denoted by $(k^{**}, S^{**})$, would require the standard equalization of marginal cost of investment in social capital and the sum of its individual marginal returns, so that

$$1 = f_k(k^{**}, S^{**}) = n f_s(k^{**}, S^{**}).$$

Social capital is thus under-provided under voluntary contribution compared to the first-best. Below we will show that the threat of conflict can actually help society to get closer to that first best level of social capital.

### 3.2 The threat

Let us now add to the previous setting the existence of an external agent that seeks to expropriate the group's income. We refer to this agent simply as the threat. For simplicity, we will assume that the intensity of the threat is given by an exogenous level $T$. Our focus is on the choice of agents within the threatened group and for that reason we do not model the threat and endogenise its choice of intensity. This is not a grossly excessive simplification when the external threat is an entity of fixed strength or if the entity moved first, as for instance, when the community is responding to a serious terrorist attack. Alternatively, the threat could be a commonly held perception which may or may not relate to reality. Alternatively, this set up would correspond to contexts where the threat is a non-strategic agent such as the anticipation of a natural disaster. Nevertheless, we endogenise the intensity of the threat in Section 5.3 and show there that our main results hold true.

Our critical assumption at this point is that the fraction of the returns from investment that members of the community can shield from the threat is a function of its level of social capital. The evidence presented in Section 2 suggests that social capital enhances the chances of a community in prevailing against competing out-groups: Social capital facilitates the emergence of neighborhood watches and self-defence groups, and increases combat power in the battlefield.

We thus assume that investments in social capital $S$ and the intensity of the threat $T$ determine $p(T, S)$, the fraction of individual returns that members of the group can protect. This function has the following properties.

**Assumption 3** The protection function $p(T, S) \in [0, 1]$ is twice differentiable, weakly increasing and concave in $S$, weakly decreasing in $T$ and it satisfies $p(T, 0) = 0$ and $p(0, S) = 1$ for any $S$.

This assumption is natural. Protection decreases with the intensity of the threat and increases with the level of social capital in the community. All returns are protected when the threat is of zero intensity, that is, when it is absent. Assumption 3 is satisfied by several reasonable and commonly-used contest success functions[6].

Let us assume for the time being that all the returns of social and individual capital are subject to expropriation. In that case, the payoff for a member of the community is given by

$$u_i^C = e - k_i - s_i + p(T,S)f(k_i, s_i + S_{-i}), \tag{3}$$

where the superscript $C$ denotes the conflict scenario. Again, members maximize (3) taking as given $S_{-i}$. The optimal interior solution to their problem is given by the FOC

$$1 = p(T,S^C)f_k(k^C,S^C) = p_s(T,S^C)f(k^C,S^C) + p(T,S^C)f_s(k^C,S^C). \tag{4}$$

Compared to the autarchy, the marginal return of private capital is reduced by the fraction expropriated by the threat. However, the return of social capital is now augmented by its protective effect. Although the threat captures a fraction $1 - p(T,S)$ of the returns of social capital, the protection it offers can potentially lead to a higher equilibrium level. The enhanced productivity of social capital can also incentivise investments in private capital despite its returns now being insecure. That is, although $f_k(k^C,S^C) \geq f_k(k^A,S^A)$, it still might be that $S^C > S^A$ because $f_{ks} \geq 0$ by Assumption 2.

Observe that we are superimposing a new collective action problem on top of the problem of voluntary provision of social capital. Protection is also a public good; it is equally enjoyed by all members of the community. So the equilibrium level of protection attained under individual contributions $p(T,S)$ would still be lower than the level of security resulting from a cooperative choice of $S$.

Note that we have assumed that social capital is the only tool a community has to protect itself. In Section 5.4, we extend the analysis and consider the case where the community has access to other protective investments such as arms or professional armies.

[6] As for instance, the Tullock ratio function (Tullock, 1967)

$$p(T,S) = \frac{S}{S+T}.$$

# 4 Equilibrium

In this section, we characterize more precisely the conditions under which the presence of a hostile out-group can lead to higher or lower levels of social capital and welfare compared to autarky.

Let us consider the case when the returns from both private and social capital are subject to expropriation by the threat as in (4) and social capital contributes to increase the returns of private investments, i.e. $f_{ks} > 0$. In order to generate predictions, we will assume some convenient functional forms. In particular, we will assume that the returns function follows a Cobb-Douglas specification

$$f(k_i, S) = k_i^{\alpha} S^{\beta}. \tag{5}$$

The parameters $\alpha, \beta > 0$ measure the return elasticity of private and social capital respectively.

The technology of protection takes the following functional form, inspired by the ones considered in Grossman and Kim (1996) and Robinson (2001):

$$p(T, S) = \begin{cases} \left(\frac{S}{T}\right)^{\sigma} & \text{if } T > S \\ 1 & \text{otherwise} \end{cases} \tag{6}$$

This function has a constant elasticity $\sigma \geq 0$. Security can be full when the community is cohesive enough relative to the intensity of the threat.[7] The group is completely unprotected, i.e. $p(T, S) = 0$, only when the threat is infinitely large. We assume $\alpha + \beta + \sigma < 1$ in order to ensure that Assumptions 1-3 are satisfied and that an interior equilibrium exists.

