Financial Contracting with Optimistic Entrepreneurs: Theory and Evidence*

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August 28, 2003

Abstract

This paper looks at the effects of entrepreneurial optimism on financial contracting and corporate performance. Optimism may increase effort, but is bad for adaptation decisions as the entrepreneur underweights negative information. The first-best contract with an optimist uses contigencies for two distinct purposes: (1) "bridging the gap in beliefs" by letting the entrepreneur take a bet on his project's success, and (2) imposing adaptation decisions in bad states. When the contract space is restricted to debt, there may exist a separating equilibrium where optimists self-select in short-term debt and realists in long-term debt.

We confront our theory to a large dataset of entrepreneurs. First, we find that differences in beliefs may be (partly) explained by usual determinants put forward in psychology and management literature. Second, in line with the two main predictions of our model, we find that (1) optimists tend to borrow more short term and (2) those optimists that borrow more short term perform better. Last, we find that firms run by optimists tend to grow less, die sooner and be less profitable, which we view as a confirmation that our measure of optimism does not proxy high risk - high return projects.

*We thank, for insightful discussions, Nicholas Barberis, Marianne Bertrand, Bengt Holmstrom, Steve Kaplan, Ulrike Malmendier, Sendhil Mullainathan, Bernard Salanié, Per Strömberg, Tano Santos, Antoinette Schoar, Enrico Perotti, Raghuram Rajan and Luigi Zingales. This paper also benefited from comments of seminar participants at the University of Chicago, Gerzensee, and the NBER summer institute.

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1 Introduction

Starting a business is a very risky thing: on average, half of the new born firms do not live up to their fifth birthday (Demoly and Thirion [2001]). It seems, however, that entrepreneurs are no more risk takers than, say, managers with similar responsibilities (for a recent test see, e.g. Busenitz and Barney [1997]). So what drives entrepreneurs ? For most management scholars, the difference lies less in attitudes toward risk than in the *perception* of risk: entrepreneurs typically overestimate the chances that their project will be successful.[1] Over-expectations on performance can result from "plain optimism" or –more plausibly in the case of entrepreneurs– from *selection*: Individuals who leave other opportunities to start a new venture tend to be those that, on average, overestimate the prospects of their project. This selection effect creates a natural upward bias in expectations, much like the winner's curse effect set forth in the auction literature. The contribution of this paper is an attempt to investigate the impact of such differences in beliefs on financial contracting and venture performance.

In a simple principal-agent model, we first study how differences in beliefs between an investor and the entrepreneur he finances affect financial contracting. Optimism has two distinct effects on optimal contracts. It affects incentives and biases the preferences of the entrepreneur over cash-flow allocation. We then test two predictions of the model using a large sample of entrepreneurs. First, we find that optimistic entrepreneurs tend to borrow more short-term, and second, we find that those optimists who use more short-term debt perform better.

The theoretical analysis yields, we think, two important insights. First, we show that to discuss the effect on optimism on incentives, it is crucial to distinguish between two types of entrepreneurial efforts. Since he overestimates the probability of success, an optimistic entrepreneur might be more prone than a realist to spend effort implementing his initial idea. However, optimistic entrepreneurs tend not to adapt enough their initial projects to changes in the environment. They inefficiently persist in implementing the initial ambitious project even if new information calls for a safer strategy. The reason underlying this ex-post inefficient project choice is that an optimistic entrepreneur tends to underweight bad news about the project's prospects: he learns less. These two kinds of efforts occur at different stages of the life-cycle: implementation effort is crucial at early stages of the project and adaptative effort becomes

[1] See for example Pinfold [2001]. Entrepreneurs also underestimate the riskiness of the project (Busenitz and Barney [1997]), overestimate their ability to control situations. In dynamic terms, optimism persists because entrepreneurs self servingly attributes favorable outcomes to their own ability, and use small samples to infer excessively precise estimates (a bias called *representativeness*).

more valuable later in the life of the venture. In this context, we show that the optimal contract makes control switch from the entrepreneur to the investor in those states where a change in the venture's business plan is necessary, a feature typical in venture-capital contracts (Kaplan and Stromberg [2000]).

The second effect of optimism on contracting concerns the optimal allocation of claims. The entrepreneur believes the investor underestimates the value of the "upside" of the venture. This provides the investor with a way to "pay the entrepreneur with dreams", as the entrepreneur is willing to exchange control and ownership rights in the low state (that he believes to be unlikely) against claims on the good state (that the investor knows to be unlikely). In a manner independent from incentive problems, these differences in valuation accross states of nature call for contingent contracting to "bridge the expectation gap".

These two insights have several consequences. First, both of these effects lead to contracts that are contingent on events that the entrepreneur does not control (external risk). This reverses the common wisdom of agency theory that agents should be insured against the shocks they do not control such as sector-wide shocks and is in line with the empirical findings of Kaplan and Stromberg [2002]. This may also explain why CEOs may be rewarded "for luck", as shown by Bertrand and Mulhainathan [2001]. Hence, differences in beliefs provide a natural way to impose some structure on what agency theory labels "private benefits". This structure comes from VNM utility theory and is naturally made dynamic through bayesian updating. Our model of entrepreneurial optimism thus provides a simple explanation for the "private equity puzzle" set forth by Tobias Moskovitz and Annette Vissing-Jorgensen [2002]: the returns of entrepreneurship tend to be low, controlling for risk[2].

