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## **FINANCE AND INDUSTRIAL DEVELOPMENT**

**TITLE:**

**FINANCING FOR SMEs IN A CONTEXT OF IMPERFECTIONS OF  
BANK CREDIT MARKET IN DEMOCRATIC REPUBLIC OF THE  
CONGO: NECESSITY FOR GOVERNMENT INTERVENTION TO  
PROMOTE THE DEVELOPMENT**

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## Abstract

Issue of financing SMEs arises with acuity in many countries because the banks which are supposed to finance these enterprises reveal cautious and qualify them risky. This paper aims to appreciate theoretically, using the Principal-Agent model, the need for government intervention as a way to attenuate the constraint of financing SMEs in a context of bank credit market imperfections. Specifically, Congolese government as a principal can incentivize the “Fonds de Promotion de l’industrie” (Promotion Funds of industry, a public company) as an agent by offering two types of contracts (optimal and sub-optimal) in order to improve the finance of SMEs in Democratic republic of the Congo.

**Key words:** financing for SMEs, imperfections of bank credit market, dynamic optimization, incentive contracts and Government intervention

CLASSIFICATION JEL : C61, D81, D82, D86

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## Abbreviations

SMEs: Small and medium enterprises

DRC: Democratic Republic of the Congo

FPI: Fonds de promotion de l’industrie

# 1. Introduction

Following the bank crisis of the late 1980s, most sub-Saharan African countries have liberalized their financial sector from 1990 in order to increase savings and reduce constraints of credit market. Thus, many firms could be financed for investment likely to be affected the real and sustainable growth.

More than two decades later, we notice that banks have improved their profitability and solvency, and several of them have too much money in reserve. However, the cost of bank credit remains relatively high, and bank credit supply excludes many small and medium enterprises (GULDE and PATILLO, 2006; HUGON 2006). This exclusion is explained by asymmetric information which characterizes many SMEs and by the observance of prudential standards that often lead banks to have an excess of prudence in loans. These imperfections of market bring banks to adopt a behavior consisting of putting the high bank rate and preferring the loans of short term (DOUMBIA, 2009).

Face up to market imperfections, two kinds of studies examine how constraints of financing SMEs could be reduced. Some of them head for what SMEs have to do about risk, collateral, relationship between banks and them in order to diminish asymmetric information that characterize them (BECK et al., 2008) . Others works put accent on the role of public intervention for alleviating SMEs to get the credit (LEFILLEUR, 2008; PERIA, 2009; CHERTOK et ali., 2009). Concerning the role of public intervention in attenuating of financial constraints of SMEs, an interesting approach is to consider the possibility of reducing these constraints by using the relationship between the government and a public enterprise that is specialized in financing SMEs like “Fonds de Promotion de l’industrie (FPI)” (Promotion Funds of industry) in the Democratic Republic of the Congo (DRC).

Indeed, DRC is a country located in central Africa and extends on the surface from 2,345,410 Km<sup>2</sup> with nine direct neighbors. In this country, a public company specializing in the promotion of SMEs exists whose the name is written above. To reduce difficulties of financing Congolese SMEs, the government can pass by this company. That is what we are going to analyze in this paper. In fact, the table 1 below gives us an idea about the role of this enterprise in financing SMEs.

Table 1: Financing SMEs by FPI (Promotion Fund of Industry)

financed SMEs	2013			2014			2015			2016		
	Number	Amount (\$)	Rate of debt recovery	Number	Amount (\$)	Rate of debt recovery	Number	Amount \$	Rate of debt recovery	Number	Amount \$	Rate of debt recovery
Loans	71	23,353,640	35%	82	49,000,748	34%	73	38,590,336	51.5%	77	33,484,645	52.8%
Subsidies	5	270,898	–	10	388,887	–	10	517,265	–	18	1,063,656	–
Total	76	23,624,538	–	92	49,389,635	–	83	39,107,601	–	95	34,548,301	–

*Source: annual report of activities of FPI (2016)*

In the light of Table 1, a lot of SMEs are financed in 2014 (82 against 77 in 2016, 73 in 2015 and 71 in 2013). Concerning the amount given, SMEs have received big funding in 2014 (40,000,748\$) followed by the years 2015 and 2016. However, 2016 revealed the year during which the FPI has recovered a big part of its loans since the rate of debt recovery is higher (52.8%) than other years (35% in 2013, 34% in 2014 and 51.5% in 2015). Even if 52.8% represents an effort that the FPI has made for recovering its debt, a big amount of loans (47.2%) is not reimbursed. An increase in the rate of debt recovery could grow the FPI's resources and allow it to finance more and more SMEs. To that end, a reasonable question that the present study raises is: what mechanisms the Congolese government can envisage in order to incentivize the FPI to increase number of financed SMEs?