**Autarky** The interior symmetric solution to the problem of a representative member of the community is given by the FOCs

$$\frac{\partial u_i^A}{\partial k_i} = -1 + \alpha k_i^{\alpha-1} S^{\beta} = 0; \tag{7}$$

$$\frac{\partial u_i^A}{\partial s_i} = -1 + \beta k_i^{\alpha} S^{\beta-1} = 0. \tag{8}$$

The interior equilibrium level of social capital under autarky is then

$$S^A = \left[\alpha^{\alpha} \beta^{1-\alpha}\right]^{\frac{1}{1-\alpha-\beta}}. \tag{9}$$

[7] The Tullock functional form described in footnote 6 does not satisfy this property.

For the time being, we will assume that the values of the parameters are such that individuals are unconstrained, i.e. $e \geq k^A + \frac{1}{n}S^A$. In Section 5.1, we consider the case where the economy is constrained.

Let us at this stage introduce the ratio between equilibrium social and private capital. This ratio measures the relative intensity of the two forms of capital. In the autarky case, this ratio in equilibrium is given simply by the ratio of the return elasticities

$$r^A = \frac{\beta}{\alpha}. \tag{10}$$

It will be important in what follows to compute the equilibrium payoff of individuals in the community. Simple calculations show this is equal to

$$u^{*A} = e + S^A[\frac{1-\alpha}{\beta} - \frac{1}{n}].$$

**Threat** Consider now the situation where the community faces a rival who is threatening to destroy or expropriate its output. Individual members now maximize (3) where the return function is as (5) and $p(T, S)$ is of the form in (6). From this it is immediate to see that if the threat is not very intense, the problem faced by the group is the same as under autarky. The equilibrium level of social capital $S^A$ can guarantee full security, i.e. $p(T, S^A) = 1$. In other words, define as $T_o$ the intensity of the threat such that $T_o = S^A$; for any $T \leq T_o$ the solution in the threat case must be identical to the one under autarky.

When the threat is of moderate intensity, given that social capital has a protective effect, it may be individually beneficial for members to invest in social capital beyond the autarkic level. In that case, full security can persist if the group can coordinate in an equilibrium where the level of social capital is such that $T \leq S$. For that to be individually optimal, the marginal product of social capital must be above its marginal cost when $S = T$, that is,

$$\left.\frac{\partial u_i^C}{\partial s_i}\right|_{S=T} = -1 + (\beta + \sigma)k_i^\alpha T^{\beta-1} > 0.$$

This together with the first order condition

$$\left.\frac{\partial u_i^C}{\partial k_i}\right|_{S=T} = -1 + \alpha k_i^{\alpha-1} T^\beta = 0,$$

defines a new intensity threshold

$$T_1 \equiv \left[\alpha^{\alpha}(\beta+\sigma)^{1-\alpha}\right]^{\frac{1}{1-\alpha-\beta}},$$

such that $S^C = T$ is an equilibrium whenever $T \in [T_o, T_1]$.

This equilibrium breaks down when the intensity of the threat is sufficiently strong. Then it becomes too individually costly to protect the group fully, and members divert their choices from investment to consumption. In other words, when $T > T_1$, the interior symmetric solution is given by the equations

$$\begin{aligned} \frac{\partial u_i^C}{\partial k_i} &= -1 + \alpha k_i^{\alpha-1}\frac{S^{\beta+\sigma}}{T^{\sigma}} = 0; \\ \frac{\partial u_i^C}{\partial s_i} &= -1 + (\beta+\sigma)k_i^{\alpha}\frac{S^{\beta+\sigma-1}}{T^{\sigma}} = 0, \end{aligned}$$

leading to the equilibrium level of social capital

$$S^C = \left[\frac{\alpha^{\alpha}(\beta+\sigma)^{1-\alpha}}{T^{\sigma}}\right]^{\frac{1}{1-\alpha-\beta-\sigma}}. \tag{11}$$

As expected, the equilibrium level of social capital in this region is decreasing in $T$. The level of social capital in (11) converges to zero as the threat becomes arbitrarily intense. Hence, there exists another threshold $T_2 > T_1$ such that $S^C = S^A$ when $T = T_2$. Beyond that threshold, the threat is so intense that investment in social capital falls below its autarkic level.

We are now in the position to state our first result, which derives directly from the discussion above.

**Proposition 1** *When social capital augments private capital and individual endowments $e$ are sufficiently large*

*a) If $T \leq T_o$, the level of social capital under conflict is the same as under autarky and there is full security.*

*b) If $T \in (T_o, T_1]$, social capital under conflict is higher than under autarky and there is full security.*

*c) If $T \in (T_1, T_2]$, security is partial but social capital under conflict is still higher than under autarky.*

*d) If $T > T_2$, the level of social capital under conflict is lower than under autarky and security is partial.*

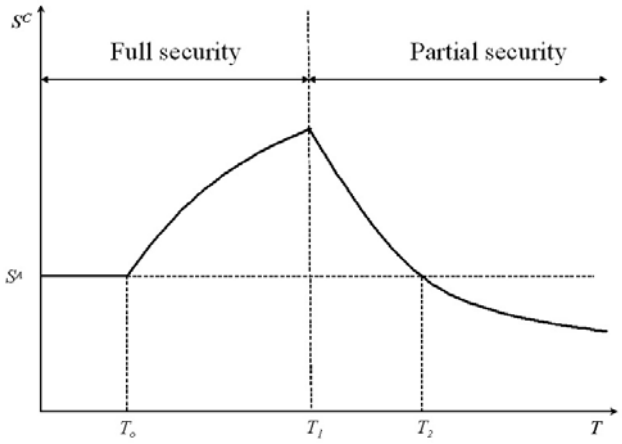


Figure 1: Equilibrium level of social capital

Figure 1 illustrates this result. For low level threats, the community operates as under autarky. The emergence of a more intense threat leads to higher investments in social capital because of its cohesive effects. Social capital increases protection, leading to higher investments in private capital as well. This enhancing effect persists even when the threat is strong, although in that case the community is not fully protected. When the threat is very intense, however, the threat of expropriation leads to a decapitalisation of the community.