Second, when contingent contracting is not possible, we show that short-term debt is the optimal contract for optimist entrepreneurs whereas realists prefer long-term debt for insurance motives. The reason why optimists find short-term debt relatively attractive is driven by two effects: first, short-term debt leads to the optimal allocation of cash-flows since optimists overestimate the probability that the business-plan runs "smoothly" and therefore underestimate the probability of not meeting their payments and being forced to renegotiation. Second, short-term debt transfers control to the investor in states where the entrepreneur would take inefficient decisions, which decreases the ex-ante cost of capital.

Last, we study the credit market equilibrium when both optimistic and realistic entrepreneurs coexist. We determine when financial ontracts can screen

[2]Interestingly, private benefits as they are usually modelled –a constant shift in payoffs– lead to very different predictions from ours. This highlights the useful explanatory role played by removing the homogeneity of beliefs.

between realist and optimistic entrepreneurs, using contingent allocation of control and repayments. The surprising result here is that, when a separating equilibrium exists, both revelation constraints - for optimists and realists - are non-binding: optimists prefer short-term debt because they leave payments and control to the investor contingent on states that are never going to occur. To realists, these financing contracts simply look too risky, and they strictly prefer insurance provided by long term debt.

We then test two major predictions of the model: first, optimists tend to be financed by short-term debt and second, optimists that use short-term debt perform better because the transfer of control in case of bad interim signals is value creating. This dataset comes from two waves of a survey conducted by the French statistical office on a population of entrepreneurs the very year their business was started, and three years later. This survey contains information on (1) entrepreneur expectations on future business growth, (2) entrepreneurial socio-demographic caracteristics and (3) business strategy. This dataset is then matched with accounting data collected from tax files, which allow us to draw a relationship between entrepreneur caracteristics and expectations with subsequent venture performance up to seven years after the business was started.

We draw several conclusions from this empirical analysis. First, we find that some observable caracteristics are strongly associated with systematic upward expectation biases on the venture's performance. These differences may be understood within a simple framework, where agents receive private signals over their project, and decide to become entrepreneurs when the expected returns to do so overshoot their outside options. Provided agents do not update correctly their expectations over the project (because of *base rate neglect* for example[3]), entrepreneurs are optimistic about their project. Those with higher outside options are going to exhibit more optimism (higher education), while those receiving more accurate signals have smaller biases (expertise in industry, idea less "novel").

We then derive from this analysis an empirical proxy for "optimism", and correlate it with financing and performance variables. First, and consistently with our model's predictions, we find that optimists tend to borrow more short-term. Second, we find that those optimists that use more short-term debt perform better. We then perform various robustness checks on our measure of optimism to verify that (1) it fits existing evidence on optimism that we can look at and (2) that it is not a proxy for the project's quality. The statistical analysis shows that optimists have a lower performance on average,

[3]For similar arguments based on this psychological bias, see Roll [1986], Thaler [1988], or more recently the survey by Barberis and Thaler [2003]. De Meza and Southey [1996] propose a model based on an exogenous heterogeneity of beliefs: in such a set-up, agents who select into entrepreneurship are those who naturally hold the most optimistic beliefs.

that optimists tend to persist in their high expectations and that entrepreneurs are more optimistic than those who take the business over from someone else.

The paper has two more sections. Section 2 outlines the model and discusses the main effects. Section 3 is devoted to the empirical analysis. Section 4, as usual, concludes.

2 Model

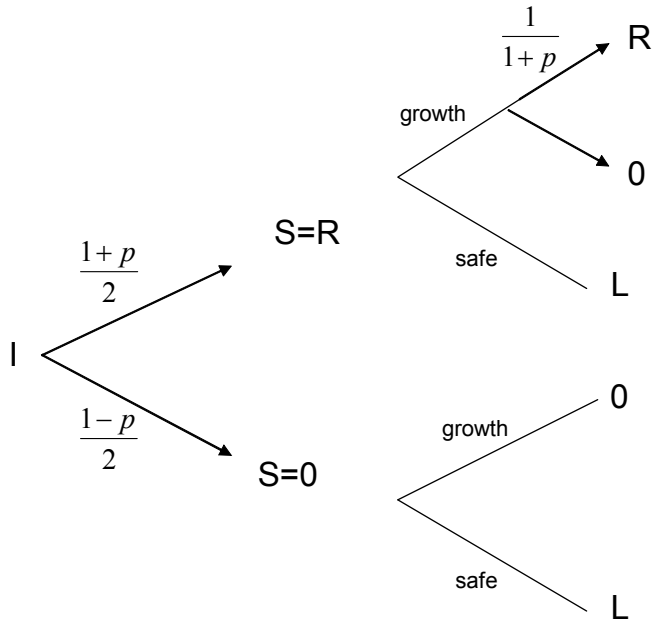
First, we present the model, and then discuss the main effects at work.