This study aims at appreciating theoretically, using the principal-agent model, the necessity for government intervention as a way to ameliorate the finance of SMEs in DRC. The study shows that the Congolese government as a principal can incentivize the FPI as an agent by offering two types of contracts (optimal and sub-optimal) in order to raise number of SMEs to be financed in DRC. Both contracts correspond to two equilibrium conditions in the form of a game matrix. These equilibrium conditions constitute two strategies that the principal and the agent can play: equilibrium based on the strategy "absence of compromise" which represents the optimal contract and equilibrium based on the strategy "compromise" symbolizing the sub-optimal contract. With reference to the risk imbedded in asymmetric information, the Congolese government and the FPI are going to choose a

sub-optimal contract like that of a prisoner's dilemma. Nevertheless, this contract is up to increase number of financed SMEs.

## **2. Literature revue on financing of SMEs**

Many studies in economic literature examine issues on financing of small and medium enterprises, and most of them point difficulties they face to have access to the bank credit.

SMEs are constrained to obtain commercial bank funding, especially long-term loans, for a number of factors, such as: high risk premium, lack of collateral, small cash flows, underdeveloped bank-borrower relationships and high transaction costs (BECK and DEMIRGÜÇ-KUNT, 2006; BECK et al., 2008). Those factors may lead banks to be refrained for financing SMEs because of asymmetric information problems that characterize SMEs. In other words, those factors may hinder a couple of risk-return to be worked better.

Indeed, problems of asymmetric information in the credit market which increase the risk may lead to credit rationing (STIGLITZ and WEISS, 1981). An important characteristic of bank credit market which makes a difference between it and others markets (goods and labor) is that the bank debtor interest rate is different of the return that banks can hope realizing on their loans. The return is equal to contractual interest rate and the probability of default (probability for borrower to not reimburse the debt) because of asymmetric information between banks and borrowers. Asymmetric information may impede banks from observing the true nature of borrowers; they may also hinder banks from influencing the behavior of borrowers once the credit contract is signed. In principle, banks could raise the risk premium on loans, but doing so may increase the probability of default by attracting riskier borrowers (adverse selection) and/or by encouraging riskier behavior of borrowers (moral hazard). Since adverse selection and moral hazard could cause the banks' expected payoff to reduce when raising the interest rate, they may refrain from increasing rates beyond a certain level even though this means not fully satisfying the demand for credit. The negative welfare effects of such credit rationing are underinvestment and lower growth (JAFFEE and STIGLITZ, 1990; WAGENVOORT and HURST, 1999).

Most of empirical studies, on SMEs financial constraints based on credit rationing problems, use two alternative strategies. The first consists of asking firms if they actually applied for credit and whether

they were turned down or not (BERGER and UDELL, 1995; COLE, 1998; BERGER et al., 2001; BERKOWITZ and WHITE, 2004). The second focuses on firms' use of costly funding alternatives relatively to bank credit like trade credit (PETERSEN and RAJAN, 1994; 1995) or leasing (SHARPE and NGUYEN, 1995; SLOTTY, 2009). In both cases these studies report that credit rationing problems are more important for more opaque firms which are the smallest and the youngest ones.

PERIA (2009) illustrates these problems in his survey by comparing financial constraints of SMEs in developing countries without Africa and in African countries. His results show that the funding of SMEs in developing countries without Africa represents 13,1% of bank loans while in African countries it represents only 5,4% of bank loans. They also show that banks accept 81,4% of SMEs demands of financing in the first countries while 68,7% of demands of the SMEs funding are accepted by African banks.

