Optimal Contracts with Hidden Information: an Export Consortium Case

Abstract: This paper analyzes the creation of an export consortium among small and medium sized enterprises (SME) by the State. A hidden information principal agent model is introduced to explain the presence of SME export consortiums. The State (principal) can not observe the random realization of the firm's (agent) disutility from effort. We introduce a setting where the informational asymmetry is post-contractual. The contract specifies the subsidy and effort levels that result from different announcements of the state by the firm. By means of the subsidy payments, the revelation of firms' competitiveness can be achieved. The results obtained are that subsidies are ex post inefficient and they can constraint the participation of the less competitive firms to the export consortium.

Keywords: Cooperation; Principal-agent model; Mechanism design; Small and medium sized enterprises; Export consortiums.

JEL classification: D2, D8, L2.

María Verónica Alderete*

* CONICET-IIESS-UNS(Consejo Nacional de Investigaciones Científicas y Técnicas-Instituto de Investigaciones Económicas y Sociales del Sur-Universidad Nacional del Sur) Department of Economics, 12 de Octubre and San Juan, (8000), Bahía Blanca, Argentine.

1. Introduction

Cooperation plays an important role in the survival of many small and medium sized businesses (Fuller-Love and Thomas 2004; Rauch 2001, Kosacoff and López 2000; Oughton and Whittam 1997). The network structure facilitates the common use of resources. Horizontal cooperation among firms is considered a major factor of profitability and technological innovation in many industries (Bloch 1995; Goyal and Joshi 2003). The adoption of common standards, exchange of information and shared use of common facilities are all examples of cooperation in which firms may increase their profits.

Building public programs to encourage small and medium sized enterprises (SME) networking for export is a main State issue. Export Consortiums are a regular case of alliances for export. In particular, an export consortium can be regarded as a set of interrelated firms that share a common objective and act independently fostering their strengths and minimizing their weaknesses to enter the international market. According to the United Nations Industrial Development Organization (UNIDO) an export consortium is a voluntary association of firms to promote goods and services exports of its members. An export consortium is a formal organization that promotes medium to long term strategic cooperation among firms, and organizes joint activities to facilitate foreign markets access. Most consortia are non-profit entities, and members retain their financial, legal, managerial and commercial autonomy. So, despite their participation in the export consortia, member firms do not give up any control over their business to others. This is the main difference between consortia and other types of strategic alliances.

The types of consortiums can differ according to their objectives:

- Consortiums for promotion: participation in trade fairs or inter-firm missions for catalogue publications, research on international market, legal consulting, financial assistance, and training.

- Consortiums for selling: building investment and marketing plans, market identification, trade mark creation, production process optimization, and contact with supporting international commerce entities.

There are many reasons that foster the development of export consortiums between firms. Most of them are: a) production costs reduction, b) export supply increase to gain international market and diversification, c) less uncertainty in international market operations, d) new business contacts, e) seasonal sales cycle's reduction, f) better positioning in arrangements with public authorities, g) regional economies development. Apart from that, some difficulties arise on export consortiums implementation. For instance, the presence of reciprocal distrust between involved parties and the managers' risk aversion. Besides, there are some main reasons for their failure, such as heterogeneity of firms' sizes, absence of a correct mechanism to select firms (in terms of techniques, financing, commerce, etc), and cultural differences, among others.

Networking can be regarded as a new institution capable of reaching the international market, for instance via export consortiums. However, it is arguable if a network is an institution, as some authors implicitly state. If a network of firms is truly a social institution, it is the simplest and the most primitive. Social institutions are more complex than networks, with a cultural superstructure of rules and a set of stable social relationships (CEPAL 2007).

Empirical evidence on export consortiums in developed countries is pretty varied. In Italy, there are 300 export consortiums, nearly 7000 SME are associated, and its exports represent 9% of the Italian ones. Around 100 of these consortiums are FEDEREXPORT (Italian Federation of Export Consortiums) members. In Spain, the ICEX (Spanish Federation of External Commerce) has supported the creation of about 200 export consortiums between 1985 and 2000. In developing countries, experiences are limited or rare. In Argentine, SME have a reduced export conduct (Yoguel and Boscherini 1996;

Kantis 1994) and we find few empirical studies as a result of inappropriate data bases. In Alderete (2007) some explanatory factors of export conduct in Argentinean small and medium enterprises are explored. The model estimated shows that the export probability is associated with some of the factors described by the theory, finding variables linked to the use of new information and communication technologies (ICT).

To shed light on export consortiums in Argentina, between 1983 and 1991 fifty two export consortiums were built, but most of them disappeared in the nineties as a result of the devaluation. From 1998, informal consortiums were created, around 100 in the whole country that represents 90% of the existing ones, with 750 firms and mainly monosectorials. The Argentinean pound devaluation in 2001 promoted firm's exports, for instance, in the food industry. Lahore SA and Modesto Bertoloni SA were members of the new export model in the milk industry. These firms joined their efforts to export 12 tons of hard reggiano cheese to EEUU in 2005. Their relationship started in APYMEL (Milk SMEs Association) and in the Argendairy export consortium, where small and medium sized enterprises export goal and ewe soft cheese. The firms had to homogenize cheese production, by sharing a qualified cheese consultant. Small and medium enterprises join to reach enough production scale for export. Other similar cheese export group was PYLACOR, from Córdoba Province. There other export consortium experiences in Argentina, for instance, small potatoes producers from Córdoba Province, potato seeds producers from Chubut Province, a small group of meet producers exporting with "trace ability" to a hotel chain in the Canarias Islands. Other export groups' experiences come from Fundación Export-ar and Bank Boston, such as honey, fish, dry fruits and onions export groups. Due to the small size of these producers, building export consortiums should not be considered a risky or anticompetitive practice.

Being a SME does not necessarily mean lack of quality but of quantity. "In the frame of complexity generated by the openness of local productive systems to global markets, the "spontaneous associations" become more rare and difficult. Usually, the obstinate entrepreneur's individualism stops projects that would benefit the productive fabric and its economic community (Boscherini and Poma 2000: page 27)".