2.1 Set-Up

There are three dates $t = 0, 1, 2$. A wealthless entrepreneur, protected by limited liability, raises I at $t = 0$ to finance a project. The returns of the project at time 2 depend on a strategy decision at time $t = 1$ (say, *growth* or *safe*) and on the project's fitness to the market - its type. Projects can be of two types: good or bad. When the entrepreneur chooses the *growth* strategy at time 1, a good project yields R , and a bad one yields zero. If the strategy chosen is *safe*, both types of projects yield L. When the project is a good one, the *growth* strategy is better than the *safe* strategy: $R > L$. When it is a bad one, the *safe* strategy is the best one: $L > 0$.

At time 1, the entrepreneur receives a non contractible signal about the project's fitness and bases his choice of a strategy on this information. This signal takes the form of an intermediate cash flow generated by the firm at $t = 1$. This cash flow is R with probability 1 if the project is good. It is R with probability p if it is bad, and 0 with probability $1 - p$. Hence, a zero cash flow is a sure sign that the project is bad, and that the optimal strategy is the safe one (which yields L instead of 0).

The sequence of events is summarized in figure **??**. First, investment I is sunk. At date $t = 1$, the interim cash flow is observed. The strategy is chosen by whoevers holds control of the firm. Last, in $t = 2$, the project generates the final cash flows, depending on its type and the strategy chosen.



The Business Plan as seen by a Realist

A priori, there are as many good as bad projects to pick up. Hence, a given project is good with probability 1/2 and bad with probability 1/2. All entrepreneurs are risk averse with concave VNM utility $u(.)$.

The important assumption here is that entrepreneurs hold different beliefs about the quality of their projects. From a theoretical viewpoint, this can be justified in many ways. In the appendix, we provide a model based on a well documented psychological bias: base rate neglect (see for example Barberis and Thaler [2003]). This psychological bias has been put forward to explain why mergers and takeovers tend to generate so little value (Thaler [1988], Roll [1988]). Applied to our problem, the argument goes as follows: consider an individual who has an idea and an estimate S of his idea's worth based on his own valuation exercise. The signal S is the combination of the project's true value (μ) and a noise term (ε), such that $S = \mu + \varepsilon$. Very good projects (large μ's) tend to generate large signals values. In other words, large value estimates S are *representative* of good projects. Knowing this, agents become entrepreneurs when $S > V$ where V is their outside options. It turns out, however, that such a computation is misleading, since a large S may have been generated through a large ε, not a large μ. In doing this wrong inference, agents neglect the fact that large values of μ do not occur very often. Put differently, while good projects normally generate good signals, good projects tend to be very rare to start with. This last piece of information (the base rate) is underweighted in agents' inferences, who put too much emphasis on the reprentativeness of the signal (they look at S, not at $E(\mu|S)$). On aver-

age these biases should compensate each other, and the aggregate population should hold unbiased beliefs. However, because of self selection, the agents that receive the largest signals are overrepresented among entrepreneurs. Therefore, entrepreneurs expectations are on average biased upwards.

This simple model of belief formation also explains why beliefs may differ among individuals. Entrepreneurs who have the largest outside options V will hold on average more over-optimistic beliefs. In addition, those who receive more accurate signals are the ones who are likely to be less over-optimistic. In the empirical section, we are going to use these predictions to estimate the expectation bias at the the individual level.

In order to pinpoint the effects of differences in beliefs on financial contracting, we choose here to simply posit that some entrepreneurs are more optimistic than others. In order to make things even clearer, we will make an extreme assumption about differences in beliefs (we solve, in appendix, a more general case, and find that the effects we highlight in the main text are robust). First, *realists* have correct - objective - priors about the project's type. Hence, they ex ante believe that the project is Good with probability 1/2. Once he observes interim cash flows, the realistic entrepreneur incorporates the additional information following Bayes' Rule. His new beliefs at date $t = 1$ are thus given by:

$$\begin{aligned} \text{P(type} &= \text{good}|\text{interim CF} = R) = 1/(1+p) \\ \text{P(type} &= \text{good}|\text{interim CF} = 0) = 0 \end{aligned}$$

Optimists don't have realistic a priori beliefs on the project's type. Ex ante, they believe the project is good with probability 1. Even though the optimistic entrepreneur also uses Bayes' law to update his beliefs at date $t = 1$, he interprets the interim cash flow information differently. Indeed, for an optimist:

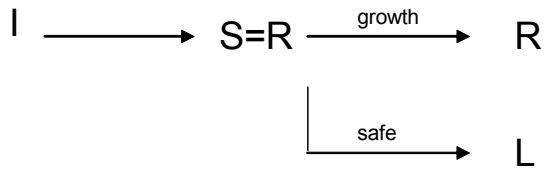
$$\begin{aligned} \text{P(type} &= \text{good}|\text{interim CF} = R) = 1 \\ \text{P(type} &= \text{good}|\text{interim CF} = 0) = 1 \end{aligned}$$

In our extreme case, where optimists are *sure* that the project is a good one, they discard all interim information they get about it.