Many studies analyzed how reducing financial constraints SMEs face. One of means proposed concern government intervention. In this respect, the government can incentivize banks to finance SMEs by keeping in reserve money that could finance banks. The government can also encourage banks to propose SMEs better conditions of credit by taking charge of losses in the event of default. This may reduce the risk supported by banks when they lend risky SMEs (CHERTOK et al., 2009). On that subject, works which analyzed the situation of African countries agree on the idea that the government intervention must focus on reforms being able to stimulate banks in financing SMEs. The objective of these reforms is to improve the business climate, to reduce default risks that characterize the African economic environment. Among those reforms, there are appropriate macroeconomic policies, the creation of institutions such as guarantee fund or mutual guarantee companies, the creation of commercial tribunal using specialized judges (GULDE and PATILLO, 2006; HUGON, 2007; DOUMBIA, 2009; LEFILLEUR, 2008; PÉRIA, 2009; TIENDREBEOGO, 2011).

In the light of what precedes, the issue of financing SMEs is subject to abundant literature but studies that examined the role of public intervention in improving of SMEs' funding did not explore it within the framework of the principal-agent model approach which seems worthwhile. To the best of the author's knowledge, given that the existing literature on financing of SMEs does not use the principal-agent model, the originality of the present study relies on this methodological approach.

### 3. Methodology: Model specification

The principal–agent model is based on the following basic assumptions:

- Relationship between a principal and an agent cannot be repeated.
- Existence of a legal framework allows one to respect the contract proposed by the principal and accepted by the agent.
- The principal is the leader according to Stackelberg model: this means the principal offers various contracts and anticipates that the agent will choose the contract that maximizes his utility (LAFFONT and MARTIMORT, 2002; BOLTON and DEWATRIPONT, 2005).

This methodology is proposed by LAFFONT and MARTIMORT (2002) and BOLTON and DEWATRIPONT (2005). The principal's objective is to develop the optimal contract for the agent. For this, he maximizes its objective function relative to incentive and participation constraints. There are two utility functions: one for the principal and another for the agent. Each one maximizes its utility function. Thus, the principal's utility (virtually linear) is:

$$V = S(q) - t \quad (1)$$

with  $S' > 0, S'' < 0, S(0) = 0$  and  $t \in R$  is the transfer (payment) that the principal gives the agent.

The agent's utility (virtually linear) is:

$$U = t - C(q, \theta) \quad (2)$$

with  $C(q, \theta) = \theta q + F$  presenting the agent's production cost,  $\theta \in R_{++}, F = 0$ .

Note that  $q$  is a variable representing produced quantity,  $V$  is the principal's utility,  $S$  symbolizes the function of  $V$ ,  $S'$  expresses the first-order condition for a maximum,  $S''$  represents the sufficient condition for a maximum,  $U$  is the agent's utility,  $C$  symbolizes the function of costs generated by the agent's activity,  $F$  represents fixed costs,  $R$  is a collection of rational numbers,  $R_{++}$  constitutes a collection of positive rational numbers and  $\theta$  is a parameter meaning a type (efficient or non-efficient) of agent. So, the function that the principal has to maximize is:

$$\left\{ \begin{array}{l} \text{Max}_{(t,q)} S(q) - t \\ S/C : t - C(q, \theta) \geq 0 \end{array} \right\} \quad (3)$$

The agent's reservation utility is assumed to be independent on  $\theta$ , which is normalized to 0. At the optimum, we have the first-order condition<sup>1</sup>:

$$\begin{cases} S'(q^{oIC}) = C'(q^{oIC}, \theta) = \theta \\ t^{oIC} = C(q^{oIC}, \theta) = q^{oIC} \theta \end{cases} \quad (4)$$

### 3.1 Principal--agent in a context of complete information

The contract contains maximum quantity and transfer  $(q^{oIC}, t^{oIC})$  that the agent can choose or not.

