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Making Friends to Influence Others: Entry and Contribution Decisions that Affect Social Capital in an Association

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ABSTRACT. We examine factors affecting entry and contribution to an association that provides different goods using social capital formed by heterogeneous firms in a political economy environment. We model and solve a game that explains investments to form social capital within associations and determine the effect on the intensive and extensive marginal contributions to the association related to the government's susceptibility to influence. Association products such as capital goods for members or lobbying the government to influence regulation affect membership and contribution decisions. Government influenceability also affects the decision to contribute to social capital, but it varies with agent productivity and association output. Often, an increase in government influenceability increases social capital in associations composed of high productivity agents because they prefer to influence policy while low productivity agents focus on production.

Keywords: association, productivity, social capital

JEL: D71, D73

1. Introduction

In the U.S., over 90,000 trade and professional associations existed in 2009 (ASAE, 2014). Within these associations, members contribute time, expertise, financial support and other resources, which combine to form social capital. In turn, associations use social capital to produce goods beneficial for members and regulatory relief (Bennet 2000; Ogilvie 2004; Sukiassyan and Nugent 2011). Associations may provide information about market conditions (Kirby 1988; Stennek 1997; Fafchamps and Minten 2002; Bramoulle and Kranton 2007), offer assistance regarding new technologies or relieve other resource constraints for members (Bandiera and Rasul 2006; Matuschke and Qaim 2009; Bauernschuster et al. 2010; Fisher and Qiam 2012). Additionally, associations may work to influence government regulations to assist members (Helliwell and Putnam 1995; Grossman and Helpman 1994). A potential member's decision to join an association and their determination of how much to contribute to the association's social capital may depend directly on the mix of goods provided by the association.

Additionally, potential members are influenced by the current level of regulation when deciding to join an association. The ability of an association to influence the regulatory decisions of the government can affect a firm's membership and social capital contribution decisions (Sukiassyan and Nugent 2008; Pyle 2009; and Christoforou 2011). Much has been made of the effects of lobbying on regulations in general. For example, Fredriksson (1997) provides a theoretical model to show that pollution taxes depend on lobby group membership. The level of regulation stringency may affect the membership and contribution decisions of heterogeneous firms differently.

The degree to which the government is susceptible to influence, which we refer to as government influenceability, may also affect how regulations are selected and how the

association uses social capital, which, will impact membership and contributions. Grossman and Helpman (1994) show that when the government places more weight on welfare received from lobbying contributions, the regulatory stringency becomes more lax for those lobby groups. Also, Helliwell and Putnam (1995) suggest that increased regulatory power of a government can lead to more association products in the hands of regulators. Given the link between government influenceability, the regulatory environment and association products in determining an agent's decision to join a group and contribute to social capital formation, it is surprising that such relationships have not been systematically analyzed.

The purpose of this paper is to examine the determinants of joining and contributing to an association to create social capital by heterogeneous agents to create a mix of association products in a political economy environment. We focus on the manner in which the goods provided by the association, the productivity of firms, and the ability to influence the government interact to induce formation of social capital in an association. Specifically, we examine the effect of two direct factors, goods provided by the association and the current level of regulation, on association membership. We also consider the indirect effect of government influenceability on the intensive (per firm contribution) and extensive (total number of firms) margins of social capital formation in the association. By formally modeling the direct and indirect factors affecting an agent's decision to join an association, we are able to understand the determinants of social capital formation

In his seminal works, Coleman (1988, 1990) explained social capital as an individual's social obligations and expectations that could serve as "credit slips" for future assistance from others. In this view, social capital is a divisible and private asset, but emerges from the individual's network of social relationships (Portes 1995). On the other hand, Putnam (1993,

2000) described social capital as a good or service shared by, and embedded in, the community. Operationally, Lin (2001) incorporates elements of Putnam and Coleman's definition by viewing social capital as "resources embedded in social networks and accessed and used by actors for action." We model the idea of Glaeser et al. (2002) that individual investment creates social capital but we extend it by incorporating Lin and Putnam's view where the group dictates social capital use. In our model, individual investments in a group combine to form social capital. The group augments the contributions so that the social capital has greater value than a simple sum of individual contributions. Moreover, the individual elements become non-separable components of social capital once within the association and social capital becomes a fungible asset which can be transformed into a variety of products for allocation by the association.

A firm's decision to contribute to an association may depend on how the association uses social capital and on the productivity of the firm. Some associations provide only club goods with use restricted to members. Krishnan and Sciubba (2009) investigate labor agreements in Ethiopia, and discuss how different types of farmers may face different incentives to participate in reciprocal labor agreements. They suggest that the most productive farmers may not join, as they can do better on their own. Other associations create capital for members and work to influence government policy. Goedhuys et al. (2008) provide evidence that the more productive manufacturing firms in Tanzania join business associations. This may in part be due to their hopes of changing the business environment through the association. Finally, associations such as industry lobbying groups work exclusively to affect policy as a public good to the entire industry, and often consist of the most productive firms.

Social capital formation may also depend on the attributes of government institutions where the association operates. Empirical studies show mixed results of the effects of

governance characteristics on social capital. Some estimates suggest that increases in government influenceability decreases social capital as measured by trust (Della Porta 2000). However, if group membership serves as a proxy for social capital, government influenceability has a positive effect on social capital (Christoforou 2011). Our analysis provides a plausible explanation for this inconsistency. When groups use social capital to influence regulatory policy, contributions to social capital increase when governments are highly susceptible to influence.

We study a political economy model where the government selects a regulatory level to control a negative externality created by firms such as pollution from manufacturing industries or food contamination spreading to the populace from the food industry. An association of firms influences the government's regulatory decision by using the social capital it generates to provide some level of political support. We investigate how different factors affecting the choice of the regulatory policy in this political economy framework influence social capital formation.

We analyze a three-stage complete information game. In the first stage, heterogeneous firms with varying productivity levels decide whether or not to join an association. Association members determine the amount of labor to contribute to generate social capital. In the second stage, the association decides whether to use the social capital to provide production inputs for its members or to influence the government in setting the tax level for the industry. The government maximizes a weighted function between the value it derives from political support from the association and economic welfare of society when choosing the optimal tax regulation level. In the final stage, firms select the optimal level of inputs in their production.

We contribute to the literature by examining how the use of social capital and the current level of regulation affect the decision to join an association for different firms. We explain how government influenceability impacts regulation and the allocation of social capital. Our theory

provides an explanation of why an association membership may constitute the most or least productive in an industry and how the association selects the optimal mix of products for its members.

Our results suggest that how an association allocates social capital can affect the amount of social capital provided. We show that if there are diminishing returns to association provided inputs, firms will increase social capital investment if the association lobbies more to reduce regulatory burden. Furthermore, we find that the more (less) productive firms provide less (more) social capital if the regulatory tax increases. The ability of the association to influence the tax rate may impact who contributes to social capital and the use of social capital. We also show that the level of government influenceability affects how the association allocates the available social capital between providing the club good available for association members' production and the public good of regulatory policy influence. When faced with relatively large benefits or small costs of reducing the level of regulation, the association most often allocates more social capital to influence policy. We distinguish between the extensive and intensive margins of social capital formation and show how an increase in government influenceability increases social capital in associations composed of high productivity agents.

The next section provides a description of the model and structure of the game. We then solve the equilibrium of the game in Section 3. From this, we discuss the determinants of social capital formation and its use in Section 4. Conclusions follow in Section 5.

2. Theoretical Model

Following the Melitz (2003) firm entry mechanism, a continuum of firms exists where a potential entrant pays a fixed cost for entry into the industry. The entry price entitles the firm to some level of productivity, x, drawn from a known and fixed distribution $H(x)$. A single

individual owns each firm. Each individual has a fixed amount of labor, L, to allocate between working to produce output, L_w, or investing time in an association to produce social capital, L_s, such that, $L = L_w + L_s$.

The combination of individual members' labor generates social capital in the association, $S = S\left(\int_{B_1}^{B_2} L_s(x)dx\right)$,where S is social capital, $L_s(x)$ is endogenously determined labor allocated toward social capital formation depending on productivity level x, and B_1 and B_2 are endogenously determined lower and upper bound threshold levels of productivity.[1]

Output by each firm, Q, is sold in a perfectly competitive market at a price p. The associated production function, $Q = xf(L_w, K_p, K_s)$, increases in all arguments and is concave where K_p represents the amount each firm purchases capital in the market and K_s the amount of capital produced by the association. We assume capital provided by the association may substitute with capital purchased from the market such that $\frac{\partial Q}{\partial K_p \partial K_s} < 0$. For example, marketing by the association may take the place of marketing by a firm, and different types of knowledge available from other members in the association may substitute for knowledge attainable outside the association. The amount of association-produced capital is based on a production function, $K_s = g(\mu, S)$, that is increasing and concave in both arguments where μ denotes the proportion of social capital allocated towards the production of capital for its members chosen by the association. Furthermore, we assume that $\frac{\partial K_s}{\partial S \partial \mu} < 0$ because more social capital yields higher association-produced capital at a diminishing rate. Only firms that join the association have access to K_s. The association directs the remaining social capital, 1- μ, to influence the government in setting regulations.