Hence, optimists do not update when they see no interim cash flow: this is a limit case, but perfectly consistent with bayesian updating.[4] More precisely, optimists do two kinds of mistakes ex ante: first, they overestimate the

[4]We consider for its simplicity this limit case of optimism. We show in appendix how these results can be generalized to moderate optimism, as long as (1)optimism is sufficiently strong and (2) the signal is sufficiently informative about the project's choice.

probability of a good signal. They think good signals occur with probability 1 (good projects never fail), while realists think good signal occur with probability $(1+p)/2 < 1$ (bad projects may fail). The second mistake optimists make is that they overestimate the probability of success of the growth strategy (1 versus 1/2). The business plan, as it is seen by an optimistic entrepreneur, is given in the following figure.



The business Plan as seen by an Optimist

To focus on the important effects, we make the following additional assumptions:

1. Conditional on the signal being good, growth is the efficient strategy:

$$\frac{1}{1+p}R > L$$

   of course, this assumption ensures that $R > L$.

2. Assume the entrepreneur chooses the *safe* strategy whether he observes a good or a bad signal. In this case, the project's NPV is given by $L - I$. We assume it is positive:

$$L > I$$

3. The project cannot be fully financed by its payoff in the bad state, i.e.:

$$I > \frac{1-p}{2}L$$

Hence, all projects could be funded if the entrepreneur could commit to always choose the *safe* strategy. Given the above condition 1, it would a fortiori be the case if the entrepreneur could commit to choose the *safe* strategy in case of bad signal only. Put otherwise, there would be no credit rationing if the signal was contractible.

Though observable, the signal is, however, not contractible. Hence, neither contingent control transfers, nor contingent debt repayment can be enforced. Given this, the financing contract has to be a debt contract but may still take two forms: first, a short-term debt contract, that specifies a repayment at date 1. If cash-flow is 0, then the entrepreneur defaults and the investor takes

control of the firm. The other type of contract is long term debt, specifying a repayment at $t = 2$. Recall that the signal is observable, so renegotiation may occur in date 1 in order for the investor to induce the entrepreneur to choose the *safe* strategy if he is tempted to play *growth*.

Before turning to the non contractible case, we start with the benchmark contract where the signal is contractible. This is going to provide us with the intuitions necessary to understand the differences between the two debt contracts. We will assume throughout the model resolution that beliefs are fully observable to the investor. Hence, he can design a contract for optimists and a contract for realists. As it turns out, this assumption is not necessary, as the two financing contracts are fully separating. We come back more extensively to this issue at the end of the theoretical section.

2.2 Contingent Contracts

We first study the frictionless case and assume that control and transfers can be made contingent on the interim cash flow.

2.2.1 Realist Entrepreneur

When the entrepreneur is a realist, both he and the investor share the same beliefs about the distribution of signal and payoffs. The optimal contract specifies a debt repayment that is contingent on the project success and the interim cash flow. Let D^+ be the optimal debt repayment when the project has yielded cashflows at the intermediate stage, and D^- the optimal debt repayment when the project yields no interim cash flows. In this case, an entrepreneur who witnesses a bad signal always chooses the *safe* strategy ($L - D^- > 0$) and an entrepreneur who observes the good signal always chooses the *growth* strategy. Given our assumption 1, both decisions are efficient. As we assume perfect competition among investors, the equilibrium, optimal contract with a realistic entrepreneur solves:

$$\max \left[\underbrace{\frac{1}{2}u(2R - D^+)}_{\text{good signal, good project}} + \underbrace{\frac{p}{2}u(R - D^+)}_{\text{good signal, bad project}} + \underbrace{\frac{1-p}{2}u(L - D^-)}_{\text{bad signal, safe strategy}} \right]$$
$$\text{s.t. } \frac{1+p}{2}D^+ + \frac{1-p}{2}D^- = I$$

where the first term in the maximand represents the entrepreneur's payoff when the project yields interim cash flow, the growth strategy is chosen, and the project is finally good. The second term stands for the case where the

entrepreneur is misled on the project's quality by its yielding $t = 1$ cash flows. The last term corresponds to the entrepreneur receiving a bad signal, and therefore choosing the appropriate *safe* strategy.

Since the entrepreneur is risk averse, he prefers to smooth his income across states of nature as much as possible. Hence, the optimal contract insures the entrepreneur against the possibility of a bad signal. Moreover, there is no issue of moral hazard here: strategy choice in $t = 1$ is always optimal from the entrepreneur's and the investor's viewpoints. Thus, insurance smoothes income flows as much as possible, by having D^- as small as possible and D^+ as large as possible. Put otherwise, it is optimal to insure the agent against a source of uncertainty he does not control.

More formally, the optimal contract is unique and solves the following set of two equations:

$$\begin{aligned} u'(2R - D^+) + pu'(R - D^+) &= (1-p)u'(L - D^-) \quad (1) \\ (1+p)D^+ + (1-p)D^- &= 2I \quad (2) \end{aligned}$$

where the first equation corresponds to the first order condition of the above optimization program and the second one to the fact that the investor has to make non negative profit.