This contract is optimal if the type of the agent is  $\theta$ . Consequently,

$$S(q^{oIC}) - t^{oIC} = S(q^{oIC}) - C(q^{oIC}, \theta) \geq 0 \quad (5)$$

We can consider two optimal contracts:  $(\bar{t}, \bar{q})$  and  $(\underline{t}, \underline{q})$  if  $\bar{\theta} \succ \underline{\theta}$  (the value of parameter  $\theta$  is low for an efficient agent and high for a non-efficient agent), where  $(\bar{t}, \bar{q})$ : is an optimal contract for an agent's type  $\bar{\theta}$  (non-efficient agent) and  $(\underline{t}, \underline{q})$  is an optimal contract for an agent's type  $\underline{\theta}$  (efficient agent)<sup>2</sup>. Thus:  $\underline{q} \succ \bar{q}$  (as  $S'$  is small in the first-order condition): the maximum production of the efficient agent is greater than the one of the non-efficient agent;

$$\underline{t} - C(\underline{q}, \underline{\theta}) = \underline{U} = 0 = \bar{U} = \bar{t} - C(\bar{q}, \bar{\theta}) \quad (6)$$

and

$$\underline{V} = S(\underline{q}) - \underline{\theta}\underline{q} \equiv \max_q S(q) - \underline{\theta}q \succ S(\bar{q}) - \underline{\theta}\bar{q} \succ S(\bar{q}) - \bar{\theta}\bar{q} = \bar{V} \quad (7)$$

where the profit of the principal is high if the agent is efficient.

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<sup>1</sup> The first-order condition allows us to get maximal quantities which can be the higher value of production the agent has to product for which the principal is ready to pay him an amount. This best possible value is the condition that should permit the agent to receive remuneration.  $q^{oIC}$  means a quantity produced in a context of complete information and  $t^{oIC}$  is the payment in the same context.

<sup>2</sup>  $\underline{q}$ ,  $\underline{t}$ ,  $\underline{U}$  and  $\underline{V}$  represent respectively quantity obtained, transfer given, the function value of the agent's utility and the function value of the principal's utility if the agent is efficient ( $\underline{\theta}$ ).  $\bar{q}$ ,  $\bar{t}$ ,  $\bar{U}$  and  $\bar{V}$  are respectively quantity obtained, transfer given, the function value of the agent's utility and the function value of the principal's utility if the agent is non-efficient ( $\bar{\theta}$ ).



However,  $\underline{t} = \underline{\theta}q$  may be smaller or larger than  $\bar{t} = \bar{\theta}\bar{q}$  according to the form of  $S^3$ .

From the above, the agent cannot refuse any contract because the utility that he will have by choosing any contract proposed by the principal will be at least equal his reservation utility. In the context of complete information, the delegation is not expensive for the principal because he reaches the same level of utility that he would get if he had produced by himself with the same agent's cost function. It is important to note that the principal can observe the type of agent in the context of complete information, but he cannot do that when information is asymmetric. This way, the agent can hide his type. So, how can the principal incite the agent to reveal his true type?

### 3.2 Principal--agent in a context of asymmetric information

Assuming

$$\Theta = \{\underline{\theta}, \bar{\theta}\}, \bar{\theta} \succ \underline{\theta}, \Pr(\underline{\theta}) = \alpha \quad (8)$$

we wonder what will happen if the principal proposes two contracts  $\{(\underline{t}, \underline{q}), (\bar{t}, \bar{q})\}$  obtained in the context of complete information. Given the difficulty that the principal has to distinguish between two types of agents when information is asymmetric, the efficient agent ( $\underline{\theta}$ ) can choose the contract for the non-efficient agent ( $\bar{\theta}$ ) because his utility will be higher than zero instead of zero:

$$(\underline{t}, \underline{q}) \rightarrow \underline{t} - C(\underline{q}, \underline{\theta}) = 0 \quad (9)$$

and

$$(\bar{t}, \bar{q}) \rightarrow \bar{t} - C(\bar{q}, \underline{\theta}) = \bar{q}\bar{\theta} - \bar{q}\underline{\theta} \succ 0 \quad (10)$$

Consequently, the best contract in the context of complete information cannot be implemented in the context of asymmetric information because one type of agent imitates another type. Then, what kind of contracts can the principal propose for the agent in this latter context?