This paper employs a theoretical perspective on mechanism design to build associative structures of SME, for instance export consortiums. Through export consortium firms have an opportunity to exploit competitive advantages. Unfortunately, informational asymmetries arise in this business relationship. Even when informational asymmetries do not exist at the time of contracting, the parties to a contract often anticipate that asymmetries will develop sometime after the contract is signed. The principal-agent model is a common framework for studying such a problem. The party who has the bargaining power to design the contract terms is referred to as the principal and the other party the agent. It is usually assumed that the agent possesses private information unobservable by the principal.

In the literature of economic theory there are two distinguishable situations known as the principal agent problem. We can distinguish whether the private information bears on: a) what the agent does, the decision he takes (hidden action). In which the problem is to motivate the agent to take an appropriate hidden action (his effort); b) who the agent is, what his characteristics are (hidden information). This situation consists in motivating the agent to take an appropriate observable action (his report) on the basis of hidden information (Arrow, 1985; Fudenberg and Tirole, 1986; Grossman and Hart, 1993). This information would influence how the principal values the agent's actions. Within the realm of contract theory, relevant situations include a seller who is better informed than a buyer about the cost of producing a specific good.

In each of these situations, having private information gives the player possessing it a potential strategic advantage in his dealings with the other player. In both cases, the principal faces the problem of providing incentives for the agent to take the desired action, but the solution methods turn out to be drastically different.

In general these informational problems prevent society from achieving the first best allocation of resources that could be possible in a world where all information would be common knowledge.

Some authors (Hart and Holmstrom, 1987) use moral hazard to refer to either of the hidden action or hidden information variants of the principal agent problem. Here, however, we use the term in the original sense. Although many real world situations combine moral hazard and hidden information problems, the hidden action- hidden information dichotomy serves as a useful tool for a better understanding of this model. Our purpose is to consider the problem of hidden information lonely. In order to reach an efficient use of economic resources, some information rent must be given up to the privately informed agent. At the optimal second-best contract, the principal trades off his desire to reach allocative efficiency against the costly information rent given up to the agent to induce information revelation. Implicit here is the idea that there exists a legal framework for this contractual relationship. The limitation of the model is that we avoid that monitoring the effort level exerted by the agent is a common moral hazard problem.

We consider the hidden information case as a special problem in export consortiums where firms do not know their true costs of exporting or competitiveness levels (disutility of effort), although the firm takes an observable action (effort): production for export. For most of firms, exporting by means of an export consortium is their first experience in the international market. Many firms could not individually achieve the international market due to their reduced scale of production. The cost of exporting information is privately known once the consortium is exporting and the contract signed. This hidden information is especially prevalent in the international market, where entrepreneurs may not have a proven track record. The cost of exporting goes beyond the production cost, which the firm may probably know, and includes, managerial and promotion costs.

For example, consider a firm who has better information about his exporting costs than the principal. By behaving as if he had high costs, the firm can seek to induce the principal to pay him more than she would if she knew he had low costs. That is, he has an incentive to use his superior information to capture an "information rent." Of course, the principal is aware of this possibility; so, if she has the right to propose the contract between them, she will propose a contract that works to reduce this information rent.

The problem addressed in this paper is faced by manufacturers of many industries with an export activity. The paper is organized as follows. In section 2, we develop a hidden information principal agent model to determine the optimal contracts for each type of the export consortium member firms. Two theoretical cases are analyzed in the corresponding subsections. In section 3, we elaborate a simulation exercise to illustrate the results obtained by the theoretical model.

Usually, the cooperative behavior of small and medium sized firms is described as a rational, conscious and planned process. If this were the case, there should be a model capable of identifying those significant factors on inter-firm cooperation propensity. By studying export consortiums among small and medium enterprises using a hidden information principal agent model, this paper contributes to the economic theory of networks in SME.

2. The Model

The State (principal) is searching firms (agents) to build an export consortium. The firms' level of effort, called e, is fully observable (for instance, production for export that fits the international requirements and the consortium profile). What is not observable after the contract is signed is the random realization of the firm's disutility from effort. For example, a firm can become aware of having networking skills and competitiveness that turn a high effort into a relative low disutility of effort.

To avoid restrictions coming from the analysis with a continuum of types, we focus in a simple model with two types of firms: the competitive (firm h) and the non-competitive (firm l) ones.

There are different types of firms according to their competitiveness level, θi, which can take two possible values: θ_l are the less competitive firms in the international market and θ_h are the most competitive ones. In this case, $\theta_h > \theta_l$ and Prob $(\theta_h) = \lambda \in (0,1)$.

We suppose that the level of effort e can be measured by a one-dimensional variable $e \in (0,\infty)$

The export consortium earns benefits equally distributed between the State (that manages the consortium) and the participant firms. Gross benefits, excluding any subsidy payment to the participant firm, are a simple deterministic function of effort, so that $\pi(e_i) = \delta e_i^{1/2}$, where $\delta \in (0,1)$ represents the proportion of benefit taking by the consortium. It is verifiable that $\pi(0) = 0; \pi'(e) > 0$ and $\pi''(e) < 0 \; \forall e$.

The firm is an expected utility maximizer whose Bernoulli utility function over subsidies and effort, $u(s,e,\theta)$ depends on a state of nature θ that can be discovered after the contract is signed and that only the firm can observe. S represents the subsidy offered by the principal, which is an income to the consortium participating firm.

We assume that $\theta \in R$ and we focus on a special form of $u(s,e,\theta)$ that is widely used in the literature.

$$u(s,e,\theta) = v(s - g(e,\theta))$$

The function $g(e,\theta)$ measures the disutility of effort in monetary units. In particular, we assume that $g(e,\theta) = e^2/\theta$, so that $g(0,\theta) = 0 \; \forall\theta$ and the following properties are verified:

$$g_e(e,\theta) > 0 \text{ if e>0,}$$
$$= 0 \; if \; e = 0$$

$$g_{ee}(e,\theta) > 0 \;\; \forall e$$
$$g_\theta(e,\theta) < 0 \;\; \forall e$$
$$g_{e\theta}(e,\theta) < 0 \; if \; e > 0$$
$$= 0 \; if \; e = 0$$

Thus, the firm is averse to increases in effort and this aversion is larger the greater the current level of effort. We also assume that the firm is risk averse, with v"(.)<0.

$$u(s,e,\theta) = \ln((1-\delta)e^{1/2} + s - e^2/\theta$$

Where (1-δ) represents the proportion of benefits emerged from the export consortium received by the participant firms.