[1] Note that the limits of integration will differ depending on the type of association formed. We expand on this when we solve for these limits.

We solve the three-stage complete information game for the subgame perfect Nash equilibrium using backward induction.

(1) In the first stage, firms decide whether to enter the industry or not. Firms that enter the industry, decide to join the association or not. Those that join allocate their labor between working to produce output in their own firm or working for the association to increase social capital.

(2) In the second stage, the government determines the level of regulation stringency to control a negative externality from firms' production. This policy is affected by the political support of the association in the form of social capital contribution. The association allocates social capital between production of two products: a club good in the form of capital available to members, or lobbying to influence public policy, which constitutes a public good for the industry.

(3) In the third stage, every firm in the industry simultaneously and independently selects the private level of capital purchased in the market and produces output as a function of the policy regulation and social capital formed by the association.

3. Three-Period Complete Information Game

We start by solving the third stage and continue recursively.

3.1. *Third Stage - Firm Input Decision*

We compare the private capital purchase by association members to nonmembers. After joining the association, each member chooses private capital, K_p, to maximize profit given all variables in the preceding stages,

$$(1)\ \pi^j\ (p,t,r;L_w,x,\mu,S) \equiv \mathrm{Max}_{K_p}\left\{(p-t)xf\left(L_w,K_p,K_s(\mu,S)\right)-rK_p\right\},$$

where p is the competitive output price, t is the tax regulation set by the government and r is the exogenous input price of capital. Taking the first order condition with respect to K_p, we find,

(2) $(p-t)xf_K\left(L_w, K_p, K_s(\mu, S)\right) - r = 0,$

which states that the value of marginal product of capital equals the price of capital.[2]

Firms that do not join the association also choose private capital, K_p,

(3) $\pi^n(p, t, r; L_w, x) \equiv \text{Max}_{K_p}\{(p-t)xf\left(L_w, K_p\right) - rK_p\}.$

Again, we find the value of marginal product of capital equals the capital price,

(4) $(p-t)xf_K\left(L_w, K_p\right) - r = 0.$

Equations (2) and (4) differ by the potential presence of additional capital for members of the association brought about by investment in social capital. Higher taxes lead to less capital purchased by all firms, $\frac{dK_p}{dt} < 0$, and when the association allocates more social capital to generate association-produced capital, members purchase less private capital, $\frac{dK_p}{d\mu} < 0$. Furthermore, since we assume diminishing marginal product of capital, $\frac{\partial Q}{\partial K_p \partial K_s} < 0$, members of the association purchase less private capital than non-members.

Lemma 1. *Members (nonmembers) of the association choose the level of private capital, K_p, that solves equation (2) (equation (4)).*

3.2 *Second Stage - Political Economy Subgame*

Following Grossman and Helpman (1994), the government maximizes a weighted sum of the political support received and the aggregate welfare of the economy by choosing tax regulation, *t*. The government's total welfare, *G*, depends on the aggregate welfare in the economy, *V*, plus a weighted measure of political support given by the association,

[2] Subscripts on functions denote derivatives, $\frac{dF}{dx} = F_x$ and $\frac{d^2F}{dx^2} = F_{xx}$.

(5) $G = V + \alpha(1-\mu)Sv,$

where α is the weight given to political support by the association in the government's welfare function and is a measure of government influenceability, 1-μ is the proportion of S allocated to influence the government's regulatory decision and *v* is the shadow value of social capital. The second term in (5) represents the monetary value of social capital that can be used by the government. For instance, this can be viewed as the monetary savings for running an election in the next cycle from using volunteers within the association to aid in grass roots movements in a campaign. When α is large (small), the government places more (less) weight on the monetary value on political support which means that government influenceability is high (low). Here, μ is also directly affected by *t*.

The aggregate welfare in this economy, $V = \Pi^j + \Pi^n - \delta E$, depends on the welfare of association members and non-members and the value of the negative externality from the industry, where $\Pi^j = \int_{B_1}^{B_2} \pi^j\,(p,t,r;L_w,x,\mu,S)dx$ is the aggregate profit of firms in the association, $\Pi^n = \int_{B_3}^{B_4} \pi^n\,(p,t,r;L_w,x)dx$ is the aggregate profit for firms that do not join the association, $E = \eta \int_{x^i}^{\infty} xf\left(L_w, K_p, K_s(\mu,S)\right)dx$ is the aggregate externality from the industry and δ is the marginal damage from the externality. Note that aggregate profits for firms that are members and nonmembers of the association are endogenously determined by lower and upper bound productivity thresholds, B_1, B_2, B_3 and B_4. Also, the externality depends on the aggregate output produced by the industry where η denotes a conversion factor from output to externality units and x^i is the minimum productivity cutoff to remain in the industry.

The first order condition of the government is,

(6) $\Pi_t^j + \Pi_t^n - \delta E_t - \delta E_\mu \frac{\partial \mu}{\partial t} - \alpha S v \frac{\partial \mu}{\partial t} = 0.$

where $\Pi_t^n = -\int_{B_3}^{B_4} xf dx < 0$, $E_t = \eta \int_{x^i}^{\infty} xf_{K_p} \frac{dK_p}{dt} dx < 0$ and $E_\mu = \eta \int_{x^i}^{\infty} xf_{K_s} \frac{\partial K_s}{\partial \mu} dx > 0$. The government equates the marginal benefits of the tax, in the form of reduced external damages, to the marginal cost of the tax, in the form of lost profit. The government weighs these benefits and costs differently given α which we expound on after solving the association's problem.

The association chooses the proportion of social capital, μ, used to influence the government's regulatory decision to maximize aggregate welfare of association members. The aggregate welfare of the association, *W*, equals the aggregate profit of all members,

(7) $\max_\mu \quad W = \Pi^j$.

The association faces a tradeoff since more social capital allocated toward capital for association members (higher μ) means less social capital available to influence the government in reducing regulatory taxes. We also consider the cases where associations provide only association-generated capital (μ=1) and where they only lobby the government (μ=0).

Taking the first order condition with respect to μ yields,

(8) $\Pi_\mu^j + \Pi_t^j \frac{\partial t}{\partial \mu} = 0$,

where $\Pi_t^j = -\int_{B_1}^{B_2} xf\, dx < 0$ and $\Pi_\mu^j = \int_{B_1}^{B_2} (p-t) xf_{K_s} \frac{\partial K_s}{\partial \mu} dx > 0$. An interior solution exists for equation (8) when $\frac{\partial t}{\partial \mu} > 0$ where the association will only offer more political support to the government, lower μ, when the government sets a lower tax. Using, the inverse function rule, we can re-write equation (8) as $\frac{-\Pi_t^j}{\Pi_\mu^j} = \frac{\partial \mu}{\partial t}$. This condition states that the association provides political support to the government up to the point where the marginal cost of the political support, $\frac{\partial \mu}{\partial t}$, equals the marginal benefits of the association in the form of higher profits, $\frac{-\Pi_t^j}{\Pi_\mu^j}$. Bernheim and

Whinston (1986) and Grossman and Helpman (1994) refer to this as the local truthfulness condition.[3] Corner solutions may also occur. When $\frac{-\Pi_t^j}{\Pi_\mu^j} > \frac{\partial \mu}{\partial t}$ the association will only lobby and not provide association-produced capital but if the opposite occurs, the association will not lobby and only provide association-produced capital.

Lemma 2. *The association devotes social capital to influence the government until the marginal cost of the political contribution equals marginal profit from reducing the tax regulation for members in the association,* $\frac{-\Pi_t^j}{\Pi_\mu^j} = \frac{\partial \mu}{\partial t}$. *The association will only lobby (only provided association-produced capital) when* $\frac{-\Pi_t^j}{\Pi_\mu^j} > \frac{\partial \mu}{\partial t}$ $\left(\frac{-\Pi_t^j}{\Pi_\mu^j} < \frac{\partial \mu}{\partial t}\right)$.

By substituting $\frac{-\Pi_t^j}{\Pi_\mu^j} = \frac{\partial \mu}{\partial t}$ into (6), we write the equilibrium condition representing the optimal tax choice by the government as,

(9) $\frac{(\alpha v S + \delta E_\mu)}{\Pi_\mu^j} \Pi_t^j + \Pi_t^n - \delta E_t = 0,$

Here, the government sets the tax regulation such that the value of reduced marginal damages equals the weighted marginal cost of all firms (in the form of lower profit) in the industry.

Lemma 3. *The government sets the tax regulation until the marginal damages from the externality equal the weighted marginal cost of implementing the tax on the association and non-members in the industry,* $\frac{(\alpha v S + \delta E_\mu)}{\Pi_\mu^j} \Pi_t^j + \Pi_t^n = \delta E_t$.

[3]Such an equilibrium is unique because it restricts the political support schedule to those that the association truthfully announces (Grossman and Helpman, 1994).

The susceptibility of the government to yield to the association's tax level preferences affects how the association allocates social capital and the tax on the industry.