Condition (1) directly implies that the optimal contract has $D^+ > D^-$. Indeed, since $R > L$, smoothing incomes across states of nature implies that $(R - D^+) - (L - D^-) < R - L$, which is exactly equivalent to repaying more debt in case of good signal than in bad signal.[5]

It follows from this remark on insurance that $D^- < L$, i.e. the investor leaves something to the entrepreneur in case of a bad signal. If it were not the case, we would have:

$$D^+ = \frac{2I - (1-p)L}{1+p} < L = D^-$$

which comes from the fact that $I < L$ in the model. In this case, setting $D^- = L$ implies that, as the project always generates at least L, that $D^+ < L$, which contradicts the fact that the entrepreneur is risk averse and benefits from insurance.

[5] This is a heuristic proof. A real proof can be given assuming that $D^+ < D^-$. In this case:

$$u(2R - D^+) + pu(R - D^+) > u(2R - D^-) + pu(R - D^-)$$

however, since $R > L$, we get:

$$u(2R - D^-) + pu(R - D^-) > (1+p)u(L - D^-)$$

hence the first order condition (1) never holds.

While in general, it is not possible to know more about the different debt levels, it is easy to see that when u is quadratic, D^+ and D^- are given by:

$$D^+ - D^- = R - L + \frac{R}{1+p} > 0$$

which decreases in p. The intuition is that, as p increases, the signal becomes less and less informative - all projects generate interim cash flows. Insurance against the signal becomes less and less possible.

2.2.2 Optimistic Entrepreneur

The driving force of optimal contracting in the absence of moral hazard is the demand for insurance. This general result does not hold any more with an optimistic entrepreneur. The first reason is trivial in our model: since they believe the project to be good for sure, optimists do not ask for insurance.

The second reason for which the standard intuition does not hold is more interesting. Since optimists underestimate the probability of failure, they are willing to repay more debt in this case. They think it is not going to happen anyway. In contrast, since they overestimate their chances of success, they are less willing to repay debts if the project works. Hence, when compared to realistic entrepreneurs, optimists prefer to pay more in case of failure, and less in case of success. In other words, even with the same degree of risk aversion, optimists prefer steeper, more risky payoffs. In a realist's view, optimistic entrepreneurs asks for *too little* insurance.

Hence, the gap in beliefs between an optimistic entrepreneur leads to predictions opposite to the standard theory. Usually, the optimal contract transfers all the risk to the risk neutral agent. In the optimum here, the entrepreneur gets nothing in case of a bad signal and the investor gets the safe strategy payoff L. The entrepreneur is happy to give up this claim to the investor since he thinks the firm is always going to generate interim cash, as the project is a good one.

To see this more formally, consider two class of contracts. The first class does not transfer control to the investor if the signal is bad. In this case, the entrepreneur goes for the *growth* strategy as he still believes that the project is a good one. Even with bayesian updating, he attributes the failure to generate interim cash flow to improbable bad luck. Hence, in this first class of contract, entrepreneurs always play it *growth*. Investors take it into account, and the optimal contract in this class is given by:

$$\begin{aligned} \max \quad & \underbrace{u(2R - D^+)}_{\text{good signal, good project}} \\ \text{s.t.} \quad & \frac{1+p}{2} D^+ = I \end{aligned}$$

as the entrepreneur is certain that the project has good quality. This optimal contract yields utility $u(2R - 2I/(1+p))$.

Look now at the class of financing contracts that transfer control to the investor in case of bad signal. In this case, the realistic investor plays it *safe* in case of bad signal, and lets the entrepreneur go for the *growth* strategy if the signal is good. In this class of contracts, the optimal contract is given by:

$$\begin{aligned} &\max u(2R - D^+) \\ &\text{s.t. } \frac{1+p}{2}D^+ + \frac{1-p}{2}D^- = I \end{aligned}$$

as the entrepreneur does not think the project may fail, the optimal contract is a corner solution of this program:

$$\begin{aligned} D^- &= L \\ D^+ &= \frac{2I - (1-p)L}{1+p} < L \end{aligned}$$

where all claims contingent on the bad signal are transfered to the investor, and as much claims as possible on the good signal are transfered to the entrepreneur.

This second class of contracts clearly dominates the first one, as:

$$u\left(2R - \frac{2I}{1+p}\right) < u\left(2R - \frac{2I}{1+p} + \underbrace{\frac{1-p}{1+p}L}_{\text{gains from giving up control}}\right)$$

The class of contracts that transfer control to the investor in case of bad signal dominates those that do not for two reasons. First, entrepreneur do not think giving up control contingent on a bad signal is costly since bad signals never occur. Second, the investor is willing to lower the debt repayment in the good state if he gets control in the bad state which enables him to choose the efficient strategy.