The risk neutral State should insure the firm against fluctuations in his income. A contract that maximizes the surplus available in the relationship (and hence the State's payoff) must make the level of firm effort responsive to the disutility incurred by the firm, that is, to the state θ. To fix ideas, we first illustrate how these goals are accomplished when θ is observable; we then turn to an analysis of the problems that arise when θ is observed only by the firm.

A. Case: θ observable

If θ is observable, a contract can directly specify the firm's level of effort and subsidy, contingent in each realization of θ. Thus, a complete information contract consists of two pairs of subsidy-effort: $(s_h, e_h) \in RxR_+$ for state θ_h and $(s_l, e_l) \in RxR_+$ for state θ_l. The State optimally chooses these pairs to solve the following problem:

$$\text{Max Up} = \lambda(\delta e_h^{1/2} - s_h) + (1-\lambda)(\delta e_l^{1/2} - s_l) \quad (1)$$

$$s_l, e_l \geq 0$$
$$s_h, e_h \geq 0$$

Subject to:

$$U_h = \ln((1-\delta)e_h^{1/2} + s_h - e_h^2/\theta_h) = 0 \quad (2)$$

(Reservation utility constraint of the most competitive firm)

$$U_l = \ln((1-\delta)e_l^{1/2} + s_l - e_l^2/\theta_l) = 0 \quad (3)$$

(Reservation utility constraint of the less competitive firm)

Where $U_h = U_l = 0$ represents both types of firm's reservation utility level, that is, the utility level they must receive to accept the consortium's contract. We suppose that firms' participation will provide them the same level of utility reach outside. The participation constraint shows that the State can not force them to participate, so the expected utility of each firm must be at least equal to its reservation utility.

Solution:

From constraints (2) and (3) we deduce:

$\ln((1-\delta)e_i^{1/2} + s_i - e_i^2/\theta_i) = 0$, if $(1-\delta)e_i^{1/2} + s_i - e_i^2/\theta_i = 1$, then

$$s_l = 1 + e_l^2/\theta_l - (1-\delta)e_l^{1/2} \quad (4)$$

$$s_h = 1 + e_h^2/\theta_h - (1-\delta)e_h^{1/2} \quad (5)$$

Replacing these expressions in the principal's maximizing function we obtain:

$$\text{Max } Up = \lambda(\delta e_h^{1/2} - 1 - e_h^2/\theta_h + (1-\delta)e_h^{1/2}) + (1-\lambda)(\delta e_l^{1/2} - 1 - e_l^2/\theta_l + (1-\delta)e_l^{1/2}) \quad (6)$$

$$e_h, e_l > 0$$

$$\frac{\partial Up}{\partial e_h} = \lambda(\delta 1/2.e_h^{-1/2} - 2e_h/\theta_h + (1-\delta)1/2.e_h^{1/2}) = 0 \quad (7)$$

$$\frac{\partial Up}{\partial e_l} = \lambda(\delta 1/2.e_l^{-1/2} - 2e_l/\theta_l + (1-\delta)1/2.e_l^{1/2}) = 0 \quad (8)$$

From (7) and (8) we obtain $e_h = (1/4\theta_h)^{2/3}$; $e_l = (1/4\theta_l)^{2/3}$

Substituting these terms into (4) and (5) we get:

$s_h = 1+\theta_h^{1/3}(1/4)^{4/3} - (1-\delta)(1/4.\theta_h)^{1/3} = 1+(1/4.\theta_h)^{1/3}(0.16-(1-\delta)0.63)$

$s_l = 1+\theta_l^{1/3}(1/4)^{4/3} - (1-\delta)(1/4.\theta_l)^{1/3} = 1+(1/4.\theta_l)^{1/3}(0.16-(1-\delta)0.63)$

Since $\theta_h > \theta_l$, then $e_h > e_l$ and $s_h > s_l$.

Because the marginal cost of effort is less in state θ_h than in state θ_l, the contract determines that the effort must be superior in state θ_h For the subsidies to be different ($s_h = s_l \neq 1$) and effort dependent, it must be verified that (1-δ) ≤ 0,25 Thus, firms must get 25% of the consortium's benefits as much.

The menu of contracts with θ observable is:

$(s_h, e_h) = (1+\theta_h^{1/3}(1/4)^{4/3} - (1-\delta)(1/4.\theta_h)^{1/3}; (1/4\theta_h)^{2/3})$

$(s_l, e_l) = (1+\theta_l^{1/3}(1/4)^{4/3} - (1-\delta)(1/4.\theta_l)^{1/3}; (1/4\theta_l)^{2/3})$

In a principal-agent model, with an observable state variable θ, the optimal contract involves an effort level e_i^* in state θ_i such that u'(e_i^*) = g_e (e_i^*, θ_i) and fully insures the firm, setting its subsidy in each state θ_i at the level s_i^* such that v(s_i^* - g(e_i^*, θ_i)) = $\overline{u}$.

Thus, with a strictly risk adverse firm, a first best contract is characterized by two basic features: first, the State fully insures the firm against any risk; second, the State requires the firm to produce to the point at which the marginal benefit of effort exactly equals its marginal cost. Because the marginal cost of effort is lower in state θ_h than in state θ_l, the contract calls for more effort in state θ_h.

B. Case: θ Non observable

The desires both to insure the risk-averse firm and to elicit the proper levels of effort come into conflict when informational asymmetries are present. Suppose, for example, that the State offers the firm a contract such as the one showed in the last figure, and relies that the firm will reveal its true state voluntarily. However, in state θ_h the firm prefers contract (s_l^*, e_l^*) to (s_h^*, e_h^*). As a result, in state θ_h firm will lie to the consortium, claiming that it is actually state θ_l And this misrepresentation causes a benefit loss to the consortium.