Proposition 1. *If G is concave in t, then* $\frac{dt}{d\alpha} < 0$. *When* $\Pi_{\mu}^{j} < \delta E_{\mu}$, *then* $\frac{d\mu}{d\alpha} < 0$ *but if* $\Pi_{\mu}^{j} > \delta E_{\mu}$ *and* $\alpha > (<) \frac{\Pi_{\mu}^{j} - \delta E_{\mu}}{vS}$ *then* $\frac{d\mu}{d\alpha} < (>) 0$.

Proof: See Appendix A.

When government influenceability increases, the tax falls unambiguously. However, the effect of the government's influenceability on the association's decision to allocate social capital depends on marginal damages, marginal profit and the initial level of influenceability. When marginal external damages due to the allocation of more social capital to production outweighs the marginal aggregate profit from allocating a proportion of social capital to club good production, $\Pi_{\mu}^{j} < \delta E_{\mu}$, the government will set a high tax to mitigate the damage. In this case, when government influenceability increases, the association decreases its allocation of social capital to the production of club goods and increase efforts to combat the high tax. However, if the marginal damages are lower, $\Pi_{\mu}^{j} > \delta E_{\mu}$, the association increases its allocation of social capital to influence public policy only when the government exhibits a relatively high initial level of influenceability, $\alpha > \frac{\Pi_{\mu}^{j} - \delta E_{\mu}}{vS}$. Here, the association will not face a high tax and expends resources that may lower the tax only when it can easily influence the government. Otherwise, the association increases its allocation towards the provision of club goods.[4]

[4] There is a distinction between the results of the Grossman-Helpman model and our analysis. In the Grossman-Helpman model, monetary contributions given by the association to influence policy are not in the aggregate welfare of the economy, V, but in our model, the social capital contribution appears in V. In our model, we see a feedback of

3.3 *First Stage - Social Capital Formation*

A continuum of firms exists where all potential entrants pay a fixed fee, φ_f, and obtain a productivity draw, *x*, from a fixed and known distribution *H(x)*. Firms with the lowest productivity draws leave the industry and produce nothing. Individual firms that enter decide to allocate labor to production and possibly to the association to build social capital. The individual owner with productivity draw *x* compares the profit from producing and joining the association, producing and not joining the association, and not entering the industry,

$$\Pi = \max\left[\pi^{jj}, \pi^{nn}, 0\right].$$

Here $\pi^{nn} \equiv \pi^{n}(p,t,r;L\ \ ,x) - wL\ \ - \varphi_f$ is profit of not joining the association, $\pi^{jj} \equiv \max_{L_S}\left(\pi^{j}(p,t,r;L\ \ - L_s, x, \mu, S) - w(L\ \ - L_s) - \theta_j - \varphi_f\right)$ is profit after joining the association and is concave in L_S, θ_j is the fixed cost of joining the association and *w* is the opportunity cost of labor. We assume smooth and continuous profit functions.

Proposition 2. *A firm joins the association and contributes a positive amount of labor towards social capital formation when* $\pi^{jj} > max\ \ [\pi^{nn}, 0]$. *A firm does not join the association but continues to produce in the industry when* $\pi^{nn} > max\ \ \left[\pi^{jj}, 0\right]$. *A firm exits the industry when* $0 > max\ \ \left[\pi^{nn}, \pi^{jj}\right]$.

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the policy choice on the welfare of the economy through the amount of social capital allocated to influencing public policy because it negatively affects the level of club goods produced. This implies that a positive level of government influenceability may lead to the socially efficient outcome. To see this, note that a government not affected by social capital contributions from the association sets taxes such that $\Pi_t^j + \Pi_t^n = \delta E_t$. We arrive at this condition when $\Pi_\mu^j = \alpha v S + \delta E_\mu$ and is substituted back into the condition in Lemma 3. Thus, if the marginal aggregate profit from allocating a proportion of social capital to club goods exactly equals the weighted marginal cost of influencing public policy plus the marginal external damages, we may arrive at the socially optimal tax level.

Profit unambiguously increases in productivity and we know that the productivity level where the firm is indifferent to joining the association occurs when $\pi^{nn} = \pi^{jj}$. However, we do not know, *a priori*, if the relatively more or less productive individuals join the association. Understanding who joins the association allows us to determine the minimum productivity level needed to stay in the industry since profit differs between joiners and non-joiners. If L_s increases in x, high productivity firms join the association. This implies lower profits for non-joiners than for joiners, and the minimum productivity level needed to produce in the industry results from non-joiners such that $\pi^{nn} = 0$. In contrast, if L_s decreases in x, relatively low productivity firms join the association and the minimum productivity level to stay in the industry results by solving $\pi^{jj} = 0$.

Since we want to understand how L_s relates to productivity, we begin with the first order condition that determines π^{jj},

(10) $-\pi^{j}_{L_w} + \pi^{j}_{K_s} \frac{\partial K_s}{\partial L_s} + w = 0,$

which states that the marginal profit of labor in production equals the marginal profit of labor in social capital formation. Using the implicit function theorem on equation (10) we find,

(11) $\frac{dL_s}{dx} = -\frac{\pi^{j}{}_{L_s,x}}{\pi^{j}{}_{L_s,L_s}},$

where $\pi^{j}{}_{L_sL_s} < 0$ given concavity of π^{j}. Thus, the change in L_s with respect to *x* depends on the sign of $\pi^{j}{}_{L_sx}$. Here, $\pi^{j}{}_{L_sx} = -\pi^{j}_{L_wx} + \pi^{j}_{K_sx}\frac{\partial K_s}{\partial L_s} = -(p-t)f_{L_w} + (p-t)f_{K_s}\frac{\partial K_s}{\partial L_s}$. We find that L_s increases (decreases) in productivity if the marginal product of L_s is greater (less) than the marginal product of L_w.

There are two types of associations in terms of membership characteristics made up of firms with varying levels of productivity. If the marginal product of L_s exceeds the marginal

product of L_w, then L_s increases in productivity and the most productive firms join the association. The minimum productivity to produce in the industry, x^j, results from $\pi^{nn} = 0$ as illustrated in Figure 1. Here, x^a shows the cutoff productivity of joining the association. However, if the marginal product of L_s is less than the marginal product of L_w, then L_s decreases in productivity and the least productive firms join the association. The minimum productivity to produce in the industry, x^i, results from $\pi^{jj} = 0$ as illustrated in Figure 2.[5] In both cases, we solve for the productivity cutoff for joining the association, x^a, using $\pi^{nn} = \pi^{jj}$. Given the two types of associations, the amount of social capital generated in the association equals,

$$(12)\ S = \begin{cases} S\left(\int_{x^a}^{\infty} L_s(x)dx\right) \text{ if } f_{L_w} < f_{K_s}\frac{\partial K_s}{\partial L_s} \\ S\left(\int_{x^i}^{x^a} L_s(x)dx\right) \text{ if } f_{L_w} > f_{K_s}\frac{\partial K_s}{\partial L_s}. \end{cases}$$

We summarize the entry condition of firms in the industry below.

Lemma 4. *Firms enter the industry until the expected cost of entering, ϕ_f, equals the expected benefits,* $\Pi^{**} = \begin{cases} \int_{x^i}^{x^a} \pi^{nn}(x)dH(x) + \int_{x^a}^{\infty} \pi^{jj}(x)dH(x) \text{ if } f_{L_w} < f_{K_s}\frac{\partial K_s}{\partial L_s} \\ \int_{x^i}^{x^a} \pi^{jj}(x)dH(x) + \int_{x^a}^{\infty} \pi^{nn}(x)dH(x) \text{ if if } f_{L_w} > f_{K_s}\frac{\partial K_s}{\partial L_s}. \end{cases}$

Melitz (2003) calls this the free entry condition which yields the measure of entrants in the industry.

3.4. *Subgame Perfect Nash Equilibrium*

[5] Because we assume smoothness and continuity of the profit function, we eliminate the possibility of discontinuous jumps in the relationship between x and L_s.

Proposition 3. *The subgame perfect Nash equilibrium occurs when: (i) Firms enter the industry until the expected benefits of entering equal the expected cost as summarized in Lemma 4. (ii) Upon entering, Proposition 2 governs the firm's decision to join the association or not. (iii) Upon joining, equation (10) describes the firm's level of investment in social capital formation. (iv) The association allocates social capital between the provision of club goods for members and lobbying the government to influence regulation, μ^*, to solve equation (7) leading to the condition in Lemma 2. (v) The government chooses the regulatory level, t^*, to solve equation (5) leading to the condition in Lemma 3. (vi) Firms in the association select capital according to Lemma 1.*

4. Determinants of Social Capital

We determine how the interaction between the association and the government affects social capital formation. Then, we examine how changes in government influenceability affect the intensive and extensive margins of social capital formation. There are two direct factors affecting the decision to join and contribute to social capital within the association: the mix of products chosen by the association, μ, and the regulation, t. Government influenceability can be called an indirect factor since it affects social capital formation through μ and t.