$$r^C = \begin{cases} \frac{\beta}{\alpha} & \text{if } T \leq T_o \\ (\frac{T^{1-\alpha-\beta}}{\alpha})^{\frac{1}{1-\alpha}} & \text{if } T \in (T_o, T_1) \\ \frac{\beta+\sigma}{\alpha} & \text{if } T \geq T_1 \end{cases} .$$

A comparison with (10) shows that the economy under threat is always more social-capital intensive than under autarky.

**Welfare** Proposition 1 shows that the threat helps to solve the collective action problem present in autarky. Members of the group have an additional incentive to invest in social capital in order to increase the protection of the returns of their investments. The new level of social capital is thus closer to

the first best under autarky, $S^{**}$. It actually can surpass that level.[8]. When the threat is moderate, i.e. $T \in (T_o, T_1)$, this increase in social capital also enhances the marginal return of private capital, making individuals invest more in both forms of capital than under autarky. This implies that the threat can have a potential welfare enhancing effect, as the following Proposition states

**Proposition 2** *There exists a threshold $\widehat{T} \in (T_1, T_2)$ such that for any intensity of the threat $T \in (T_o, \widehat{T})$, welfare under conflict is higher than under autarky, i.e. $u^{*C} > u^{*A}$.*

**Proof.** Simple calculations show that the equilibrium payoff for a member of the group in this case is

$$u^{*C} = \begin{cases} u^{*A} & \text{if } T \leq T_o \\ e + (1-\alpha)\left(\alpha^{\alpha} T^{\beta}\right)^{\frac{1}{1-\alpha}} - \frac{T}{n} & \text{if } T \in (T_o, T_1) \\ e + S^C[\frac{1-\alpha}{\beta+\sigma} - \frac{1}{n}] & \text{if } T \geq T_1 \end{cases}.$$

Because the solution is unconstrained when $T \leq T_o$ and $T \geq T_1$, we can apply the envelope theorem directly, so the effect of $T$ on $u^{*C}$ is just the direct effect. In the first case, $u^{*C}$ does not depend on $T$. In the second, $u^{*C}$ is strictly decreasing in $T$ via $p(S^*, T)$. When $T \in (T_o, T_1)$, recall that $p(S^*, T) = 1$ because $S^C = T$. Using the chain rule

$$\frac{\partial u_i^{*C}}{\partial T} = \frac{\partial u_i^C}{\partial S^C} \frac{\partial S^C}{\partial T} > 0,$$

where the inequality follows from $\frac{\partial S^C}{\partial T} = 1$ and that when $T \in (T_o, T_1)$

$$\begin{aligned} \frac{\partial u_i^C}{\partial S} &= -1 + p(T,T) f_s(k_i^*, T) + p_s(T,T) f(k_i^*, T) \\ &= -1 + \frac{(\beta+\sigma)}{T} f(k_i^*, T) > 0. \end{aligned}$$

Therefore, equilibrium welfare is increasing in the interval $(T_o, T_1)$.

Given that $u^{*C}$ is strictly decreasing in $T$ when $T \geq T_1$, and converges to zero when $T$ becomes arbitrarily large (because $S^C$ converges to zero), there must exist a level of the threshold $\widehat{T}$ such that $u^{*C} = u^{*A}$. This threshold $\widehat{T}$ must be strictly smaller than $T_2$ because at that level $S^C = S^A$ so $u^{*C} = e + S^A[\frac{1-\alpha}{\beta+\sigma} - \frac{1}{n}] < e + S^A[\frac{1-\alpha}{\beta} - \frac{1}{n}] = u^{*A}$. ■

[8] When the size of the group is sufficiently small so that $n < (\frac{\beta+\sigma}{\beta})^{1-\alpha}$, there exists a range of threat intensities within the interval $(T_o, T_1)$ such that $S^{**} < S^C$.

When the threat is of low intensity, it introduces no distortion in the economy. But when it is moderate, the threat induces members of the community to enhance its cohesion by investing in social capital. This partially solves the collective action problem that leads to underinvestment in social capital under autarky. This welfare enhancing effect can survive even for threat intensities so high that the community cannot protect itself fully, i.e. $T \in (T_1, \widehat{T})$. When the intensity of the threat is too severe, though, members divert their investments into consumption, leading to lower levels of welfare.

**Relation with the conflict literature** The economics of conflict literature has extensively dealt with conflictual group interactions.[9] However, most of this literature takes a macro perspective in that it tends to assume a group as a single organic entity. This assumption leads to one of the main tenets of this literature, namely that conflict is fundamentally costly, even when it does not actually occur, because it destroys resources, disrupts economic activities and has a negative effect on future investment (Collier, 1999). Such costs remain even in a world of no open conflict because investments in arms as a credible deterrence are costly as they divert resources from productive activities. The unitary group assumption ignores the potential countervailing force that conflict brings, that is, that inter-group conflict groups may help to resolve intra-group social dilemmas and provide cooperative welfare gains.