Consequently, looking for an optimal contract is a key matter.

The revelation principle greatly simplifies the analysis of these types of contracting problems. According to this principle, the State can without any loss restricts contracts to the following form:

- After the state is realized, the firm is required to announce which state has occurred.
- The contract specifies an outcome (s(θ),e(θ)) to each possible announcement θ.
- In every state, the firm finds it optimal to report the state truthfully.

This principle allows us to write the State's problem as follows:

$$\text{Max Up} = \lambda(\delta e_h^{1/2} - s_h) + (1-\lambda)(\delta e_l^{1/2} - s_l) \quad (9)$$

Subject to:

$$\text{(i) } U_l = \ln((1-\delta)e_l^{1/2} + s_l - e_l^2/\theta_l) \geq 0 \quad (10)$$

(Reservation utility constraint of the less competitive firm)

$$\text{(ii) } U_l = \ln((1-\delta)e_h^{1/2} + s_h - e_h^2/\theta_h) \geq 0$$

(Reservation utility constraint of the most competitive firm)

$$\text{(iii) } U(s_h, e_h, \theta_h) \geq u(s_l, e_l, \theta_h)$$
$$\ln((1-\delta)e_h^{1/2} + s_h - e_h^2/\theta_h) = \ln((1-\delta)e_l^{1/2} + s_l - e_l^2/\theta_h) \quad (11)$$

(Incentive Compatibility Constraint of the most competitive firm).

$$\text{(iv) } U(s_l, e_l, \theta_l) \geq u(s_h, e_h, \theta_l)$$
$$\ln((1-\delta)e_l^{1/2} + s_l - e_l^2/\theta_l) = \ln((1-\delta)e_h^{1/2} + s_h - e_h^2/\theta_l)$$

(Incentive Compatibility Constraint of the less competitive firm).

The pairs (s_l, e_l) and (s_h, e_h) that the contract specifies are now the subsidy and effort levels that result from different announcements of the state by the firm, that is, the outcome if the firm announces that the state is θ_l is (s_i, e_i). Constraints (i) and (ii) make up the reservation utility (or individual rationality) constraint for the infinitely risk-averse firm, if it is to accept the contract, it must be guaranteed a utility of at least $\overline{u}$ in each state, that represents the reservation utility level, as in the case of observable θ.

Constraints (iii) and (iv) are the incentive compatibility (or truth telling or self selection) constraints for the firm in states θ_h and θ_l respectively. These constraints imply that the firm will be induced to truth telling as long as the contract generates a lower utility if a deviation from the truth takes place. In (iii) the firm's utility in state θ_h is $\ln((1-\delta)e_h^{1/2} + s_h - e_h^2/\theta_h)$ if it tells the truth, but it becomes $\ln((1-\delta)e_l^{1/2} + s_l - e_l^2/\theta_h)$ if it lies and claims that it is state θ_l. Thus, the firm will tell the truth if $\ln((1-\delta)e_h^{1/2} + s_h - e_h^2/\theta_h) \geq \ln((1-\delta)e_l^{1/2} + s_l - e_l^2/\theta_h)$. Same analysis corresponds to constraint (iv).

Furthermore, because constraints (ii) and (iv) are redundant[1], the previous problem simplifies. In any optimal contract, we see:

(i) $e_l \leq e_l^*$, that is, the firm's effort level in state θ_l is no more than the level that would arise if θ were observable.

(ii) $e_h = e_h^*$, that is, the firm's effort level in state θ_h is exactly equal to the level that would arise if θ were observable.

Consequently, the contract to be offered to the most competitive firm will lie in a region, where the less competitive firm doesn't have incentives to lie (would be worse by claiming it's the most competitive) and the most competitive firm would be better.

$$\text{Max Up} = \lambda(\delta e_h^{1/2} - s_h) + (1-\lambda)(\delta e_l^{1/2} - s_l) \quad (12)$$

Subject to:

$$U_l = \ln((1-\delta)e_l^{1/2} + s_l - e_l^2/\theta_l) = 0 \quad (13)$$

(Reservation utility constraint of the less competitive firm).

[1] An analysis of this conclusion is presented in Mas-Colell and Whinston (1995), p 495.

$$\ln((1-\delta)e_h^{1/2} + s_h - e_h^2/\theta_h) = \ln((1-\delta)e_l^{1/2} + s_l - e_l^2/\theta_h) \quad (14)$$

(Reservation compatibility constraint of the most competitive firm).

Given any subsidy-effort (s_l, e_l) pair, the State's problem is to find (s_h, e_h) that maximizes its profit in state θ_h.

We suppose that constraints (13) y (14) must bind, such that:

From (12) $\ln((1-\delta)e_l^{1/2} + s_l - e_l^2/\theta_l) = 0$, then $s_l = 1 + e_l^2/\theta_l - (1-\delta)e_l^{1/2}$

From (13) $(1-\delta)e_h^{1/2} + s_h - e_h^2/\theta_h = (1-\delta)e_l^{1/2} + s_l - e_l^2/\theta_h$

Replacing s_l in (13) follows:

$$s_h = 1 + e_l^2/\theta_l - e_l^2/\theta_h + e_h^2/\theta_h - (1-\delta)e_h^{1/2}$$

Substituting s_h *and* s_l just obtained into the principal's maximizing function we obtain:

Max (15)

$$Up = \lambda(\delta e_h^{1/2} - 1 - e_l^2/\theta_l + e_l^2/\theta_h - e_h^2/\theta_h + (1-\delta)e_h^{1/2}) + (1-\lambda)(\delta e_l^2 - 1 - e_l^2/\theta_l + (1-\delta)e_l^{1/2})$$

$$\frac{\partial Up}{\partial e_h} = \lambda(1/2.e_h^{-1/2} - 2e_h/\theta_h) = 0 \quad (16)$$

$$\frac{\partial Up}{\partial e_l} = \lambda(-2e_l/\theta_l + 2e_l/\theta_h) + (1-\lambda)(1/2e_l^{-1/2} - 2e_l/\theta_l) = 0 \quad (17)$$