4.1. *The Direct Impacts of Association and Government Decisions on Social Capital Formation*

The allocation of social capital between capital-substitute goods and policy influence, μ, together with the prevailing tax, t, have an effect on the decision of firms within the association to contribute to social capital formation. We begin by examining the effect of a change in the

amount of social capital devoted to creating association-produced capital on the amount of labor used to generate social capital.

Proposition 4. *If diminishing returns to association-produced capital from social capital exist, then an increase in the allocation of social capital towards the production of association-produced capital decreases social capital investment,* $\frac{dL_s}{d\mu} < 0$.

Proof. See Appendix B.

When the amount of association-produced capital exhibits diminishing marginal returns from social capital, any additional investment towards the formation of social capital will yield less association-produced capital than the previous investment. Therefore, firms will reduce their allocation of labor toward social capital when they know that the association uses more of the social capital to create association-produced capital.

Proposition 5. *High (low) productivity association members provide less (more) social capital if the tax increase, if* $f_{L_w} < (>) f_{K_s} \frac{\partial K_s}{\partial L_s}$ *holds then* $\frac{dL_s}{dt} < (>) 0$.

Proof: See Appendix B.

High productivity association members contribute more to social capital if social capital goes toward reducing tax regulations. However, an increase in the tax rate leads to more contribution to social capital accumulation from low productivity firms. Higher taxes mean the association directs more social capital to produce capital for members. Thus, low productivity association members invest more in social capital to generate association-produced capital for production.

We contrast the behavior of two national associations which our model may explain: the American Medical Association (AMA) and the US Chamber of Commerce (USCC). Both advance the art of their craft (medicine and entrepreneurship, respectively) and promote professional networking interests, but they also engage in lobbying for favorable regulations. However, the degree to which they allocate their resources varies. In 2010, AMA contributed $2.5 million in lobbying (about 8% of its revenues) to influence government policy while USCC spent $157 million (about 79% of its revenues) (Center for Responsive Politics, 2012).[6]

From Proposition 5, one plausible explanation of the emphasis on lobbying by the USCC that our model suggests is that members in that organization are highly productive and gain more from reducing governmental regulations than from production assistance. This may be evidenced by a handful of large, productive donor firms such as NewsCorp, Goldman Sachs and Chevron Texaco (NY Times, 2010). In contrast, our model suggests that the AMA is composed of relatively low productivity members that value production assistance more than the lobbying component. The AMA has experienced a steady decline in American members. In 2002, 30% of American physicians were members (Korcok, 2002) but in 2011 the number dropped to 15% (Collier, 2011). In contrast, associations for specialty physicians have seen strong growth over the same period (Collier, 2011) illustrating a migration of specialty physicians away from the AMA.[7]

4.2 The Indirect Effects of Government Influenceability on Social Capital Formation

[6] The 2010 AMA annual report stated an annual budget of approximately $274 million. The USCC does not publish annual financial reports but a newspaper article estimates during that year, the budget for the group was $200 million (NY Times, 2010).

[7] Based on an interview with an ER doctor at Pullman Regional Hospital in Pullman, WA, most AMA members are family practioners and those that deal with internal medicine while most specialists are not members. Furthermore, he stated that specialists join other associations focused on obtaining favorable regulations to help service patients and improve their pay.

To determine the level of social capital generated, we consider how many firms join the association, which we refer to as the extensive margin, and how much each association member contributes, known as the intensive margin. Differentiating the social capital function yields,

$$\frac{dS}{d\alpha} = \left[\frac{\partial S}{\partial B_2}\left(\frac{\partial B_2}{\partial t}\frac{dt}{d\alpha} + \frac{\partial B_2}{\partial \mu}\frac{d\mu}{d\alpha}\right) + \frac{\partial S}{\partial B_1}\left(\frac{\partial B_1}{\partial t}\frac{dt}{d\alpha} + \frac{\partial B_1}{\partial \mu}\frac{d\mu}{d\alpha}\right)\right] + \int_{B_1}^{B_2}\left(\frac{dL_s}{dt}\frac{dt}{d\alpha} + \frac{dL_s}{d\mu}\frac{d\mu}{d\alpha}\right)dx.$$

The last term measures the change in the intensive margin while the first two terms measure the change in the extensive margin due to a change in influenceability. We consider three types of associations: associations that only lobby ($\mu=0$), associations that only provide association-produced capital ($\mu=1$) and associations that provide both services ($0<\mu<1$).

4.2.1 *The Intensive Margin – How much Social Capital is Contributed by Each Firm*

The effect of influenceability on the intensive margin of social capital provision depends on the initial level of government influenceability and the magnitude of marginal external damages.

Table 1 summarizes the effect of government influenceability on the intensive margin of social capital formation for associations with low productivity based on Propositions 1, 4 and 5. Low productivity association members care about production more than influencing policy, which impacts how they react to changes in government influenceability. When associations lobby and provide association-produced capital for its members, higher government influenceability levels induces the association to shift social capital to influencing regulatory policy. The increased political support leads to a lower tax thereby reducing the amount of social capital these firms contribute to the association given small marginal external damages and a low initial level of government influenceability. However, with a high level of initial government influenceability or if higher marginal damages exist, the effect of influenceability on social capital in the intensive margin is ambiguous for low productivity associations. Here, some

firms with high damages likely contribute more to social capital to influence the government while others contribute less knowing that less association-produced capital exists. The preferences by the low productivity group are highlighted when they only provide association-produced capital (μ=1) and government influenceability decreases. We find that when governments are harder to influence, social capital increases at the intensive margin in these associations as they exclusively focus on providing capital for members.

The effect of influenceability on the decision of high productivity association members to contribute to social capital differs. The high productivity association members focus on influencing policy because high productivity firms produce more negative externality and, therefore, pay more taxes. With high initial government influenceability or large marginal external damages, any increase in government influenceability will lead to an increase in social capital at the intensive margin to reduce the regulatory tax level. The preferences of high productivity associations are highlighted when they only lobby and government influenceability declines. In this case, social capital in the intensive margin in these associations unambiguous declines because the association affects regulation less.

4.2.2 *The Extensive Margin – Which Firms Join the Association*

We examine the cutoff productivity levels related to joining the association and remaining in the industry, and how these cutoffs change with changes in the government influenceability level. Table 2 summarizes the effect of government influenceability on social capital in the extensive margin.

When the high productivity firms join the association, social capital is $S = S\left(\int_{x^a}^{\infty} L_s\,(x)dx\right)$ from equation (12). If the cutoff productivity to join the association, x^a, increases, then social capital decreases such that, $\frac{\partial S}{\partial x^a} = -S'L_s(x^a) < 0$. Government

influenceability affects social capital formation at the extensive margin through the change in the cutoff productivity in joining the association *vis-a-vis* the government's tax decision and the association's choice of how to allocate the social capital, such that $\frac{dS}{d\alpha} = \frac{\partial S}{\partial x^a}\left(\frac{\partial x^a}{\partial t}\frac{dt}{d\alpha} + \frac{\partial x^a}{\partial \mu}\frac{d\mu}{d\alpha}\right)$.[8]

We find that in associations with high productivity firms, when tax increases, the cutoff productivity to join the association increases, $\frac{\partial x^a}{\partial t} > 0$, leading to less social capital. In this case, only the most productive firms join the association. In contrast, with more association-produced capital available, the cutoff productivity to join the association decreases, $\frac{\partial x^a}{\partial \mu} < 0$, and more firms with lower productivity join the association. When the association produces more of the club good, more firms substitute the association-produced capital for their private capital. The lower productivity firms will be most interested in making this substitution.

Interestingly, we find that an increase in government influenceability could lead to an increase in social capital at the extensive margin when the most productive firms comprise the association. This occurs with low initial government influenceability. When influenceability increases, taxes set by the government decrease leading to more members in the association. Furthermore, with relatively low initial government influenceability, the association opts to increase the allocation to the club good which entices more firms to join the association. The preference of high productivity firms are highlighted when the association only lobbies. In this case, a rise in government influenceability unambiguously increases social capital at the extensive margin.

When low productivity firms join the association, social capital accumulates according to the following: $S = S\left(\int_{x^i}^{x^a} L_s(x)dx\right)$ from equation (12). If the cutoff productivity for joining the

[8] See Appendix C for proof.

association, x^a, increases, then social capital increases such that $\frac{\partial S}{\partial x^a} = S' L_s(x^a) > 0$. Also, if the cutoff productivity to join the industry, x^i, increases, then social capital decreases such that $\frac{\partial S}{\partial x^i} = -S' L_s(x^i) < 0$. The total effect of influenceability on the extensive margin equals $\frac{dS}{d\alpha} = \frac{\partial S}{\partial x^a}\left(\frac{\partial x^a}{\partial t}\frac{dt}{d\alpha} + \frac{\partial x^a}{\partial \mu}\frac{d\mu}{d\alpha}\right) + \frac{\partial S}{\partial x^i}\left(\frac{\partial x^i}{\partial t}\frac{dt}{d\alpha} + \frac{\partial x^i}{\partial \mu}\frac{d\mu}{d\alpha}\right)$.[9]

We find that the productivity cutoff to join the association increases when the tax increases, $\frac{\partial x^a}{\partial t} > 0$. However, we find that the productivity cutoff for those that remain in the industry increases when taxes increase also, $\frac{\partial x^i}{\partial t} > 0$. Both effects imply that relatively more productive firms join the association when faced with higher taxes. Unlike the previous case where social capital decreases when the most productive firms join the association when confronted with higher taxes, the number of members may not necessarily decline when low productivity firms make up the association since both productivity cutoffs increase.