The investor takes all claims contingent on the bad signal, and the entrepreneur as much claims as possible on the good one. The magnitude of the utility gain from the trade in claims is $\frac{1-p}{1+p}L$. Indeed, to increase the payoff of the entrepreneur in the good state by \$1 without losing money, the investor needs to extract $\$\frac{1+p}{1-p}$ in the bad state. He can do so until he hits the maximum debt repayment L.

Hence, because the entrepreneur sees only the good state, in the optimal contract, his payoff is zero in the bad state. From the point of view of the investor, the entrepreneur demands to be "paid with dreams". Here, contingencies are used to "bridge the beliefs gap", not to provide insurance. The

optimal contract is thus one that (1) transfers the control to the investor if the signal is bad, and (2) yields no income to the entrepreneur in case of bad signal. Such payoffs and control transfers contingent on the venture meeting milestones are characteristic of venture-capital contracts (see Kaplan and Stromberg [2000]). In sharp contrast with existing financial contracting theories, this model suggests that such contingencies may be driven by differences in opinions rather than insurance motives or moral hazard and assymetric information. In particular, as the result of entrepreneurial optimism, large risk-sharing opportunities subsist in these contracts: a large amount of external risk (on which the entrepreneur has no impact) could be transfered to the principal. This particular aspect is consistent with Kaplan and Stromberg [2002] who show that, in venture capital contracts, substantial amounts of external risk are indeed borne by entrepreneurs.

In real life, however, a large majority of new ventures are financed by simple debt contracts of either short or long maturity. Venture capital contracts, which specify both contingent repayments *and* control transfers are the exception, rather than the rule. This is going to be particularly true in our sample of French start-ups, as the French private equity market is less developed and more LBO oriented than the US one.

This is why, in the following, we focus on the set of financing contracts where the interim cash flow level cannot be directly contracted upon. In this case, only two types of contracts are feasible: a long term debt contract, that specifies a repayment D in case of final success, and a short-term debt contract that specifies a debt repayment in case of interim cash flow, and a control transfer if the firm fails to honor it.

2.3 Short-term Debt

With short-term debt, the firm is unable to meet its commitment at date 1 unless the interim cash flow is $R > 0$. If the firm fails to generate any cash flow, the investor seizes control and ownership of the firm, and can impose the safe strategy[6].

When the firm generates interim cash flows R, the short-term debt contract specifies a debt repayment $D < R$, and both parties split. Given our assumption 1, the entrepreneur then chooses the *growth* strategy.

[6] If the cooperation of the entrepreneur is necessary to undertake the safe strategy (e.g. the entrepreneur can not be replaced) then the same results obtain if we assume that the investor makes a take-it or leave-it offer to the entrepreneur.

2.3.1 Realist Entrepreneur

Let us now caracterize the optimal short-term debt contract with a realistic entrepreneur. At date $t = 0$, interim cash flows are going to be R with probability $(1 + p)/2$ and 0 with probability $(1 - p)/2$. Both the investor and the entrepreneur share the same beliefs about future cash flows. Perfect competition among investors implies that the optimal short-term debt contract solves:

$$\max_D \left[\frac{1}{2} u(2R - D) + \frac{p}{2} u(R - D) + \frac{1-p}{2} u(0) \right]$$
$$I = \frac{1+p}{2} D + \frac{1-p}{2} L$$

whose solution is trivially given by:

$$D = \frac{2I - (1-p)L}{1+p} > 0$$

We first notice that, since $L > I$, the short-term debt repayment satistfies $D < L$. short-term debt contracts are always feasible because the firm always generates at least cash flow L under these contracts. Hence, the NPV is at least L which is larger than I. All projects may be financed. Secondly, the debt repayment is larger when the signal is bad (it amounts to L), than when the signal is good (it amounts to $D < L$). The short-term debt contract thus does not provide much insurance to the realistic risk averse entrepreneur.

Before turning to the optimistic entrepreneur, we compute the realistic entrepreneur's utility:

$$\frac{1}{2}[u(2R - D) + pu(R - D) + (1 - p)u(0)]$$

Since it tends to amplify, rather than tame, the uncertainty, the short-term debt contract seems to be a costly way of financing a risk-averse realist entrepreneur. As we shall see, this cost of uncertainty is not an issue for an optimist entrepreneur.

2.3.2 Optimistic Entrepreneur

We now turn to the case when the entrepreneur is optimistic. The investor's payoff is still given by:

$$D = \frac{2I - (1-p)L}{1+p}$$

since only this level of debt D satifies his zero profit condition.

In our set-up, optimism is extreme to simplify the calculations: from the entrepreneur's viewpoint, the project is good, and is thus going to yield cash flows both at $t = 1$ and $t = 2$. The firm is therefore going to be able to repay any debt level below $2R$. His ex-ante utility with short-term debt is therefore:

$$u(2R - \frac{2I - (1-p)L}{1+p})$$

From an optimistic entrepreneur's viewpoint, short-term debt is a good deal because it transfers to the investor a claim that the entrepreneur believes to be worthless: the firm value contingent on a bad signal. In this simple set up, short-term debt provide the same allocation of cash-flows ($D^- = L$, $D^+ = D$) as the contingent contract case. short-term debt allows to achieve the first best with an optimistic entrepreur.