From (16) $e_h = (1/4\theta_h)^{2/3}$

From (17) $e_l = \left[\frac{(1-\lambda)}{4(1/\theta_l - \lambda/\theta_h)}\right]^{2/3}$

Each type's subsidy is inferred from those previous levels of effort, that is:

$$s_h = 1 + (1/4)^{4/3}\theta_h^{1/3} + (1/\theta_l - 1/\theta_h)\left[\frac{(1-\lambda)}{4(1/\theta_l - \lambda/\theta_h)}\right]^{4/3} - (1-\delta)\left[\frac{(1-\lambda)}{4(1/\theta_l - \lambda/\theta_h)}\right]^{1/3}$$

$$s_l = 1 + 1/\theta_l\left[\frac{(1-\lambda)}{4(1/\theta_l - \lambda/\theta_h)}\right]^{4/3} - (1-\delta)\left[\frac{(1-\lambda)}{4(1/\theta_l - \lambda/\theta_h)}\right]^{1/3}$$

In case θ is not observable $e_h > e_l$ y $s_h > s_l \ \forall\ \delta$.

The solution occurs in the point of tangency between the most competitive firm's indifference curve and the state's isoprofit curve.

Finally, in the hidden information principal agent model with an infinitely risk-averse firm the optimal contract sets the level of effort (production for export) in state θ_h (most

competitive firms) at its first best (full observability) level e_h^*. Moreover, at the state of less competitiveness θ_l, the level of production for export is distorted downward from its first best level e_l^*. In addition, the firm is inefficiently insured, receiving an utility greater than his reservation utility level in the most competitive state, and an utility equal to its reservation level in the less competitive state. The State's expected payoff is strictly lower than the expected payoff he receives when the competitiveness state is observable, while the infinitely risk averse firm's expected utility is the same as when the state is observable. We must observe that while the outcome here is Pareto inefficient, it is a constrained Pareto Optimum, there is no allocation that Pareto dominates this outcome and can be achieved by a central authority who can not observe the level of competitiveness of the firm.

3. Simulation exercise

In this section, we simulate the results acquired by the hidden information model. At first, we state some possible values to the parameters according to the assumptions of the model. Then, we simulate the contract under full observability of the competitiveness level and then under nonobservability.

A. Case θ Observable

In this section, we simulate the results acquired by the hidden information model. At first, we state some possible values to the parameters according to the assumptions of the model. Then, we simulate the contract under full observability of the competitiveness level and then under nonobservability.

First, we take the definitions of (s_h, e_h) and (s_l, e_l) from section 2.1. By defining possible values of θ_h and θ_l we get possible values of the contracts. As can be seen in Table 1, sh>sl for all eh>el. Moreover, to get positives values of the principal expected utility we must constrain θ_h and θ_l

Next, we take a pair of possible values of the state levels, for instance θh=10; θl=9.5 and observe others parameters changes:

Table 1 – Levels of subsidy payments (S) and efforts (e) as functions of states θ_h and θ_l

δ	θh	θl	eh	el	λ	Sh	Sl	Uh	Ul	Up
0.8	0.2	0.1	0.136	0.085	0.5	1.018	1.015	-0.633	-0.708	-0.671
0.8	0.8	0.5	0.342	0.250	0.5	1.029	1.025	-0.427	-0.507	-0.467
0.8	2	1	0.630	0.397	0.5	1.040	1.031	-0.246	-0.387	-0.316
0.8	5	4	1.160	1.000	0.5	1.054	1.050	-0.057	-0.105	-0.081
0.8	6	5	1.310	1.160	0.5	1.057	1.054	-0.027	-0.065	-0.046
0.8	8	7	1.587	1.452	0.5	1.063	1.060	0.008	-0.017	-0.004
0.8	10	9	1.842	1.717	0.5	1.068	1.066	0.018	0.000	0.009
0.8	12	11	2.080	1.963	0.5	1.072	1.070	0.010	-0.005	0.003
0.8	14	13	2.305	2.194	0.5	1.076	1.074	-0.013	-0.025	-0.019

Source: The Author.

a) Changes in δ

From Table 2, we can infer that if and only if δ≥0.8 then sh>sl, for all eh>el.

Table 2 – Effect of changes in δ (proportion of benefits taken by the State) on the levels of subsidy payments and efforts

δ	eh	El	λ	Sh	Sl	Uh	Ul	Up
0.1	1.842016	1.78009184	0.2	0.117814	0.132769	0.017907	0.000651	0.004102
0.2	1.842016	1.78009184	0.2	0.253535	0.26619	0.017907	0.000651	0.004102
0.3	1.842016	1.78009184	0.2	0.389256	0.39961	0.017907	0.000651	0.004102
0.4	1.842016	1.78009184	0.2	0.524977	0.53303	0.017907	0.000651	0.004102
0.5	1.842016	1.78009184	0.2	0.660698	0.66645	0.017907	0.000651	0.004102
0.6	1.842016	1.78009184	0.2	0.796419	0.79987	0.017907	0.000651	0.004102
0.7	1.842016	1.78009184	0.2	0.93214	0.93329	0.017907	0.000651	0.004102
0.8	1.842016	1.78009184	0.2	1.06786	1.06671	0.017907	0.000651	0.004102
0.9	1.842016	1.78009184	0.2	1.203581	1.20013	0.017907	0.000651	0.004102

Source: The Author.

b) Changes in λ

In Table 3, we observe that the principal's utility Up is an increasing function of λ. Thus, the larger the probability of being a high competitive firm (probability near one) is, the larger the State expected utility will be.