When the association allocates more social capital to the production of club goods, an increase in the cutoff productivity for joining the association occurs, $\frac{\partial x^a}{\partial \mu} > 0$ and the cutoff productivity of remaining in the industry decreases, $\frac{\partial x^i}{\partial \mu} < 0$. In this case, holding the effect through taxes constant, more firms join the association. This result is similar to the previous case where the most productive firms comprise the association.

The effect of government influenceability on the extensive margin of social capital formation is ambiguous for an association composed of low productivity firms. At high levels of initial influenceability and low marginal damages, an increase in influenceability leads to a decline in social capital by lowering the cutoff productivity of those who join the association. A

[9] See Appendix D for proofs.

similar result occurs given high marginal damages from the externality. However, in both cases, the effect of influenceability on social capital through the cutoff productivity of remaining in the industry is ambiguous. Thus, the total extensive effect is also ambiguous.

4.2.3 *Total Effect of Government Influenceability on Social Capital*

Combining the results from the intensive and extensive margins, we summarize the effect of government influenceability on aggregate social capital in Table 3. We find cases with a clear relationship between government influenceability and social capital formation.

Proposition 6. If the following conditions hold, $f_{L_w} < f_K \frac{\partial K}{\partial L_s}$, $\Pi_\mu^j > \delta E_\mu$, and $\alpha < \frac{\Pi_\mu^j - \delta E_\mu}{vS}$, then $\frac{dS}{d\alpha} > 0$ through both the extensive and intensive effects when μ=0 and α increases or when μ=1 and α decreases.

Proof: See the combined results from Appendix B, C and D.

Associations with high productivity firms prefer to influence regulatory decisions. When the association only lobbies, an increase in government influenceability increases aggregate social capital with large marginal external damages or when high initial government influenceability exists. Also, when an association does not lobby at all, a decline in government influenceability leads to a reduction in social capital given the same conditions. Interestingly, we have identified a case where government influenceability positively relates to social capital formation within an association.

Super Political Action Committees or Super PACs provide an example of associations that focus solely on policy influence. We see an increase in contributions to Super PACs from the 2010 election cycle with nearly $82 million in contributions to over $828 million in 2012

(Center for Responsive Politics, 2012). The January 2010 U.S. Supreme Court ruling on Citizens United vs. Federal Elections Committee upheld the ability of corporations to promote the election of a particular candidate. Hasen (2010) argued that the ruling made it easier to influence government. Additionally, 2012 included the Presidential election, which might represent a particularly focused and effective use of Super PAC funds. If Super PACs found the 2012 elections an exceptional opportunity to influence policy, then this may explain part of the enormous increase in contributions between 2010 and 2012. These findings correspond to the predictions of our model.

5. Conclusions

We model and solve a game that examines the decision to join and contribute to social capital formation in an association by heterogeneous agents in a political economy environment. We combine three factors: an association producing a mix of products, firms with heterogeneous technological productivity, and government's susceptibility to association influence over a policy affecting the industry. Members join an association which can produce a club good only accessible to association members or it can be used to influence the level of regulatory burden faced by the entire industry. A producer's decision to join the association and how much to contribute directly depends on the outputs produced with the association's social capital and the level of government regulation. The government's susceptibility to influence affects the amount of social capital formation and the association's allocation of it.

We investigate two types of associations: one with high productivity members and one with low productivity members. We find that the most productive firms are more likely to join the association if the social capital is used to influence regulation, and the least productive firms are more likely to join in order to access the association-produced capital. Intuitively, more

productive firms that produce more negative externalities benefit from favorable policies that regulate externalities, while less productive firms benefit from cost saving services provided by the association. Alternatively, more productive firms may benefit more from associations that can enhance revenues by lowering taxes whereas less productive firms may benefit more from the provision of direct assistance to their production process in the form of cheaper capital goods. Hence the theory helps explain a number of empirical studies and some basic economic intuition.

Government influenceability affects the number of firms joining (the extensive margin) and the contribution of each firm (the intensive margin) towards social capital formation in the association. If the lowest productivity producers constitute association membership, there is an inverse relationship between government influenceability and social capital formation. This is highlighted in the case of the association that only provides association generated capital. If its members are low productivity members, a decrease in government influenceability unambiguously leads to an increase in social capital in the intensive margin. The effect of government influenceability on the extensive margin is ambiguous because its effect on the cutoff productivity for joining the association and the entering the industry move in countervailing directions.

The opposite occurs if the most highly productive firms comprise the association. Often an increase in government influenceability leads to more firms joining the association since their lobbying power is more likely to lead to lax regulations. This is highlighted in the case of the association that only provides lobbying services. Here, if members of the association are high productivity firms, an increase in government influenceability increases the intensive and extensive margins of social capital formation in most instances.

An interpretation of this is that, when governments are more susceptible to influence, associations that emphasize government lobbying are going to draw more membership contributions from the most productive firms and social capital formation increases. In contrast, the impact on the membership of associations that emphasize member services is uncertain. The insight here is that, it is not just that governments that are responsive to lobbying are more likely to face associations that lobby heavily, it is that the membership and participation in those lobbying associations will tend to increase and be dominated by the most productive firms.

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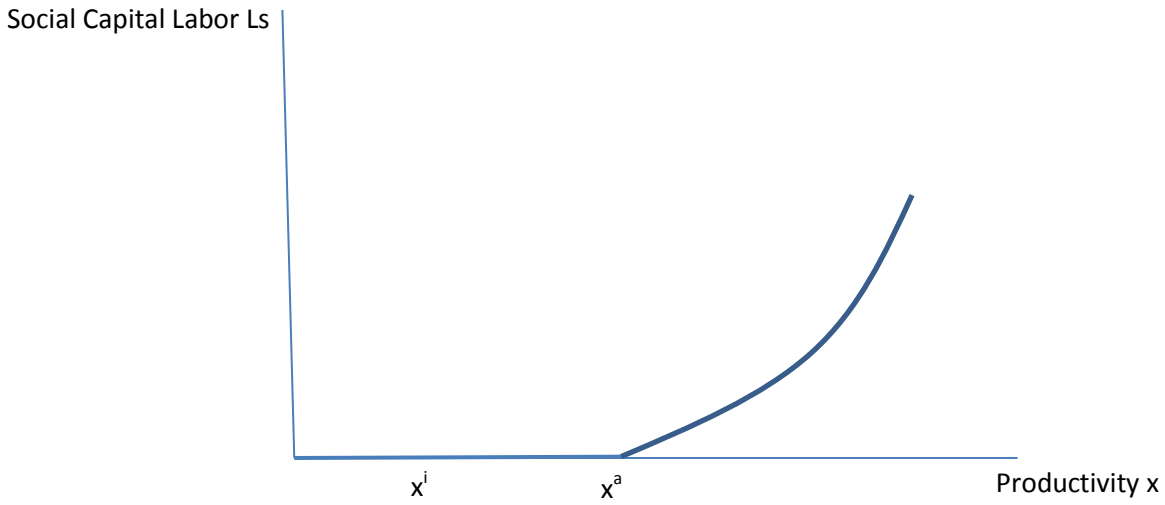

Fig. 1. *Productivity and Investment in Social Capital when Marginal Product of Social Capital is larger than Marginal Product of Labor*

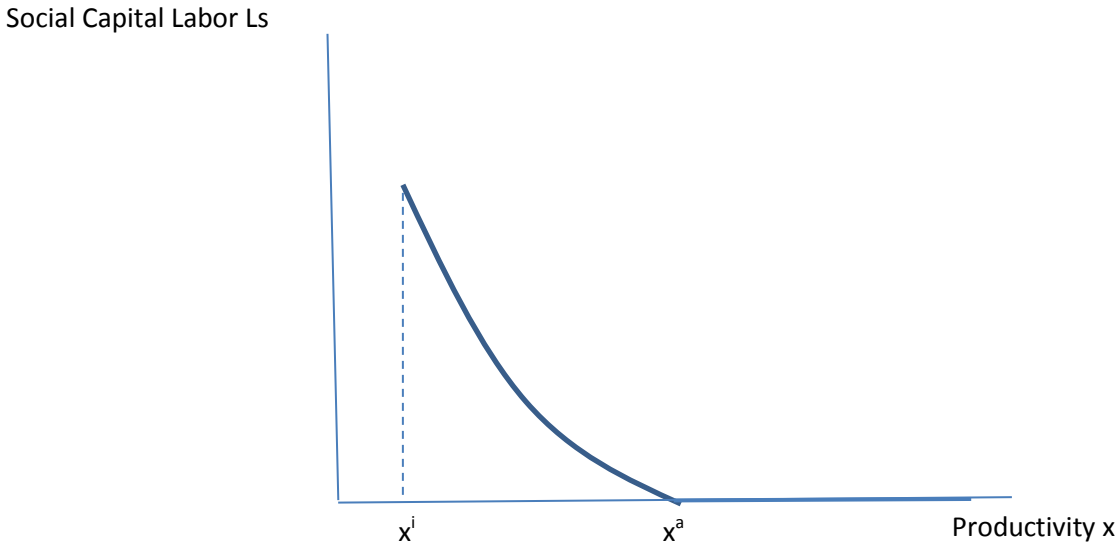

Fig. 2. *Productivity and Investment in Social Capital when Marginal Product of Social Capital is less than Marginal Product of Labor*