A few papers explore this possibility. Sanchez-Pages (2006) argues that if there is a tragedy of the commons that cannot be resolved formally or informally, violence may be efficiency enhancing if it provides exclusive rights to the victor. Münster and Staal (2011) argue that conflict against an external group may be welfare-improving if it uses up resources on external fighting that would otherwise have been used on internal fighting. Hugh-Jones and Zaltan (2012) show how an external threat can induce in-group cooperation to establish a reputation under a weakest-link structure. While we also focus on the possibility of conflict resolving a collective action problem, the focus of our paper is on social capital and the form that it may take.

A strand of the economics of conflict literature has centred upon the security of property rights. Grossman and Kim (1995, 1996) developed a predator/prey model where the prey moves first and invests in capital and arms in order to protect its property before the predator makes a decision whether it is profitable to attack given the prey's prior investment in arms. Our model is inspired by

[9] See Garfinkel and Skaperdas (2007) for an excellent review.

this approach and could also be framed as a dynamic model where present investments have future returns subject to the risk of expropriation.

# 5 Extensions

## 5.1 Constrained Economies

So far we have assumed that members of the community were wealthy enough to be unconstrained in their choices. In this Section, we will consider the case of poorer economies were individuals are constrained in equilibrium. We will show that the enhancing effect of conflict on social capital is stronger in these societies, but at the expense of lower investments in private capital. Consequently, the welfare effect is more ambiguous.

First, let us define the equilibrium investment under autarky:

$$e^A \equiv k^A + \frac{1}{n}S^A = S^A[\frac{\alpha}{\beta} + \frac{1}{n}].$$

Similarly, the maximum equilibrium investment under the threat is given by

$$e^C \equiv k^C(T_1) + \frac{1}{n}S^C(T_1),$$

because investments in both forms of capital attain a maximum at $T = T_1$.

If $e < e^C$ the economy is constrained for a certain range of threat intensities. If the threat is not too intense, or if it is very strong, the interior strategy profile characterized above is still an equilibrium. Otherwise, the economy is constrained. But it is easy to see that the results in Proposition 1 would still hold qualitatively. The only difference is that the level of social and private capital remain constant, and above the autarkic levels, in the range of threat intensities for which the economy is constrained.

Things are different when $e < e^A$. In that case, the economy is already constrained under autarky. We will say that the community is *severely* constrained in this case. In autarky, the equalization of marginal products yield the equilibrium level of social capital

$$\overline{S}^A = \frac{\beta}{\beta + n\alpha}ne.$$

By the same token as in the previous Section, if the intensity of the threat is

sufficiently low, that is, if $T \leq \overline{T}_o \equiv \overline{S}^A$, this level is also the equilibrium level of social capital under conflict. If the threat becomes more intense, though, it is again the case that the group coordinates in an equilibrium with full security and enhanced investments in social capital. For higher intensities, full security is no longer an equilibrium and protection is only partial. In this case, the equilibrium level of social capital is

$$\overline{S}^C = \frac{\sigma + \beta}{\sigma + \beta + n\alpha} ne.$$

Note that this equilibrium level of social capital is independent of the intensity of the threat and strictly greater than $\overline{S}^A$. Hence, when the intensity of the threat is high, that is, when $T > \overline{S}^C$ social capital is higher under the threat than in autarky. Observe that because $\overline{S}^C$ does not depend on $T$, social cohesion is maintained at the expense of investments in private capital. The following proposition summarizes all these results.

**Proposition 3** *In severely constrained economies, i.e. when* $e < e^A$:

*a) If* $T \leq \overline{S}^A$, *the levels of social and private capital under conflict are the same as under autarky and there is full security.*

*b) If* $T > \overline{S}^A$, *social (private) capital under conflict is higher (lower) than under autarky and there is full security.*

*c) If* $T \geq \overline{S}^C$, *the levels of social and private capital are as in b) but security is partial.*

**Proof.** The only statement not following immediately from the discussion above is that the equilibrium level of private capital under the threat is lower than under autarky when $T \in (\overline{S}^A, \overline{S}^C)$. To see this just note that the equilibrium level of social capital is $T$ in that region. Hence, the equilibrium level of private capital is $e - \frac{1}{n}T$. Comparing that with $\overline{k}^A$ shows

$$e - \frac{1}{n}T < \overline{k}^A \Leftrightarrow T > \frac{\beta}{\beta + n\alpha} ne = \overline{S}^A.$$

■

Being constrained, members of the community invest more in the form of capital which yields higher returns. This is social capital because when the

threat emerges, social capital becomes more productive due to its protective effect. But since the economy is constrained, the autarky level of social capital protects the community fully for a smaller range of threat intensities compared to the unconstrained case. This can be seen by noting that $\overline{S}^A < T_o$. Noting also that $\overline{S}^C < T_1$ leads to the following corollary

**Corollary** *The range of threat intensities for which social capital is higher under conflict than under peace is larger for constrained economies than for unconstrained economies. In addition, constrained economies attain full security for a smaller range of threat intensities.*

Poor societies under threat become both more intensive in social capital and less secure than wealthy societies under a threat of the same intensity. Wealthy societies have the capability of resisting threats of higher intensities due to their larger resources. Poor societies respond to threats of expropriation by increasing their level of social capital, which helps them to increase their cohesion. But to do so they must reduce their levels of investment in private capital. As the threat becomes more intense, these societies become even more social capital intensive. Still, their smaller resources lead to lower security resulting in poor economies being subject to effective expropriation for a wider range of threats.