2.4 Long Term Debt

The other possible financing contract is long term debt. At $t = 0$, this class of contracts specifies a debt level D to be reimbursed at date $t = 2$ if the project succeeds.

2.4.1 Realistic Entrepreneur

A firm run by a realistic entrepreneur always yields at least L: from assumption 1, if interim cash flows are R, the realistic entrepreneur chooses the *growth* strategy.[7] The firm finally generates $2R$ when the project is good, and R when it is bad. When interim cash flows are zero, the entrepreneur gets zero if he choose the *growth* strategy. He therefore plays it *safe* and the firm finally generates L.[8]

Given that $I < L$, long term debt is risk-free with a realist. Hence, long term debt repayment is immediately given by the investor's no profit condition:

$$D = I$$

[7] The debt overhang effect makes the growth strategy even more attractive when the interim signal is good:

$$\frac{1}{1+p}(R - D) > L - \frac{1}{1+p}D > L - D$$

[8] Here, the debt overhang effect could tempt the entrepreneur to gamble for resurrection and choose the growth strategy if bad projects could generate positive cash flows. Our assumption that no interim cash flows are *always* followed by a failure of the *growth* strategy ensures that it does not happen here.

From this simple condition, we obtain that $D < L$ and $D^+ = D^- = I$. This contract thus does not achieve first best. It does *not* replicate the cash flow allocation of the optimal contingent contract, where, as we have seen above: $D^- < D^+$. It is however, closer to the first best than the short-term debt contract, that features $D^- > D^+$.

It is clear that under long term debt, cash flow allocation to the entrepreneur second-order stochastically dominates cash flow allocation under short-term debt, while the expected return to the entrepreneur is the same under both contracts. Hence, the realistic entrepreneur strictly prefers long term debt, which provides smoother income allocation across states of nature. Long term debt is prefered because it provides more insurance than short-term debt. Put otherwise, short-term debt makes contracts too contingent on a signal that the entrepreneur does not control.

2.4.2 Optimistic Entrepreneur

Optimistic entrepreneurs do not interpret a bad signal as evidence that the project is bad. They remain convinced that the *growth* strategy is optimal, and undertake it. The investor knows, however, that it is going to fail and yield zero. He is thus better off renegociating on the debt level, provided he can make sure the entrepreneur chooses the *safe* strategy. Renegotiation occurs if $R - D < L$. To simplify the analysis, we assume that the entrepreneur has all the bargaining power, and is therefore able to extract all the surplus: he gets $L-(R-D)$.[9] In this case, renegotiation is of little importance ex ante. It has no impact on the entrepreneur's ex ante expected utility, since he expects this situation never to occur. The investor gets nothing in case of bad signal (all the surplus is transfered to the entrepreneur even with renegociation), and has to finance himself on the good state only. His zero profit condition therefore writes:

$$\frac{1+p}{2}D = I$$

Thus, long-term debt is feasible with an optimist if $\frac{2I}{1+p} < R$ with $D = \frac{2I}{1+p}$.

When $R - D > L$ renegociation is not possible, unless the investor is able to transfer money to the entrepreneur to compensate him from choosing the safe strategy. We assume away this possibility, such that the investor gets zero in case of bad signal. His zero profit condition yields therefore the same debt level as above.

Hence, whether both parties renegociate ex post or not, the entrepreneur's

[9] All our results hold qualitatively with a more general renegociation process.

utility is given by:

$$u = u(2R - D)$$

To check on whether the optimistic entrepreneur prefers short-term to long term debt contract, it therefore suffices to show that D is larger under long term debt contract. This happens if and only if:

$$\underbrace{\frac{2I}{1+p}}_{\text{long term debt}} > \underbrace{\frac{2I}{1+p} - \frac{1-p}{1+p}L}_{\text{short-term debt}}$$

which clearly holds. short-term debt is preferred because under short-term debt, the investor is able to extract the full firm value (L) in case of bad state, which lowers the cost of debt in good states. Only this last part counts for the optimistic entrepreneur. Contingent control rights make contingent claims therefore optimally allocated between the two parties. In mathematical terms, the level of long term debt is above the short-term debt repayment by $L(1-p)/(1+p)$, which is exactly the increase in utility generated by transfering all claims on the bad signal to the investor (who values them) away from the entrepreneurs (who thinks they are worthless). [10]

2.5 Results

This section summarizes and reinterprets the main results of the above analysis.

2.5.1 Self Selection of Optimists

First, we have looked, above, at short and long term debt contracts when beliefs can be observed by the investor. We have seen that the optimistic entrepreneur always prefers the short-term debt contract.

Proposition 1 *Assume that the investor can observe the entrepreneur's belief:*

- *Short-term debt is feasible with both type of entrepreneurs*
- *Long-term debt is feasible with realists but feasible with optimists only if* $R > \frac{2I}{1+p}$.
- *An optimistic entrepreneur always prefers short-term debt.*
- *A realistic entrepreneur always prefers long-term debt.*

[10] This still holds if the investor has all the bargaining power.