Table 1

The Effect of Government Influenceability (α) on the Intensive Margin of Social Capital

Types of Associations	Characteristics of Damage and Influenceability	High Productivity Association	Low Productivity Association
Associations that lobby and provide capital (0<μ<1)	Large external damages and α increases (decreases)	↑ (↓)	? (?)
	Small external damages, high initial government influenceability and α increases (decreases)	↑ (↓)	? (?)
	Small external damages, low initial government influenceability and α increases (decreases)	? (?)	↓ (↑)
Associations that only lobby (μ=0)	Large external damages and α increases (decreases)	↑ (↓)	↓ (?)
	Small external damages, high initial government influenceability and α increases (decreases)	↑ (↓)	↓ (?)
	Small external damages, low initial government influenceability and α increases (decreases)	? (↓)	↓ (↑)
Associations that only provide capital (μ=1)	Large external damages and α increases (decreases)	↑ (↓)	? (↑)
	Small external damages, high initial government influenceability and α increases (decreases)	↑ (↓)	? (↑)
	Small external damages, low initial government influenceability and α increases (decreases)	↑ (?)	↓ (↑)

Note: Proof can be found in Appendix B. High initial government influenceability means $\alpha > \frac{\Pi_{\mu}^{j} - \delta E_{\mu}}{vS}$ while low initial government influenceability is $\alpha < \frac{\Pi_{\mu}^{j} - \delta E_{\mu}}{vS}$. Large external damages means $\delta E_{\mu} > \Pi_{\mu}^{j}$ while small external damages is $\delta E_{\mu} < \Pi_{\mu}^{j}$.

Table 2

The Effect of Government Influenceability (α) on the Extensive Margin of Social Capital

Types of Associations	Characteristics of Damage and Influenceability	High Productivity Association	Low Productivity Association
Associations that lobby and provide capital ($0<\mu<1$)	Large external damages and α increases (decreases)	? (?)	? (?)
	Small external damages, high initial government influenceability and α increases (decreases)	? (?)	? (?)
	Small external damages, low initial government influenceability and α increases (decreases)	↑ (↓)	? (?)
Associations that only lobby ($\mu=0$)	Large external damages and α increases (decreases)	↑ (?)	? (?)
	Small external damages, high initial government influenceability and α increases (decreases)	↑ (?)	? (?)
	Small external damages, low initial government influenceability and α increases (decreases)	↑(↓)	? (?)
Associations that only provide capital ($\mu=1$)	Large external damages and α increases (decreases)	? (↓)	? (?)
	Small external damages, high initial government influenceability and α increases (decreases)	? (↓)	? (?)
	Small external damages, low initial government influenceability and α increases (decreases)	↑ (↓)	?(?)

Note: Proof can be found in Appendices C and D. High initial government influenceability means $\alpha > \frac{\Pi_{\mu}^{j} - \delta E_{\mu}}{vS}$ while low initial government influenceability is $\alpha < \frac{\Pi_{\mu}^{j} - \delta E_{\mu}}{vS}$. Large external damages means $\delta E_{\mu} > \Pi_{\mu}^{j}$ while small external damages is $\delta E_{\mu} < \Pi_{\mu}^{j}$.

Table 3

The Effect of Government Influenceability (α) on Aggregate Social Capital

Types of Associations	Characteristics of Damage and Influenceability	High Productivity Association	Low Productivity Association
Associations that lobby and provide capital (0<μ<1)	Large external damages and α increases (decreases)	? (?)	? (?)
	Small external damages, high initial government influenceability and α increases (decreases)	? (?)	? (?)
	Small external damages, low initial government influenceability and α increases (decreases)	? (?)	? (?)
Associations that only lobby (μ=0)	Large external damages and α increases (decreases)	↑ (?)	? (?)
	Small external damages, high initial government influenceability and α increases (decreases)	↑ (?)	? (?)
	Small external damages, low initial government influenceability and α increases (decreases)	? (↓)	? (?)
Associations that only provide capital (μ=1)	Large external damages and α increases (decreases)	? (↓)	? (?)
	Small external damages, high initial government influenceability and α increases (decreases)	? (↓)	? (?)
	Small external damages, low initial government influenceability and α increases (decreases)	↑ (?)	? (?)

Note: Proof can be found by combining results in Appendix B, C and D. High initial government influenceability means $\alpha > \frac{\Pi_{\mu}^{j} - \delta E_{\mu}}{vS}$ while low initial government influenceability is $\alpha < \frac{\Pi_{\mu}^{j} - \delta E_{\mu}}{vS}$. Large external damages means $\delta E_{\mu} > \Pi_{\mu}^{j}$ while small external damages is $\delta E_{\mu} < \Pi_{\mu}^{j}$.

Appendix A. Proof of Proposition 1.

To ensure an interior solution for the choice of the tax rate, t, we assume that G is concave in t which implies that $G_{tt} < 0$. From (6), $G_{t\alpha} = -Sv\frac{\partial \mu}{\partial t}$ so that,

(A1) $\frac{dt}{d\alpha} = -\frac{G_{t\alpha}}{G_{tt}} = -\frac{-Sv\frac{\partial \mu}{\partial t}}{G_{tt}}$.

Recall that $\frac{\partial \mu}{\partial t} = \frac{-\Pi_t^j}{\Pi_\mu^j} > 0$ from Lemma 2. Therefore, $\frac{dt}{d\alpha} < 0$.

When the association chooses an interior solution for the proportion of social capital to allocate, μ, we assume that W is concave in μ which implies that $W_{\mu\mu} < 0$. From (8), $W_{\mu\alpha} = \Pi_t^j \frac{\partial^2 t}{\partial \mu \partial \alpha}$ so that

(A2) $\frac{d\mu}{d\alpha} = -\frac{W_{\mu\alpha}}{W_{\mu\mu}} = -\frac{\Pi_t^j \frac{\partial^2 t}{\partial \mu \partial \alpha}}{\Pi_{\mu\mu}^j}$.

Since $\Pi_t^j < 0$ and $W_{\mu\mu} = \Pi_{\mu\mu}^j < 0$, the sign of $\frac{d\mu}{d\alpha}$ hinges on $\frac{\partial^2 t}{\partial \mu \partial \alpha}$. Recall that $\frac{\partial t}{\partial \mu} = \frac{\Pi_\mu^j - \alpha Sv - \delta E_\mu}{-\Pi_t^j - \Pi_t^n + \delta E_t}$ from the first order condition of the government choice in equation (6). Thus,

(A3) $\frac{\partial^2 t}{\partial \mu \partial \alpha} = \frac{-Sv}{-\Pi_t^j - \Pi_t^n + \delta E_t}$.

The numerator of (A3) is negative. We can determine the sign for the denominator of (A3) by comparing it with (6). From (6), we have

(A4) $-\Pi_t^n - \frac{(\alpha vS + \delta E_\mu)}{\Pi_\mu^j}\Pi_t^j + \delta E_t = 0$.

Comparing (A4) with the denominator for (A3), we have

$-\Pi_t^j - \Pi_t^n + \delta E_t >?< -\frac{(\alpha vS + \delta E_\mu)}{\Pi_\mu^j}\Pi_t^j - \Pi_t^n + \delta E_t = 0$.

Simplifying, we find the condition determining the sign for the denominator of (A3),

$-\Pi_t^j\left(1-\frac{(\alpha vS+\delta E_\mu)}{\Pi_\mu^j}\right)>?<0.$

Since $-\Pi_t^j>0$, the sign of the denominator of (A3) depends on the following condition,

(C1) $\alpha>(<)\frac{\Pi_\mu^j-\delta E_\mu}{vS}$.

Note that if $\Pi_\mu^j<\delta E_\mu$, the right hand side of (C1) is always negative and since α is always positive, we will have the case where $\alpha>\frac{\Pi_\mu^j-\delta E_\mu}{vS}$ resulting in $-\Pi_t^j-\Pi_t^n+\delta E_t<0$. However, if $\Pi_\mu^j>\delta E_\mu$ then $\alpha>(<)\frac{\Pi_\mu^j-\delta E_\mu}{vS}>0$ results in $-\Pi_t^j-\Pi_t^n+\delta E_t<(>)0$. Thus, when $\Pi_\mu^j<\delta E_\mu$ then $-\Pi_t^j-\Pi_t^n+\delta E_t<0$, resulting in $\frac{d\mu}{d\alpha}<0$. If $\Pi_\mu^j>\delta E_\mu$ and $\alpha>(<)\frac{\Pi_\mu^j-\delta E_\mu}{vS}>0$ then $-\Pi_t^j-\Pi_t^n+\delta E_t<(>)0$, resulting in $\frac{d\mu}{d\alpha}<(>)0$.