## 5.2 Separable social capital

There are a number of returns from social capital which cannot be easily expropriated. Take group identity for instance. Identity is a source of social capital because it provides a dense set of networks for which only membership of the group have access (Wintrobe, 1995). Because of this, social capital in the form of group identity may be less expropriable. Non-expropriable social capital can also be the result of socialization with family or friends and have a consumption value. It can also be a form of symbolic capital (Bourdieu, 1984) created through identity-building activities or conflict itself. To capture these instances of social capital as 'bonding', let us now separate the returns from social capital from their interaction with other forms of capital. As a result, these returns cannot be fully expropriated. This offers a new channel through which the threat of conflict can create social capital: insecurity induces individuals to divert their investments from expropriable to non-expropriable forms of capital.

To model this possibility, we opt for parsimony and extend the model by assuming that social capital can have consumption-like returns. In real life,

most forms of social capital are likely to have both investment and consumption/bonding qualities.[10] So let us assume that returns from investment are given by the function $f(k_i, S) + \gamma S$. The parameter $\gamma > 0$ measures the return of the non-expropriable facets of social capital. In case of autarky, the optimal interior investments in private and social capital satisfy

$$1 - \gamma = f_k(k^A, S^A) = f_s(k^A, S^A), \tag{12}$$

which, given Assumption 1, implies that investments in both types of capital are higher compared to the case when social capital was non-separable. This is to be expected. Social capital has now an additional source of returns which leads to higher investments and to a higher marginal return of private capital.

In case of conflict, the payoff of a community member now becomes

$$u_i^C = e - k_i - s_i + p(T, S) f(k_i, s_i + s_{-i}) + \gamma S.$$

Note that we are not assuming here that all the returns of social capital are non-expropriable, only part of them.

Assuming that the economy is unconstrained, it is straightforward to show that for $\gamma < 1$ the results in Section 3 still hold qualitatively. Let us focus instead in the case where $\gamma \geq 1$. In that scenario, the marginal return of social capital is always greater than its marginal cost so in equilibrium individuals invest their entire endowment in both forms of capital. Hence, $S^C = n(e - k^C)$, where $k^C$ is such that

$$\frac{\gamma + p_s(T, n(e-k^C)) f(k^C, n(e-k^C))}{p(T, n(e-k^C))} = f_k(k^C, n(e-k^C)) - f_s(k^C, n(e-k^C)). \tag{13}$$

Similarly to the constrained case, the marginal return of private and social capital must be equal at the optimal solution. The comparison of expressions (12) and (13) yields the following result.

**Proposition 4** *When the non-expropriable returns of social capital are high enough, i.e. $\gamma \geq 1$, the equilibrium level of social (private) capital under the threat is higher (lower) than under autarky. Moreover, if the returns*

[10] Bridging and bonding social capital are ultimately psychological concepts based on collective identity. The former is presented as a production rather than a utility function, because the key benefit deriving from it is instrumental. It provides a vehicle through which productive private capital can be utilised effectively. Bonding social capital, on the other hand, is depicted as a direct psychological consumption benefit without productive properties.

*function is as in (5) and the technology of protection is (6), the equilibrium level of social capital is strictly increasing in the intensity of the threat.*

**Proof.** When $\gamma > 1$, optimal investment choices must equate marginal returns so that under autarky

$$\begin{aligned} f_s(k^A, S^A) + \gamma &= f_k(k^A, S^A) \Leftrightarrow \\ \gamma &= f_k(k^A, n(e-k^A)) - f_s(k^A, n(e-k^A)). \end{aligned}$$

On the other hand, when the threat is strong enough, rearranging (13) show that optimal investment choices under conflict must satisfy

$$\begin{aligned} \gamma &= p(T, n(e-k^C))[f_k(k^C, n(e-k^C)) - f_s(k^C, n(e-k^C))] \\ &\quad -p_s(T, n(e-k^C))f(k^C, n(e-k^C)). \end{aligned}$$

Therefore we can establish that in this case

$$\begin{aligned} \gamma &< p(T, n(e-k^C))[f_k(k^C, n(e-k^C)) - f_s(k^C, n(e-k^C))] \\ &< f_k(k^C, n(e-k^C)) - f_s(k^C, n(e-k^C)). \end{aligned}$$

The second inequality holds from the fact that for (14) to hold $f_k(k^C, n(e-k^C)) > f_s(k^C, n(e-k^C))$. Note now that by Assumption 1 and 2, the difference $f_k(k, n(e-k)) - f_s(k, n(e-k))$ is strictly decreasing in $k$. Hence, it must be that $k^C < k^A$ because

$$f_k(k^A, n(e-k^A))) - f_s(k^A, n(e-k^A)) = \gamma < f_k(k^C, n(e-k^C)) - f_s(k^C, n(e-k^C)).$$

Given that individuals invest their entire endowment in the two scenarios, it must then also be that $S^C > S^A$. When the threat is not strong enough, i.e. $T \leq S^A$, the two scenarios coincide so $S^C = S^A$.