We consider a packet of two contracts as earlier:  $\{(\underline{t}, \underline{q}), (\bar{t}, \bar{q})\}$ . This packet is incentivized if it satisfies the following incentive (IC1, IC2) and participation (PC1, PC2) constraints<sup>4</sup> :

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<sup>3</sup> For more detail, refer to Laffont and Martimort (2002), like Bolton and Dewatripont, (2005) which lengthily extended on the various approaches from the inciting mechanisms within the framework from the analysis principal--agent.

$$\underline{U} \equiv \underline{t} - C(\underline{q}, \underline{\theta}) \geq \bar{t} - C(\bar{q}, \underline{\theta}) \quad (\text{IC1})$$

$$\bar{U} \equiv \bar{t} - C(\bar{q}, \bar{\theta}) \geq \underline{t} - C(\underline{q}, \bar{\theta}) \quad (\text{IC2})$$

$$\underline{t} - C(\underline{q}, \underline{\theta}) \geq 0 \quad (\text{PC1})$$

$$\bar{t} - C(\bar{q}, \bar{\theta}) \geq 0 \quad (\text{PC2})$$

In the context of complete information, the agent has an exact reservation utility whatever his type ( $\underline{U} = \bar{U} = 0$ ); however, this is not possible in the context of asymmetric information if  $\bar{q} > 0$  (i.e. if the principal wants to use two types of agents for the production) like a packet of incentive contracts. Thus, (IC1) implies:

$$\underline{U} \geq \bar{t} - \underline{\theta}\bar{q} = \bar{U} + \bar{q}\Delta\theta > \bar{U} \geq 0 \quad (11)$$

There are rents resulting from the information provided for each type:  $\underline{U} \equiv \underline{t} - \underline{\theta}\underline{q}$  and  $\bar{U} \equiv \bar{t} - \bar{\theta}\bar{q}$ .

Thus, the program of the principal can be written as follows:

$$\begin{aligned} & \text{Max}_{\{(\underline{t}, \underline{q}), (\bar{t}, \bar{q})\}} \alpha(S(\underline{q}) - \underline{t}) + (1 - \alpha)(S(\bar{q}) - \bar{t}) \\ & S/C : (\text{IC1}), (\text{IC2}), (\text{PC1}) \text{ and } (\text{PC2}) \end{aligned} \quad (12)$$

Using the rents resulting from the information provided, the program becomes:

$$\text{Max}_{\{(\underline{U}, \underline{q}), (\bar{U}, \bar{q})\}} \underbrace{\alpha(S(\underline{q}) - \underline{\theta}\underline{q}) + (1 - \alpha)(S(\bar{q}) - \bar{\theta}\bar{q})}_{\text{effectiveness-allowance hoped}} - \underbrace{(\alpha\underline{U} + (1 - \alpha)\bar{U})}_{\text{rents resulting from information hoped}} \quad (13)$$

With incentive (IC3, IC4) and participation (PC3, PC4) constraints:

$$\underline{U} \geq \bar{U} + \bar{q}\Delta\theta \quad (\text{IC3})$$

$$\bar{U} \geq \underline{U} - \underline{q}\Delta\theta \quad (\text{IC4})$$

$$\underline{U} \geq 0 \quad (\text{PC3})$$

$$\bar{U} \geq 0 \quad (\text{PC4})$$

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<sup>4</sup> The constraints of incentive (IC1) and IC2 imply a constraint of monotony:  $\bar{t} \leq \underline{t}$  and  $\bar{q} \leq \underline{q}$ .

To solve this program, it is important to assess these rents ( $\underline{U}$  and  $\bar{U}$ ) using constraints. For this, we have to resort to examining the constraints that could be saturated at the optimum (Kuhn and Tucker, 1951). Two cases are examined: with inclusive contracts and without inclusive contracts.

*With inclusive contracts:  $\bar{q} > 0$*

Starting from PC3, IC3 and IC4, if  $\underline{U} = 0$ , then:  $-q\Delta\theta \leq \bar{U} \leq -\bar{q}\Delta\theta$ , this violates PC4.

Consequently,  $\underline{U} > 0$ . From PC4, IC3 and IC4, if  $\bar{U} = 0$ , then:  $\bar{q}\Delta\theta \leq \underline{U} \leq q\Delta\theta$ , which respects PC3.