Appendix B. The effect of government influenceability on the intensive margin of social capital formation.

Here, α affects L_s through μ and t. Such that,

(A5) $\frac{dL_s}{d\alpha}=\frac{dL_s}{dt}\frac{dt}{d\alpha}+\frac{dL_s}{d\mu}\frac{d\mu}{d\alpha}$.

Given our results for (A1) and (A2), we only need to find $\frac{dL_s}{dt}$ and $\frac{dL_s}{d\mu}$.

The effect of μ on Ls is,

(A6) $\frac{dL_s}{d\mu}=-\frac{\pi^j{}_{L_s,\mu}}{\pi^j{}_{L_s,L_s}}=-\frac{-\pi^j_{L_w,\mu}+\pi^j_{K_s,\mu}\frac{\partial K_s}{\partial L_s}+\pi^j_{K_s}\frac{\partial^2 K_s}{\partial L_s\partial\mu}}{\pi^j{}_{L_s,L_s}}$;

where the numerator is $\pi^j{}_{L_s,\mu}=-(p-t)xf_{L_wK_s}\frac{\partial K_s}{\partial\mu}+(p-t)xf_{K_sK_s}\left(\frac{\partial K_s}{\partial L_s}\right)^2+(p-t)xf_{K_s}\frac{\partial^2 K_s}{\partial L_s\partial\mu}$ and $\pi^j{}_{L_s,L_s}<0$ from the assumption of concavity. Here, $\pi^j{}_{L_s,\mu}<0$ because we assumed concavity of the production function in capital, complementarity between capital and labor and

diminishing returns from social capital in the production of association-produced capital such that $\frac{\partial^2 K_S}{\partial L_S \partial \mu} = \frac{\partial^2 K_S}{\partial S \partial \mu}\frac{\partial S}{\partial L_S} < 0$. Thus, $\frac{dL_S}{d\mu} < 0$.

The effect of t on Ls is,

(A7) $\frac{dL_S}{dt} = -\frac{\pi^j{}_{L_S,t}}{\pi^j{}_{L_S,L_S}}$

The sign of (A7) depends on $\pi^j{}_{L_S,t}$. Here, $\pi^j{}_{L_S,t} = -\pi^j_{L_w,t} + \pi^j_{Kt}\frac{\partial K}{\partial L_S} = x f_{L_w} - x f_{K_S}\frac{\partial K_S}{\partial L_S}$. Thus, if $f_{L_w} < (>) f_{K_S}\frac{\partial K_S}{\partial L_S}$ then $\frac{\partial L_S}{\partial t} < (>) 0$. This condition is similar to the condition determining the effect of x on Ls in equation (11).

There are six cases that emerge determining the effect of α on the intensive margin of social capital accumulation,

Case B.1. Assume $\delta E_\mu < \Pi^j_\mu$, $\alpha > \frac{\Pi^j_\mu - \delta E_\mu}{vS}$, and $f_{L_w} < f_{K_S}\frac{\partial K_S}{\partial L_S}$.

(A8) $\underset{-}{\frac{dL_S}{d\alpha}} = \underset{- \; -}{\frac{dL_S}{dt}\frac{dt}{d\alpha}} + \underset{- \; -}{\frac{dL_S}{d\mu}\frac{d\mu}{d\alpha}} > 0$;

Case B.2. Assume $\delta E_\mu < \Pi^j_\mu$, $\alpha > \frac{\Pi^j_\mu - \delta E_\mu}{vS}$, and $f_{L_w} > f_{K_S}\frac{\partial K_S}{\partial L_S}$.

(A9) $\underset{+}{\frac{dL_S}{d\alpha}} = \underset{+ \; -}{\frac{dL_S}{dt}\frac{dt}{d\alpha}} + \underset{- \; -}{\frac{dL_S}{d\mu}\frac{d\mu}{d\alpha}}$;

Case B.3. Assume $\delta E_\mu < \Pi^j_\mu$, $\alpha < \frac{\Pi^j_\mu - \delta E_\mu}{vS}$, and $f_{L_w} < f_{K_S}\frac{\partial K_S}{\partial L_S}$.

(A10) $\underset{-}{\frac{dL_S}{d\alpha}} = \underset{- \; -}{\frac{dL_S}{dt}\frac{dt}{d\alpha}} + \underset{- \; +}{\frac{dL_S}{d\mu}\frac{d\mu}{d\alpha}}$;

Case B.4. Assume $\delta E_\mu < \Pi^j_\mu$, $\alpha < \frac{\Pi^j_\mu - \delta E_\mu}{vS}$, and $f_{L_w} > f_{K_S}\frac{\partial K_S}{\partial L_S}$.

(A11) $\underset{+}{\frac{dL_S}{d\alpha}} = \underset{+ \; -}{\frac{dL_S}{dt}\frac{dt}{d\alpha}} + \underset{- \; +}{\frac{dL_S}{d\mu}\frac{d\mu}{d\alpha}} < 0$;

Case B.5. Assume $\delta E_\mu > \Pi_\mu^j$ and $f_{L_w} < f_{K_s}\frac{\partial K_s}{\partial L_s}$.

(A12) $\frac{dL_s}{d\alpha} = \underset{-}{\frac{dL_s}{dt}}\underset{-}{\frac{dt}{d\alpha}} + \underset{-}{\frac{dL_s}{d\mu}}\underset{-}{\frac{d\mu}{d\alpha}} > 0;$

Case B.6. Assume $\delta E_\mu > \Pi_\mu^j$ and $f_{L_w} > f_{K_s}\frac{\partial K_s}{\partial L_s}$.

(A13) $\frac{dL_s}{d\alpha} = \underset{+}{\frac{dL_s}{dt}}\underset{-}{\frac{dt}{d\alpha}} + \underset{-}{\frac{dL_s}{d\mu}}\underset{-}{\frac{d\mu}{d\alpha}};$

When examining the cases when the association only lobbies or only provides association-produced capital, $\frac{d\mu}{d\alpha} = 0$ in two cases: (i) if α rises and μ=1 and (ii) if α declines and μ=0.

Appendix C The effect of government influenceability on the extensive margin of social capital formation for associations with high productivity members.

When more productive agents join the association, social capital is $S = S\left(\int_{x^a}^{\infty} L_s\,(x)dx\right)$ and

(A14) $\frac{\partial S}{\partial x^a} = -S'L_s(x^a) < 0.$

Thus, to determine the effect of α on S in the extensive margin we solve,

(A15) $\frac{dS}{d\alpha} = \frac{\partial S}{\partial x^a}\left(\frac{\partial x^a}{\partial t}\frac{dt}{d\alpha} + \frac{\partial x^a}{\partial \mu}\frac{d\mu}{d\alpha}\right)$.

Given (A1), (A2) and (A14), we only need $\frac{\partial x^a}{\partial t}$ and $\frac{\partial x^a}{\partial \mu}$ to determine the sign of (A15).

First we derive x^a. The cutoff productivity for joining the association occurs when, $\pi^{nn}(x) = \pi^{jj}(x)$. Solving for x^a,

$(p-t)xf\left(L\ \ , K_p^{**}\right) - rK_p^{**} - wL - \varphi_f = (p-t)xf\left(L_w, K_p^*, K_s(\ \mu, S\ \ )\right) - rK_p^* - w(L-L_s) - \theta_j - \varphi_f$

where K_p^{**} and K_p^* are the optimal private capital levels for nonmembers and members of the association, respectively. Recall that $K_p^{**} > K_p^*$ and L > L_w. Re-arranging the above equation,

(A16) $x^a = \frac{-\theta_j + r\left(K_p^{**} - K_p^*\right) + wL_s}{(p-t)\left(f\left(L\ \ , K_p^{**}\right) - f\left(L_w, K_p^*, K_s(\ \mu, S\ \ )\right)\right)}.$

Since $x^a > 0$, the sign of the numerator and the sign of the denominator are the same. When the association is composed of high productivity firms, the condition $f_{L_w} < f_{K_s}\frac{\partial K_s}{\partial L_s}$ holds, and more output will be produced by the firm who devotes less Lw to production and more to social capital, thus $f\left(L\ \ , K_p^{**}\right) - f\left(L_w, K_p^*, K_s(\ \mu, S\ \ )\right) < 0$. Since the denominator is negative, the numerator is also negative for $x^a > 0$.