Table 3 – Effect of changes in λ (Probθ= θ_h) on the levels of subsidy payments and efforts

δ	eh	El	λ	Sh	Sl	Uh	Ul	Up
0.8	1.842016	1.78009184	0.1	1.06786	1.06671	0.017907	0.000651	0.002376
0.8	1.842016	1.78009184	0.2	1.06786	1.06671	0.017907	0.000651	0.004102
0.8	1.842016	1.78009184	0.3	1.06786	1.06671	0.017907	0.000651	0.005827
0.8	1.842016	1.78009184	0.4	1.06786	1.06671	0.017907	0.000651	0.007553
0.8	1.842016	1.78009184	0.5	1.06786	1.06671	0.017907	0.000651	0.009279
0.8	1.842016	1.78009184	0.6	1.06786	1.06671	0.017907	0.000651	0.011004
0.8	1.842016	1.78009184	0.7	1.06786	1.06671	0.017907	0.000651	0.01273
0.8	1.842016	1.78009184	0.8	1.06786	1.06671	0.017907	0.000651	0.014455

Source: The Author.

B. Case θ Non observable

In this case, we take the definitions of (s_h, e_h) and (s_l, e_l) from section 2.2. Following the previous process, we determine possible values of θ_h and θ_l. By setting δ=0.8 and λ=0.5 as parameters, we observe (Table 4) that since θh>θl, then eh>el and sh>sl.

Table 4 – Levels of subsidy payments and efforts when δ=0.8 and λ=0.5

δ	λ	θh	Θl	eh	el	Sh	Sl	Up
0.8	0.5	9.55	9.5	1.786332	1.773906	1.069492	1.06486	0.000191
0.8	0.5	9.65	9.6	1.798781	1.786397	1.069707	1.065106	0.003693
0.8	0.5	9.75	9.7	1.811186	1.798844	1.06992	1.06535	0.007171
0.8	0.5	9.85	9.8	1.823549	1.811249	1.070131	1.065592	0.010624
0.8	0.5	9.95	9.9	1.835871	1.823611	1.070341	1.065833	0.014055
0.8	0.5	10.05	10	1.848151	1.835931	1.070551	1.066071	0.017462
0.8	0.5	10.15	10.1	1.86039	1.848211	1.070759	1.066308	0.020847

0.8	0.5	10.25	10.2	1.872589	1.860449	1.070965	1.066544	0.024209
0.8	0.5	10.35	10.3	1.884749	1.872648	1.071171	1.066778	0.027549
0.8	0.5	10.45	10.4	1.89687	1.884807	1.071375	1.06701	0.030868
0.8	0.5	10.55	10.5	1.908952	1.896927	1.071578	1.06724	0.034166
0.8	0.5	10.65	10.6	1.920996	1.909008	1.07178	1.067469	0.037443
0.8	0.5	10.75	10.7	1.933002	1.921051	1.071981	1.067697	0.040699
0.8	0.5	10.85	10.8	1.944971	1.933057	1.072181	1.067923	0.043935
0.8	0.5	10.95	10.9	1.956904	1.945025	1.07238	1.068147	0.047151
0.8	0.5	11.05	11	1.9688	1.956957	1.072578	1.06837	0.050347
0.8	0.5	11.15	11.1	1.98066	1.968853	1.072774	1.068592	0.053524

Source: The Author.

4. Graphic example

On the space of two dimensions (subsidy-effort) we illustrate the optimal contracts under full observability and under non-observability of the state, subject to the following conditions: θh=10; θl=9.5; δ=0.8 and λ=0.5.

A. Case θ Observable

From the reservation utility constraint of each type of firm, we deduce $s_l = 1 + \frac{e_l^2}{9.5} - (1-\delta)e_l^{1/2}$ and $s_h = 1 + \frac{e_h^2}{10} - (1-\delta)e_h^{1/2}$. Taking the effort levels as given, we deduce the subsidy payment to each type of firm. We search for the tangency point between the firm indifference curve and the State utility for each possible values of θ_h and θ_l

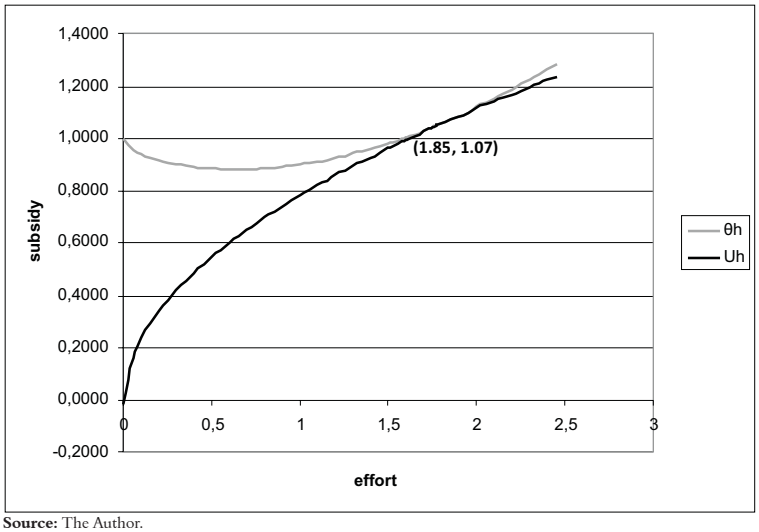
In Table 5 and Figures 1 and 2, we observe that the subsidy payment and the principal utility in state θ_l are equal (1.0607) at the level of effort 1.76. Besides, in state θ_h tangency occurs at the level of effort 1.85, where subsidy and utility are equal to 1.0702, which is larger than the level obtained in state θ_l.