Only the efficient agent has a positive rent resulting from information. Given the rationality of the non-efficient agent, only  $\bar{U} = 0$  is possible. This implies  $\underline{U} = \bar{q}\Delta\theta$  (as the agent's type  $\underline{\theta}$  wants to imitate the agent's type  $\bar{\theta}$  but not vice versa). So at the optimum, constraints IC3 and PC4 should be saturated<sup>5</sup>. Substituting in the program the rents resulting from the information above, we have:

$$\text{Max}_{\{q, \bar{q}\}} \alpha(S(\underline{q}) - \underline{\theta}q) + (1 - \alpha)(S(\bar{q}) - \bar{\theta}\bar{q}) - \alpha\bar{q}\Delta\theta \quad (14)$$

Deriving this function, we obtain at the optimum the elements of inclusive contracts in the context of asymmetric information:

$$\frac{\partial}{\partial q} = \alpha(S'(\underline{q}) - \underline{\theta}) = 0 \Rightarrow S'(\underline{q}^{oAI}) = \underline{\theta} \quad (15)$$

$$\frac{\partial}{\partial \bar{q}} = (1 - \alpha)(S'(\bar{q}) - \bar{\theta}) - \alpha\Delta\theta = 0 \Rightarrow S'(\bar{q}^{oAI}) = \bar{\theta} + \frac{\alpha}{1 - \alpha} \Delta\theta \quad (16)$$

Comparatively in the context of complete information, we obtain  $\underline{q}^{oAI} = \underline{q}^{oCI}$  and  $\bar{q}^{oAI} < \bar{q}^{oCI}$ , and maximum payments:

$$\underline{t}^{oAI} = \underline{U} + \underline{\theta}\underline{q}^{oAI} = \bar{q}^{oAI} \Delta\theta + \underline{\theta}\underline{q}^{oAI} = \bar{q}^{oAI} \Delta\theta + \underbrace{\underline{\theta}\underline{q}^{oAI}}_{\underline{t}^{oCI}} > \underline{t}^{oCI} \quad (17)$$

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<sup>5</sup> The saturation of the constraint implies equality of the two members (i.e., right-hand side and left-hand side). As above, from PC4, IC3, and IC4, if  $\bar{U} = 0$  in PC4,  $\bar{q}\Delta\theta \leq \underline{U} \leq q\Delta\theta$ ;  $\underline{U} = \bar{q}\Delta\theta$  in IC3. Thus, IC3 and PC4 are saturated. However, the replacement of their values in the two other constraints (IC4 and PC3) gives:  $\bar{U} \geq \underbrace{\bar{q}\Delta\theta - q\Delta\theta}_{<0}$ ,  $\Rightarrow \bar{U} < 0$  in IC4. This violates the condition requiring that  $\bar{U} = 0$  in PC4. From PC3,

$\underline{U} \geq 0$  and IC3,  $\underline{U} = \underbrace{\bar{q}\Delta\theta}_{>0}$ ;  $\underline{U}$  must be superior to zero but not equal to zero. Thus, IC4 and PC3 are

unsaturated constraints.

$$\bar{t}^{oAI} = \bar{U} + \bar{\theta}\bar{q}^{oAI} = \bar{\theta}\bar{q}^{oAI} < \bar{\theta}\bar{q}^{oCI} \equiv \bar{t}^{oCI} \quad (18)$$

Note that  $\underline{q}^{oAI}$  and  $\underline{t}^{oAI}$  are, respectively, maximum quantity produced and transfer made if the type of agent is efficient in the context of asymmetric information. Likewise,  $\bar{q}^{oAI}$  and  $\bar{t}^{oAI}$  are, respectively, maximum quantity obtained and transfer carried out if the type of agent is non-efficient in the context of asymmetric information. The high level of production in the context of complete information is  $\underline{q}^{oCI}$  if the type of agent is efficient and  $\bar{q}^{oCI}$  if the agent type is non-efficient;  $\underline{t}^{oCI}$ , and  $\bar{t}^{oCI}$  represent transfer in the context of complete information if the agent is efficient and non-efficient, respectively.