Finally, let us show that the equilibrium level of social capital is increasing in the intensity of the threat $T$. Define

$$\begin{aligned} H(T, S^C) &= p(T, S^C))[f_k(e - \frac{S^C}{n}, S^C) - f_s(e - \frac{S^C}{n}, S^C)] \\ &\quad -p_s(T, S^C)f(e - \frac{S^C}{n}, S^C) - \gamma = 0. \end{aligned}$$

By the implicit function theorem,

$$\frac{\partial S^C}{\partial T} = -\frac{\frac{\partial H(T,S^C)}{\partial T}}{\frac{\partial H(T,S^C)}{\partial S^C}}.$$

For the numerator, taking the functional form (5),

$$\begin{aligned}\frac{\partial H(T,S^C)}{\partial T} &= -\sigma\frac{(S^C)^{\alpha+\beta-1}}{T^{1+\sigma}(e-\frac{S^C}{n})^{1-\alpha}}(\alpha S-(\sigma+\beta)(e-\frac{S^C}{n}))\\ &= -\sigma\frac{\gamma}{T}<0,\end{aligned}$$

where the second equality comes from rewriting (13) using the functional forms (5) and (6). On the other hand, tedious calculations yield

$$\begin{aligned}\frac{\partial H(T,S^C)}{\partial S^C} &= \frac{(e-\frac{S^C}{n})^{1-\alpha}}{T^\sigma S^{\alpha+\beta-1}}\left[(S^C(\alpha+\frac{\beta+\sigma}{n})-(\beta+\sigma)e)(\frac{1-\alpha}{ne-S^C}-\frac{1-\alpha-\beta}{S^C})+\alpha+\frac{\beta+\sigma}{n}\right].\\ &= \gamma\left[\frac{1-\alpha}{e-S^C}-\frac{1-\alpha-\beta}{S^C}+\frac{\alpha+\frac{\beta+\sigma}{n}}{S^C(\alpha+\frac{\beta+\sigma}{n})-(\beta+\sigma)e}\right]\\ &> \gamma\left[\frac{1-\alpha}{e-S^C}-\frac{1-\alpha-\beta}{S^C}+\frac{1}{S^C}\right]=\gamma\left[\frac{1-\alpha}{e-S^C}+\frac{\alpha+\beta}{S^C}\right]>0,\end{aligned}$$

where the second equality again comes from (13). Therefore, $\frac{\partial S^C}{\partial T} > 0$ so the equilibrium level of social capital is increasing in the intensity of the threat $T$. ■

This Proposition shows that when the bonding part of social capital is sufficiently strong, the emergence of a threat leads to a diversion of investments from private to social capital. As a result, the economy becomes more social capital intensive. Society is making additional investments in a narrower, socially cohesive form of social capital such as group identity, which is harder to expropriate. This, to some extent, can explain the adoption of a culture that appears to be closed and lacking in bridges: It can be a response to the presence of hostile out-groups.

When social capital is not fully expropriable, the effect of the threat on welfare is more ambiguous. On the one hand, the threat is pushing individuals to invest in a form of capital which was underprovided under peace due to a collective action problem. On the other hand, the non-expropriable side of social capital might not be productive enough to compensate the reduction in private

capital and the insecurity that the threat provokes.

The threat can thus bring high levels of social capital *and* lower levels of welfare. Unfortunately, it is not possible to obtain sharper results beyond particular examples.

**Example** Consider the case where $\beta = 0$ so social capital does not augment private capital. The equilibrium level of social capital under autarky is

$$S^A = n(e - (\frac{\alpha}{\gamma})^{\frac{1}{1-\alpha}}).$$

If the intensity of the threat is below this threshold, the threat introduces no distortion in the economy. Suppose that the threat is above this threshold and let us assume that social capital has no protective facet, i.e. $\sigma = 0$. In this case, the equilibrium level of social capital is

$$S^C = n(e - (\frac{\alpha}{\gamma T})^{\frac{1}{1-\alpha}}),$$

which is increasing in the intensity of the threat $T$ as shown in Proposition 4. A simple comparison shows that $S^C > S^A$ for $T > 1$. Equilibrium payoffs are

$$u^{*c} = \begin{cases} u^{*A} & \text{if } T \leq 1 \\ ne\gamma + (1 - n\alpha)(\frac{\alpha}{\gamma})^{\frac{\alpha}{1-\alpha}}(\frac{1}{T})^{\frac{1}{1-\alpha}} & \text{otherwise} \end{cases}.$$

This payoff is increasing in $T$ if and only if $n > \frac{1}{\alpha}$. In that case, the non-separable returns of social capital can compensate the reduction in private capital and the insecurity that the threat brings. The returns of social capital increase with the size of the group. If the group is big enough then the diversion of investments from private to social capital generates substantial enough returns. When $n < \frac{1}{\alpha}$, the returns of social capital are relatively small so the diversion of investments cannot compensate the loss in private returns and the emergence of the threat is harmful for the group. This case is probably the most realistic since bonding social capital is more viable in relatively small communities. Hence, we should expect the threat to have a negative welfare effect when social capital has important non-expropriable, i.e. bonding, returns.

### 5.3 Endogenous threat

So far we have taken the threat as exogenous. But if one were to analyse the case of two strategic agents engaged in a situation of mutual rivalry, the intensity of the threat should be endogenous. This is what we explore next. We show that the main results presented above still go through.