Table 5 – The optimal contract with full observability of θ (grey cells)

e	Sh	Sl	Uh	Ul
0	1.0000	1.0000	-0.0179	-0.0007
0.05	0.9555	0.9555	0.1610	0.1782
0.1	0.9378	0.9378	0.2351	0.2523
0.15	0.9248	0.9249	0.2919	0.3092
0.2	0.9146	0.9148	0.3399	0.3571
0.25	0.9063	0.9066	0.3821	0.3993
0.3	0.8995	0.8999	0.4203	0.4375
0.4	0.8895	0.8904	0.4881	0.5053
0.45	0.8861	0.8872	0.5187	0.5360
0.5	0.8836	0.8849	0.5478	0.5650
1	0.9000	0.9053	0.7821	0.7993
1.7	1.0282	1.0434	1.0252	1.0424
1.75	1.0417	1.0578	1.0404	1.0576
1.76	1.0444	**1.0607**	1.0434	**1.0607**
1.8	1.0557	1.0727	1.0554	1.0727
1.85	**1.0702**	1.0882	**1.0702**	1.0875
1.9	1.0853	1.1043	1.0848	1.1021
1.95	1.1010	1.1210	1.0992	1.1165
2	1.1172	1.1382	1.1135	1.1307

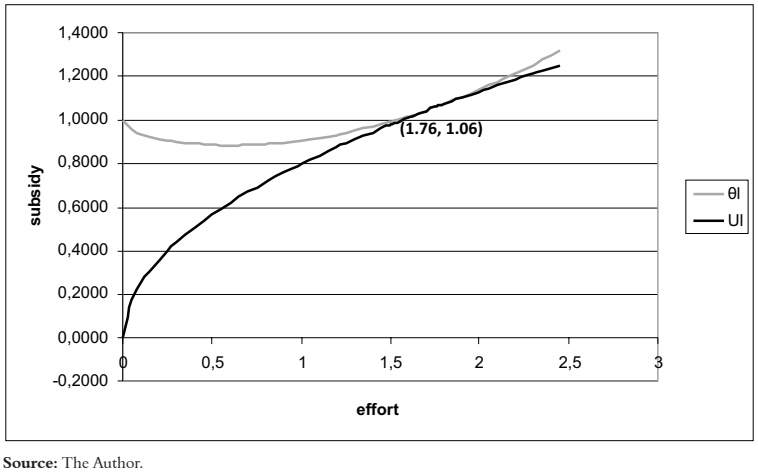
Source: The Author.

Fig. 1 – The optimal contract (s_h, e_h) with full observability of θ.



Source: The Author.

Fig. 2 – The optimal contract (s_l, e_l) with full observability of θ.



Source: The Author.

B. Case θ Non observable

In this case, we analyze the problem under non-observability of the state. Thus, the definitions of sh and sl come from the constraints of the problem, that is, the participation constraint from the less competitive firm and the incentive compatibility constraint from the most competitive firm. In this particular case, for θl=9.5, we get $s_h = s_l = 1 + e^2 / 9.5 - 0.2.e^{1/2}$.

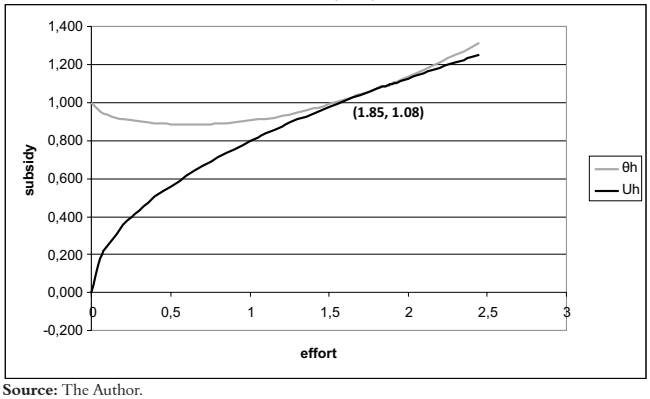
From Table 6 and Figures 3 and 4, we observe that the subsidy payment and the principal utility in state θ_l are equal (1.088) at the level of effort 1.85. Besides, in state θ_h tangency occurs at the level of effort 1.9, where subsidy and utility are equal to 1.10, which is larger than the level obtained in state θ_l.

Table 6 – The optimal contract with non observability of θ (grey cells)

e	sh	sl	Uh	Ul
0	1.000	1.000	-0.002	-0.0001
0.05	0.956	0.956	0.177	0.1788
0.1	0.938	0.938	0.251	0.2528
0.15	0.925	0.925	0.308	0.3097
0.25	0.907	0.907	0.398	0.3999
0.5	0.885	0.885	0.563	0.5656
1	0.905	0.905	0.798	0.7999
1.25	0.941	0.941	0.892	0.8943
1.5	0.992	0.992	0.978	0.9727
1.75	1.058	**1.058**	1.056	**1.058**
1.8	1.073	1.073	1.071	1.0732
1.85	**1.088**	1.088	**1.088**	1.086
1.86	1.091	1.091	1.089	1.0909
1.87	1.095	1.095	1.092	1.0938
1.88	1.098	1.098	1.095	1.0968
1.89	1.101	1.101	1.098	1.0997
1.95	1.121	1.121	1.115	1.1170
2	1.138	1.138	1.129	1.1312

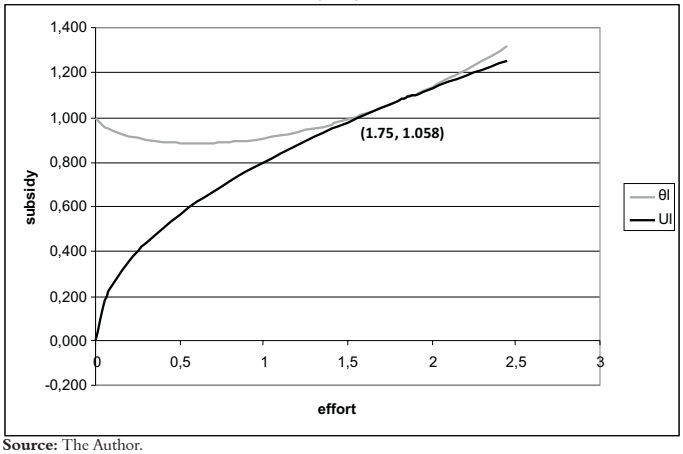
Source: The Author.

Fig. 3 – The optimal contract (s_l, e_l) when θ is not fully observable.



Source: The Author.

Fig. 4. The optimal contract (s_l, e_l) when θ is not fully observable.



Source: The Author.

5. Final Remarks

In the second approach the Liu, Song and Romilly's (1997) methodology is used to test if any causal relationship between integrated series exists, but using the Hatemi-J lag's test in order to estimate the correct VAR's order. As stated, the first main study's objective is to examine the causal relationship -and its direction- between the Mexican GDP and tourism arrivals. Moreover the second aim is to prove the relationship between private consumption and tourism arrivals.