*Without inclusive contract:  $\bar{q}^{oAI} = 0$*

This contract is the best whether the principal provides a contract that cannot give any agent a chance to cheat. Thus,  $\underline{U} = \bar{U} = 0$  and  $(\underline{t}^{oAI}, \underline{q}^{oAI}) = (\underline{t}^{oCI}, \underline{q}^{oCI})$ . In the context of asymmetric information, the firm does not maximize its profit: allowance (social value of exchange) is not efficient but it is optimal given the constraints of information.

After presenting the principal-agent model whose resolution has led to two possible types of contracts, the Congolese context can offer a reflection on the use of this methodology in order to improve the finance of SMEs through the government intervention.

## 4. Theoretical results

Before presenting the results of study we need to clarify the framework in which the methodology above is used.

### 4.1 Framework

The government is the principal and the FPI (a public enterprise), the agent. The principal determines the goal to be reached by the agent. Indeed, the principal expects the agent realizes a certain result. In our case, this result is an increase in the number of SMEs to be financed during a given period. The agent has more information about the company management than the principal. To achieve this, FPI's resources need to be sufficient. These resources come from the amount of a tax on enterprises and the amount of debt recovery. Given that the amount of tax is known by both government and FPI since the tax is taken by a 'financial public service' which deposits on FPI's account, only the amount of debt recovery depends on agent behavior. Specifically, the rate of debt recovery is based on the responsibility of the agent by selecting and monitoring the borrowers. In other words, the ability of the agent to mobilize sufficient resources in order to finance more likely SMEs depends on the rate of debt recovery which is part of the resources on which it influences. So, the more this rate is low the less the resources will be sufficient to raise a number of financed SMEs. It implies a possibility to appear asymmetric information between the government and the FPI in achieving of the goal mentioned above insofar as the FPI can recover more or less of debt. To increase the rate of debt recovery will lead more FPI's expenditure because borrower's activities must be more monitored, implying expenses. Thus, the FPI might choose a level of the rate which does not generate enough resources if it avoids expending much money.

To analyze theoretically mechanisms that government can put in place, we are going to depend on the model previously presented in section 3. The rate of debt recovery corresponds to  $q$ , number of financed SMEs is similar to  $y$ , and payment made by the principal to the agent  $t$ . So the number of financed SMEs if  $y = S(q)$ , which is an increasing function of the rate of debt recovery. Some hypotheses for understanding properly are:

- The first component of resources (amount of tax) does not vary, only the second component (amount of debt recovery) can vary and consequently modify the total resources.

- The supplement of the amount of debt recovery allows enhancing the rate of debt recovery and it is used for financing the increasing number of SMEs.
- The rate of debt recovery ( $q$ ) must at least be equal to a minimum rate fixed beforehand.

## 4.2 Presentation of results and their interpretation

Three cases representing the incentive contracts can be considered before a contract is signed:

- With inclusive contract: The difficulty to distinguish types of agents before a contract is signed (efficient agent:  $\underline{\theta}$  and non-efficient agent:  $\bar{\theta}$ ) by the principal, and especially the tendency for the efficient agent to cheat by choosing the contract reserved versus a non-efficient agent makes it very difficult to envisage this contract as an inciting mechanism.
- Without inclusive contract (contract based on absence of compromise): This optimal contract is easy to envisage, implying that only the agent indirectly bears the risk. If the agent does not realize the objective involuntarily, he will receive nothing as payment. Likewise for a value such as  $q$ , very close to  $q^*$  ( $q^{oAI}$ ), the agent will receive no payment. Thus in the year  $t + 1$  (i.e., in future) the agent would be less incited knowing that the risk beard in the year  $t$  (i.e., at present) deprived him of payment. In this contract the payment depends on the rate of debt recovery corresponding to  $q^*$ .
- Contract based on compromise: Given the risks related to activity of financing SMEs, if the agent discovers that he has to bear the risks alone, he will be less incited to increase the number of financed SMEs. In fact, an increase in number of SMEs being financed could raise the risk incurred by the agent to recover the funds, which could exert a negative effect on the rate of debt recovery and consequently discourage the agent. In this contract the principal and the agent share the risks related to the variations of the rate of debt recovery. This implies that the payment carried out by the principal for the agent's account depends partly on the funds recovered. In other words, even if this rate is not equal to that awaited ( $q^*$ ) but it is slightly higher than the debt recovery rate obtained at the previous period; the agent will receive the payment (e.g. an increase in this rate is rewarded). That incites the agent more to increase a number of SMEs needing the finance. This contract, which appears more motivating, is nevertheless sub-optimal.