Let us assume that the threat is a unitary agent whose objective is to appropriate the output produced by the community by making costly offensive efforts. That is, the threat chooses a level of intensity $T$ in order to maximize

$$u_T = (1 - p(T, S)) \sum_{i=1}^{n} f(k_i, S) - T.$$

Assuming that $p(T, S)$ takes the form in (6) and denoting $F(k, S) = \sum_{i=1}^{n} f(k_i, S)$, the best response of the threat to the choices of private and social capital of the community is

$$T^* = \begin{cases} 0 & \text{if } \sigma F(k, S) \leq S \\ [\sigma S^{\sigma} F(k, S)]^{\frac{1}{1+\sigma}} & \text{otherwise} \end{cases},$$

The intensity of the threat depends critically on the level of social capital in the community. On the one hand, social capital makes the community more attractive to attack since the output that the threat can expropriate is larger. At the same time, a large stock of social capital implies that the community can protect itself better and is less attractive to the threat. It is immediate to see that there can be no equilibrium in which the threat is of positive intensity and the community attains full security; the threat would be better off by making no offensive investments in that case. So two equilibria in pure strategies can arise: In the first one, the autarkic level of social capital is high enough to fully deter the threat. In the second equilibrium, the threat is of positive intensity and the community only attains partial security. The level of social capital can be above or below the autarkic level depending on the parameter constellations.

**Proposition 5** *Assume that the community and the threat choose their investments simultaneously. Then,*

*i) When $\beta \geq n\sigma$, the community chooses the autarkic level of social capital $S^A$ and fully deters the threat in equilibrium.*

*ii) When $\beta \leq (n-1)\sigma$, the threat is of positive intensity in equilibrium. In*

*addition, there exists a threshold* $\widetilde{\beta}$ *such that the level of social capital is above* $S^A$ *if and only if* $\beta > \widetilde{\beta}$.

**Proof.** For the first profile to constitute an equilibrium we need $\sigma F(k^A, S^A) \leq S^A$, which boils down to

$$\sigma n \left[\alpha^\alpha \beta^\beta\right]^{\frac{1}{1-\alpha-\beta}} \leq \left[\alpha^\alpha \beta^{1-\alpha}\right]^{\frac{1}{1-\alpha-\beta}} \Rightarrow \beta \geq n\sigma.$$

For the second profile, let us write down the best response of the threat to the level of social capital $S^C$, that is, the intensity $T$ solving

$$T = \left[\sigma (S^C)^\sigma F(k^C, S^C)\right]^{\frac{1}{1+\sigma}},$$

which after some tedious algebra yields

$$T^* = \left[(n\sigma)^{1-\alpha-\beta-\sigma} \alpha^\alpha (\beta+\sigma)^{\beta+\sigma}\right]^{\frac{1}{1-\alpha-\beta}}.$$

It remains to check that the level of social capital which emerges as the sum of individual best responses to $T^*$ indeed satisfies $\sigma F(k^C, S^C) > S^C$. Additional calculations show that this is the case when

$$\beta \leq \sigma(n-1).$$

Finally, the level of social capital in the second equilibrium is

$$S^{C*} = \left(\frac{\alpha^\alpha (\beta+\sigma)^{1-\alpha+\sigma}}{(n\sigma)^\sigma}\right)^{\frac{1}{1-\alpha-\beta}},$$

which is above the level under autarky $S^A$ if and only if

$$(n\sigma)^\sigma \leq (\beta+\sigma)^\sigma \left(\frac{\beta+\sigma}{\beta}\right)^{1-\alpha}.$$

The right hand of the expression is increasing in $\beta$. It is easy to check that the inequality holds strictly for $\beta = (n-1)\sigma$. Hence, there must exist a threshold $\widetilde{\beta} < (n-1)\sigma$ for which the expression holds with equality. Below that threshold, the equilibrium level of social capital is below $S^A$. ■

When social capital augments private capital considerably, i.e. $\beta > n\sigma$, the community invests enough in social capital to fully deter the threat. This is

despite the high output that the community generates being potentially very attractive for the threat. This equilibrium is therefore identical to the autarkic scenario. When social capital is moderately productive, i.e. $\beta \in (\widetilde{\beta}, (n-1)\sigma)$, the community does not invest enough to deter the threat, but it is still spurred to invest in social capital above the autarky level. In this parameter region, the threat can still have a positive effect on welfare. Finally, when social capital augments private capital only weakly, i.e. $\beta < \widetilde{\beta}$, the community makes low investments in social capital, the intensity of the threat is relatively high and property rights are insecure; welfare is hence lower than under autarky.[11]

## 5.4 Protective investments

In the analysis so far we have excluded investments with protective effects other than social capital. But communities can also respond to an external threat by investing in arms, militias, mercenaries or by building professional armies. This matters for two reasons. First, because these investments, unlike social capital, are not productive. Second, because when social capital is the only tool of a community to face a threat, this necessarily leads to larger investments in it as a response. We hence study whether our results are robust to a straightforward generalization of our baseline model incorporating the presence of arms investments.

Assume that members of the community can now use their endowment to invest in arms. Denote the individual investment in arms by $g_i$. The new individual budget constraint is $k_i + s_i + g_i + c_i \leq e$. The protection function is now

$$p(T,S,G) = \begin{cases} \frac{G^\rho S^\sigma}{T^\sigma} & \text{if } T > G^{\frac{\rho}{\sigma}} S \\ 1 & \text{otherwise} \end{cases}$$

where $G = \sum_{i \in N} g_i$ and $\rho \geq 0$ is the return of guns investments. Social capital now augments the marginal productivity of arms investments. Note that the case $\rho = 0$ corresponds to our baseline model.

The payoff function of an individual member now is

$$u_i^C = e - k_i - s_i - g_i + p(T,S,G) f(k_i, S).$$

Members choose investments in arms and in private and social capital taking

[11] Note that when $\beta \in ((n-1)\sigma, n\sigma)$ an equilibrium in pure strategies fails to exist and the equilibrium must be in mixed strategies. This is because the threat has an incentive to make positive offensive efforts and the community to attain full security.

as given the investments in social capital and arms made by the rest of members. We assume that $\alpha+\beta+\sigma+\rho<1$ in order to ensure the existence of an interior solution to this problem.