Taking the partial derivatives of the cutoff productivity with respect to t and μ, we find,

(A17) $$\frac{\partial x^a}{\partial t} = \frac{(-\theta_j + r(K_p^{**} - K_p^*) + wL_s)\left(f(L\ \ , K_p^{**}) - f\left(L_w, K_p^*, K_s(\ \mu, S\ \ )\right)\right)}{\left((p-t)\left(f(L\ \ , K_p^{**}) - f\left(L_w, K_p^*, K_s(\ \mu, S\ \ )\right)\right)\right)^2} > 0,$$

(A18) $$\frac{\partial x^a}{\partial \mu} = \frac{(-\theta_j + r(K_p^{**} - K_p^*) + wL_s)(p-t) f_{K_S}\frac{\partial K_S}{\partial \mu}}{\left((p-t)\left(f(L\ \ , K_p^{**}) - f\left(L_w, K_p^*, K_s(\ \mu, S\ \ )\right)\right)\right)^2} < 0.$$

We combine the results from (A1), (A2), (A14), (A17) and (A18) to arrive at three cases.

Case C.1 Assume $\delta E_\mu < \Pi_\mu^j$ and $\alpha > \frac{\Pi_\mu^j - \delta E_\mu}{vS}$.

(A19) $$\underset{-}{\frac{dS}{d\alpha}} = \underset{-}{\frac{\partial S}{\partial x^a}}\left(\underset{+}{\frac{\partial x^a}{\partial t}}\underset{-}{\frac{dt}{d\alpha}} + \underset{-}{\frac{\partial x^a}{\partial \mu}}\underset{-}{\frac{d\mu}{d\alpha}}\right);$$

Case C.2 Assume $\delta E_\mu < \Pi_\mu^j$ and $\alpha < \frac{\Pi_\mu^j - \delta E_\mu}{vS}$.

(A20) $$\underset{+}{\frac{dS}{d\alpha}} = \underset{-}{\frac{\partial S}{\partial x^a}}\left(\underset{+}{\frac{\partial x^a}{\partial t}}\underset{-}{\frac{dt}{d\alpha}} + \underset{-}{\frac{\partial x^a}{\partial \mu}}\underset{+}{\frac{d\mu}{d\alpha}}\right) > 0;$$

Case C.3 Assume $E_\mu > \Pi_\mu^j$.

(A21) $$\underset{-}{\frac{dS}{d\alpha}} = \underset{-}{\frac{\partial S}{\partial x^a}}\left(\underset{+}{\frac{\partial x^a}{\partial t}}\underset{-}{\frac{dt}{d\alpha}} + \underset{-}{\frac{\partial x^a}{\partial \mu}}\underset{-}{\frac{d\mu}{d\alpha}}\right).$$

When examining the cases when the association only lobbies or only provides association-produced capital, $\frac{d\mu}{d\alpha} = 0$ in two cases: (i) if α rises and μ=1 and (ii) if α declines and μ=0.

Appendix D. The effect of government influenceability on the extensive margin of social capital formation for associations with low productivity members.

When low productive agents join the association, social capital is $S = S\left(\int_{x^i}^{x^a} L_s\,(x)dx\right)$ and

(A22) $\frac{\partial S^e}{\partial x^a} = S' L_s(x^a) > 0$;

(A23) $\frac{\partial S^e}{\partial x^i} = -S' L_s\left(x^i\right) < 0$.

The effect of α on S in the extensive margin is,

(A24) $\frac{dS^e}{d\alpha} = \frac{\partial S}{\partial x^a}\left(\frac{\partial x^a}{\partial t}\frac{dt}{d\alpha} + \frac{\partial x^a}{\partial \mu}\frac{d\mu}{d\alpha}\right) + \frac{\partial S}{\partial x^i}\left(\frac{\partial x^i}{\partial t}\frac{dt}{d\alpha} + \frac{\partial x^i}{\partial \mu}\frac{d\mu}{d\alpha}\right)$.

Given (A1), (A2), (A22) and (A23), we only need to determine $\frac{\partial x^a}{\partial t}$, $\frac{\partial x^a}{\partial \mu}$, $\frac{\partial x^i}{\partial t}$ and $\frac{\partial x^i}{\partial \mu}$.

First we determine the expression for both productivity cutoffs. The expression for the productivity cutoff between those that join the association and those that do not is similar to (A16). However, the sign of the denominator is different. When the association is composed of low productivity members, the condition $f_{L_w} > f_{K_s}\frac{\partial K_s}{\partial L_s}$ holds, so $f\left(L\ \ , K_p^{**}\right) - f\left(L_w, K_p^*, K_s(\ \mu, S\ \ )\right) > 0$. Since the denominator is positive, the numerator has to be positive as well.

We find,

(A25) $\frac{\partial x^a}{\partial t} = \frac{(-\theta_j + r(K_p^{**} - K_p^*) + wL_s)\left(f(L\ \ , K_p^{**}) - f\left(L_w, K_p^*, K_s(\ \mu S\ \ )\right)\right)}{\left((p-t)\left(f(L\ \ , K_p^{**}) - f\left(L_w, K_p^*, K_s(\ \mu, S\ \ )\right)\right)\right)^2} > 0$;

(A26) $\frac{\partial x^a}{\partial \mu} = \frac{(-\theta_j + r(K_p^{**} - K_p^*) + wL_s)(p-t) f_K \frac{\partial K}{\partial \mu}}{\left((p-t)\left(f(L\ \ , K_p^{**}) - f\left(L_w, K_p^*, K_s(\ \mu, S\ \ )\right)\right)\right)^2} > 0$.

Now we analyze how t and μ affect the cutoff productivity for remaining in the industry. The cutoff productivity for remaining in the industry occurs when $\pi^j(x) = 0$. Solving for x^i we have,

(A27) $x^i = \frac{rK_p^* + w(L - L_s) + \theta_j + \theta_f}{(p-t)f\left(L_w, K_p^*, K_s(\mu, S)\right)}$.

Both the numerator and denominator are positive. The resulting partial derivatives are,

(A28) $\frac{\partial x^i}{\partial t} = \frac{(rK_p^* + w(L - L_s) + \theta_j + \theta_f) f\left(L_w, K_p^*, K_s(\mu, S)\right)}{\left((p-t)f\left(L_w, K_p^*, K_s(\mu S)\right)\right)^2} > 0;$

(A29) $\frac{\partial x^i}{\partial \mu} = -\frac{(rK_p^* + w(L - L_s) + \theta_j + \theta_f)(p-t) f_{K_s} \frac{\partial K_s}{\partial \mu}}{\left((p-t)f\left(L_w, K_p^*, K_s(\mu, S)\right)\right)^2} < 0.$

Using (A1), (A2), (A22), (A23 and (A25) to (A28), we find the following cases:

Case D.1 Assume $\delta E_\mu < \Pi_\mu^j$ and $\alpha > \frac{\Pi_\mu^j - \delta E_\mu}{vS}$.

(A30) $\underset{+}{\frac{dS^e}{d\alpha}} = \underset{+}{\frac{\partial S}{\partial x^a}} \left(\underset{+}{\frac{dx^a}{dt}} \underset{-}{\frac{dt}{d\alpha}} + \underset{+}{\frac{dx^a}{d\mu}} \underset{-}{\frac{d\mu}{d\alpha}} \right) + \underset{-}{\frac{\partial S}{\partial x^i}} \left(\underset{+}{\frac{dx^i}{dt}} \underset{-}{\frac{dt}{d\alpha}} + \underset{-}{\frac{dx^i}{d\mu}} \underset{-}{\frac{d\mu}{d\alpha}} \right)$

Case D.2 Assume $\delta E_\mu < \Pi_\mu^j$ and $\alpha < \frac{\Pi_\mu^j - \delta E_\mu}{vS}$.

(A31) $\underset{+}{\frac{dS^e}{d\alpha}} = \underset{+}{\frac{\partial S}{\partial x^a}} \left(\underset{+}{\frac{dx^a}{dt}} \underset{-}{\frac{dt}{d\alpha}} + \underset{+}{\frac{dx^a}{d\mu}} \underset{+}{\frac{d\mu}{d\alpha}} \right) + \underset{-}{\frac{\partial S}{\partial x^i}} \left(\underset{+}{\frac{dx^i}{dt}} \underset{-}{\frac{dt}{d\alpha}} + \underset{-}{\frac{dx^i}{d\mu}} \underset{+}{\frac{d\mu}{d\alpha}} \right)$

Case D.3 Assume $\delta E_\mu > \Pi_\mu^j$.

(A32) $\underset{+}{\frac{dS^e}{d\alpha}} = \underset{+}{\frac{\partial S}{\partial x^a}} \left(\underset{+}{\frac{dx^a}{dt}} \underset{-}{\frac{dt}{d\alpha}} + \underset{+}{\frac{dx^a}{d\mu}} \underset{-}{\frac{d\mu}{d\alpha}} \right) + \underset{-}{\frac{\partial S}{\partial x^i}} \left(\underset{+}{\frac{dx^i}{dt}} \underset{-}{\frac{dt}{d\alpha}} + \underset{-}{\frac{dx^i}{d\mu}} \underset{-}{\frac{d\mu}{d\alpha}} \right).$

Thus, when low productivity firms join the association, the effect of influenceability on extensive margin for social capital formation is ambiguous.