Export consortiums are considered one of the main tools for inter-firm cooperation, as they can increase SME exports' competitiveness and consolidate its products and services in the foreign markets, by reducing internationalization processes costs.

Even though the concept of networks between SME for export is pretty clear, building a successful export consortium is not an easy task. The attempts to establish group of firms for export use to fail, due to lack of information and skills. Developing countries, in particular, do not have enough experience in consortiums and are embedded in regulatory and institutional weak frames to promote export consortiums between small and medium enterprises.

This paper develops a mechanism design to build associative structures of SME, especially export consortiums. By participating in export consortium firms can exploit its competitive advantages. According to this hidden information principal agent model, the State can not observe each firm's disutility from effort. Therefore, subsidy payments can accomplish the objective of revealing the participants' competitiveness levels.

Although hidden information models are not a new theoretical tool, the paper's contribution consists in trying to explain SME cooperation for export from a different theoretical perspective. Politic implications of the paper are good, since it establishes the role of the State in promoting cooperation among firms for export. Moreover, we show that subsidy payments are ex-post inefficient as a result of the screening effect, if we assume the presence of firms with different competitiveness levels. A possible outcome of the model is that it insures that only the most competitive firms would be members of the export consortium. Even though avoiding less competitive firms participation could be positive from a planner's point of view, it constraints the smaller firms (that are almost usually the less competitive firms) opportunities of networking for export. These firms suffer from a negative feedback: less competitiveness leads to fewer subsidies for export decreasing their incentives to network and finally causing lower levels of competitiveness.

Besides, the increasing role of SMEs in the global economy raises a number of issues for industrial organization theory and policy. A question of central importance concerns the contribution of the export consortium to industrial efficiency and competitiveness.

Due to the fact that export consortiums are a particular inter-firm cooperation case, one of the future objectives of the research consist in developing some model where the State do not take place and compare its results with this one.

References

Alderete, M.V., Nuevas Tecnologías de la Información y de la Comunicación: Factores explicativos de la conducta exportadora en Argentina, *Revista Economía y Sociedad*, Universidad Michoacana de San Nicolás de Hidalgo, México, Año XIII, Nº20, Julio-Dic. 2007.

Arrow, K. "The Economics of Agency." In Pratt, J. and Zeckhauser, R. (1985), *Principal and Agents: The Structure of Business*. Boston: Harvard Business School Press.

Boscherini, F. and Poma, L, Chapter 1: "Más allá de los distritos industriales", in Poma, L. Boscherini, F. y Yoguel, G. (2000), *Territorio, conocimiento y competitividad de las empresas: el rol de las instituciones en el espacio global*, Davila editores, 2000.

Boschma, R.A. and Lambooy, J.G., Knowledge, market structure, and economic coordination: Dynamics of industrial districts, *Growth and Change*, vol. 33, 2002, pp 291-311.

Bloch, F., Endogenous structures of association in oligopolies, *RAND Journal of Economics*, Vol.26, Nº3, 1995, pp. 537-556.

CEPAL, Cinco piezas de política de desarrollo productivo, División de desarrollo productivo y empresarial, Serie Desarrollo productivo Nº 176, 2007, Naciones Unidas.

Bezchinsky, G., Internacionalización y desarrollo de mercados, Chapter 4, Book: *Aportes para una estrategia PyME en la Argentina,* 2003, CEPAL.

Fudenberg, D. and Tirole, J., A signal-Jamming theory of predation, *Rand Journal of Economics*, 17, 1986, pp 366-376.

Fuller-Love, N. and Thomas, E., Networks in small manufacturing firms, *Journal of Small Business and Enterprise Development,* Vol. 11, Nº 2 , 2004, pp 244-253.

Gimeno, J., Competition within and between networks: the contingent effect of competitive embeddedness on alliance formation, *Academy of Management Journal,* vol 47, N 6, 2004.

Goyal, S. and Joshi, S., Networks of collaboration in oligopoly, *Games and Economic Behavior*, 43, 2003, pp 57-85.

Grossman, S. and Hart, O., An analysis of the principal-agent problem, *Econometrica*, 51, 1983, pp 7-45.

Hart, O. and Holmstrom, B., "The theory of contracts" in *Advances in Economic Theory, Fifth world congress*, New York: Cambridge University Press, 1987.

Kantis, H., El proceso exportador en las pequeñas y medianas firmas: principales restricciones y elementos para el diseño de una política de estímulo, PNUD and Secretaría de Comercio e Inversiones y Subsecretaría de Política Económica, Project ARG/91/019, 1994.

Kosacoff, B. and López, A., Cambios organizacionales y tecnológicos en las Pequeñas y Medianas Empresas. Representando el estilo de Desarrollo Argentino, *Revista de la Escuela de Economía y Negocios*, N 4, 2000.

Laffont, J.-J. and D. Martimort, *The Theory of Incentives*, Princeton University Press, 2002.

Mas-Colell, A.; Whinston, M.D; Green, J.R. *Microeconomic Theory,* Oxford University Press, 1995.

Oughton, C. and Whittam, G., Competition and cooperation in the small firm sector, *Scottish Journal of Political Economy*, vol.44, Nº1, 1997.

Rauch, J., Business and Social Networks in International Trade, *Journal of Economic Literature*, vol. 39, Nº. 4, 2001, pp. 1177-1203.

Salanié B., *The Economics of Contracts*, A Primer, MIT, Cambridge MA, 1997.

Sappington, D. E., Incentives in Principal-Agent Relationships, *The Journal of Economic Perspectives*, Vol. 5, No. 2, 1991, pp. 45-66.

Xu, Z; Lin, J. and Lin, D., Networking and innovation in SMEs: evidence from Guangdong Province, China, *Journal of Small Business and Enterprise Development*, vol. 15, Nº 4, 2008, pp. 788-801.

Yoguel G and Boscherini F., La capacidad innovativa y el fortalecimiento de la competitividad de las firmas: el caso de las Pymes exportadoras argentinas, Buenos Aires, Documento de Trabajo Nº 71, CEPAL, 1996.