To illustrate the sub-optimal nature of the third contract, we suppose that the share of the agent takes the following form (VARIAN 2006):  $t(q) = \alpha S(q) + F$ , with  $F$  representing any constancy and  $0 < \alpha < 1$ . The maximization program of the agent is as follows:

$$\text{Max}_{(q)} \alpha S(q) + F - C(q) \quad [19]$$

This implies that he chooses a given rate of debt recovery  $\hat{q}$  for which

$$\alpha S'(\hat{q}) = C'(\hat{q}) \quad [20]$$

This rate does not respect the condition of effectiveness; that is :  $S'(q^{oAI}) = C'(q^{oAI}, \theta)$ .

Thus, two equilibrium conditions could be identified from analysis of the principal-agent model. They can be presented in the form of a game matrix, as shown in Table 2:

Table 2: matrix representing the two possible equilibrium conditions of the principal-agent

Agent↓ \Principal→	Absence of compromise (indisputable : $q = q^*$ )	Compromise ( $q \leq \hat{q} \neq q^*$ )
Absence of compromise (indisputable $q = q^*$ )	$(t^*, y^*)$	$(\hat{t}, y^*)$
Compromise ( $q \leq \hat{q} \neq q^*$ )	$(0, y \leq \hat{y})$	$(t \leq \hat{t}, y \leq \hat{y})$

Source: Author's interpretation from the preceding analyses.

Two outcomes can be highlighted on the basis of the matrix in Table 2.

*Equilibrium based on the strategy "absence of compromise": optimal contract*

When the government plays with the "absence of compromise" the FPI cannot play with a "compromise" because it receives nothing as payment even in the event of a small rise in the rate of recovery. So, the FPI has to play with "absence of compromise".

*Equilibrium based on the strategy “compromise”: less optimal contract*

When the government plays with “compromise” the FPI can only play with “compromise” if not it would receive a salary lower than if it played without. Knowing that it is possible that  $q \neq q^*$  the government and the FPI will be tempted to resolve to an equilibrium condition and agree to a less optimal solution like that of a prisoner’s dilemma. This takes into consideration the risk imbedded in asymmetric information that makes this choice possible. Hence this contract would incite the FPI to increase his debt recovery and at the same time taking care not to allow his wage fall by letting the rate of recovery to fall drastically.

## **5. Conclusion and recommendation**

This paper has examined the need for public intervention to release constraints of financing SMEs. Imperfections of bank credit market, which explain the behavior of banks sometimes, lower the effectiveness of actions that government can take to encourage more banks to finance SMEs. Even if government intervention does not solve completely the issue of financing SMEs, it remains a way to mitigate these constraints in an environment characterized by bank credit rationing like Democratic Republic of the Congo. To that end, the existence of a public company dealing with financing SMEs may be a way that the Congolese government can use in order to improve the access of financing by SMEs. For that purpose, this study has adopted the methodology that relies on the principal-agent model. This model helps us to highlight the relationship between the Congolese government and the FPI. The first is considered as a principal and the second as an agent. The principal can envisage the mechanisms which can have the form of contracts for motivating the agent. Two types of contracts can be proposed by the Congolese government to the FPI and constitute the theoretical results of this study. The first contract is optimal and represents an equilibrium based on the strategy called ‘absence of compromise’. The second contract is less optimal and gives equilibrium that relies on the strategy qualifying the ‘compromise’. With reference to the risk imbedded in asymmetric information the Congolese government and the FPI will be in favor of a less optimal contract. Nevertheless, this contract is able to allow a rise in number of SMEs to be financed. This approach is the originality of this paper because existing studies on financing SMEs do not seem to use this methodology. We think this approach increases strategies being able to relieve constraints of financing SMEs and



promote an expansion of SMEs' activities for boosting the economic growth that DRC needs in order to reduce the poverty.

A recommendation deserves to be proposed by this study. The Congolese government should condition the renewal of the mandate of the FPI managers to the realization of the objective assigned to them. This renewal of the mandate would constitute a form of payment referred to in this study.

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