Under autarky, nothing changes with respect to the baseline model. There is no need to invest in arms so the level of social capital remains $S^A$. Things change when the threat is of positive intensity. Because protection requires arms investments. $S^A$ cannot be an equilibrium level of social capital any more. It is easy to show that there exists a threshold threat intensity $T'_o$ such that if $T \leq T'_o$, there is full security but the level of social capital under conflict is lower than under autarky.[12] This is because the community needs to invest in arms in order to protect itself and diverts its investments away from social capital.

More importantly, the presence of arms investments can cancel the welfare-enhancing effect of the external threat, as the following Proposition states.

**Proposition 6** *When the community can invest in arms and individual endowments e are sufficiently large, there exists a threshold* $\widetilde{\rho}>0$ *such that welfare under the threat is below welfare under autarky if* $\rho>\widetilde{\rho}$.

Unlike social capital, arms investments are not productive. They are costly in terms of foregone production and consumption possibilities. When investments in arms are sufficiently high, the welfare enhancing effect of the external threat disappears because the community diverts too many resources away from productive uses in order to protect itself. Such a result would be more likely to hold in conflict scenarios where group solidarity is relatively less important than the stock of arms in the protection of the community.

# 6 Concluding Comments

This paper has contributed to the literature which suggests that the relationship between conflict and social capital is complex. Hostile inter-group interactions can help to resolve intra-group social dilemmas and increase welfare. In the present paper, we have weighed these internal welfare gains against the welfare losses of hostile relations with an out-group. We found that conflict can induce higher levels of social capital investment either because the protective aspect of social capital comes into play and/or due to the reallocation of investments from private to social capital. Given that social capital is potentially subject

[12] The proof of this result is available from the authors upon request.

to free-riding, the threat, by promoting a greater level of social capital, can be welfare improving. As the threat becomes severe, social capital is more likely to fall. Social capital may keep increasing as the threat becomes more intense if its returns are not fully expropriable. But if social capital is not productive enough, the threat may in this case induce lower welfare. Finally, we have also shown that the enhancing effect of external conflict on social capital is weaker in constrained economies. These poorer societies may end up being social capital intensive but insecure as a result of the presence of an external threat.

These results can shed light on the sometimes contradicting evidence on the relationship between conflict and social capital. Kickstarted by Bellows and Miguel (2009), a strand of the literature has found a positive relationship between violence and pro-social behavior in a number of developing countries. More recently, a number of papers have contradicted or qualified these results, suggesting that conflict decreases interethnic cooperation (Rohner et al., 2013) and social capital, at least in the short run (De Luca and Verpoorten, 2015). While prolonged war generally strengthens self-consciousness and the self-image of a community, "it may often weaken the cohesion of multinational or sharply stratified societies" (Smith, 1981, p. 390). A crucial distinction in this regard is between internal and external conflict. Deng (2010) finds that social capital increased in areas of South Sudan where violence was externally inflicted but decreased where violence was endogenous. When counter-insurgency warfare took place within villages, social tensions emerged, household composition became more nuclear and members resorted more often to courts rather than to private negotiation in order to solve disputes.

Our paper draws attention to the role of conflict in inducing social cohesion and higher social welfare. Of course, the first best outcome would be that the underprovision of social capital could be resolved without the stimulus of potential conflict. But in the absence of a peaceful mechanism to solve the collective action problem, the potential for conflict acts as an alternative mechanism. Because of this, we think that our paper is also relevant to the portrayal of threats in real-world politics. In recent times, in debates surrounding the 'War on Terror' and the Iraq war, there was much discussion about the role of war and the sense of threat in promoting civic values in the US and other Western countries. This was a position associated with neoconservatism. There was a suggestion that even if the threat was not serious, it was a Platonic 'noble lie' to present it

as such, if this could indeed promote civic values and national moral purpose.[13] For instance, Hauk and Mueller (2015) show that cultural leaders may have an incentive to supply cultural differences in a 'clash of civilizations' scenario.

It is important to highlight one important modelling choice we made in our analysis: We opted for parsimony and chose to model both bonding and bridging social capital as just one type of investment. As a result, we cannot properly investigate the effect of the threat on the substitution between bridging and bonding social capital. This is an important question for two reasons. First, because bonding social capital is likely to be less productive than bridging social capital; the former can promote distrust, patronage, intolerance, and hate. Second, because a society may deliberately adopt inferior 'bonding' technologies in order to become unattractive to hostile out-groups and consequently stagnate (Gonzalez, 2005). Had we modelled these two types of social capital separately, bonding and bridging, the welfare implications of the threat would be less ambiguous. Future research could study when external threats induce societies to adopt exclusion and discrimination and the welfare effects of such a decision.

Our model suggests that the effect of conflict on social capital depends, among other factors, on the intensity of the threat, the wealth of the community, and the degree by which social capital augments the productivity of private capital. It would be very interesting to see future empirical studies incorporating all these considerations in their analyses.

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[13] It is, of course, highly questionable whether the Iraq War actually did promote moral purpose in Western countries. Skocpol (2002) argues that for conflict to bolster American civic democracy, there needs to be a greater level of involvement in civic organisation than is present in the modern U.S. In this sense, conflict can only trigger an increase in social capital if there is a sufficient base of existing social capital.

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