As we said above, there are two effects. First, the optimal contract with a realistic entrepreneur provides as much insurance as possible: long term debt does just that, while short-term debt repayments in case of bad signal tend to be too high. Second, short-term debt contracts give all claims contingent on the bad signal to the investor, which the entrepreneur does not view as a cost. Hence, the short-term investor is able to pay the entrepreneur with "dreams".

The second main result of the above analysis is that in this set-up maturity choice is separating, and therefore, we can relax the assumption that beliefs are observable:

Proposition 2 *Assume that the investor* cannot *observe the entrepreneur's belief. The short-term debt contract with debt repayment:*

$$D = \frac{2I - (1-p)L}{1+p}$$

and the long term debt contract with debt repayment:

$$D = I$$

are separating*: realists choose long term debt and optimists choose short-term.*

The equilibrium is therefore a constrained optimum - given that we restricted the set of feasible contracts. Indeed, it is easy to see that both revelation constraints strictly hold. A realist prefers it long term since:

$$\frac{1}{2}[u(2R-D)+pu(R-D)+(1-p)u(0)] < \frac{1}{2}[u(2R-I)+pu(R-I)+(1-p)u(L-I)]$$

as contingent cash flows in case of short-term debt second order stochastically dominate cash flows in case of long term debt.

The revelation contraint for optimists writes:

$$u\left(2R - \frac{2I-(1-p)L}{1+p}\right) > u\left(2R-I\right)$$

Interestingly, it holds whether or not long-term debt is actually feasible with optimists. To see why it holds, let us write the difference in expected payoffs:

$$\begin{aligned}\Delta &= \left(2R - \frac{2I-(1-p)L}{1+p}\right) - (2R-I) \\ &= \underbrace{-\frac{1-p}{1+p}I}_{\text{credit advantage for realists}} + \underbrace{\frac{1-p}{1+p}L}_{\text{efficient claim transfer}} > 0\end{aligned}$$

which is the product of two countervailing forces.

First, the optimistic entrepreneur thinks that a long-term debt contract for realists is cheaper than short-term debt for optimists: contracts for realists look cheaper because the investor knows realists are going to choose the safe strategy in case of bad signal, and will repay part of their debt. Optimists, however, repay nothing as they still go for the growth strategy and fail. This effect is, however, fully counteracted by the fact that the short-term investor asks for claims contingent on the occurence of low signal. These claims are, in the entrepreneur's eyes, worthless. In turn, asking for these claims allow the short-term investor to leave the entrepreneur in possession of as much of his dreams as possible. By making debt short-term, the investor transforms 1$ in the bad state into $(1-p)/(1+p)$ in the good state, yielding a net (subjective) gain for the entrepreneur.

2.5.2 Initial effort

How does optimism affect initial effort ? In the context of observable beliefs, assume that the final cash-flow for the groth strategy is $R(e) = (1+e)R$ where e is a level of effort privately provisioned by the entrepreneur at time 0, and at cost $\gamma e^2/2$. The previous analysis remains unchanged, as effort here does not affect chances of success but only the size of the residual claims. Hence, the investor's zero profit conditions are unchanged, as well as the strategy choices of the entrepreneurs.

Assume first that the realist and the optimist face the same contract. Call D^+ the repayment when the good signal occurs. Then the levels of effort of the realist is smaller than the one of the optimist because the latter overweights the value of a marginal unit of effort:

$$\begin{aligned} e_{opt} &= \frac{R}{\gamma} u'(R(2+e_{opt}) - D^+) \\ e_{\text{real}} &= \frac{1}{2}\frac{R}{\gamma} u'(R(2+e_{\text{real}}) - D^+) < e_{opt} \end{aligned}$$

In equilibrium however, both types of entrepreneurs select different contracts. In the separating equilibrium, we get:

Proposition 3 *In equilibrium, for the contracts they select respectively:*

- *The level of effort from optimists is:*

$$e_{opt} = \frac{R}{\gamma} u'(R(2+e_{opt}) - I + \frac{1-p}{1+p}(L-I))$$

- *The level of effort from realists is:*

$$e_{\text{real}} = \frac{1}{2}\frac{R}{\gamma}[u'(R(2+e_{\text{real}}) - I)]$$

In general, these levels of effort can be ranked one way or the other, as the result of two opposite effects: first, the optimist overestimates the probability that his effort has an impact, which *increases* the propensity to do effort. Second, because of the nature of the optimal contract, the optimist has more wealth than the realist in case of a good signal. The wealth effect tends to *decrease* effort. For a risk-neutral agent, the second effect vanishes and therefore optimism leads to *higher* effort.

2.5.3 Propensity to Invest Personal Wealth

Assume now that entrepreneurs have wealth $A < I$, they can either borrow the full amount I required to finance the project, or less, down to $I - A$. Assume, to simplify, that beliefs are observable. The question that may be asked then is: do optimist have a tendency to invest more of their own wealth ? The answer is easy to get: all the previous analysis remains intact (replacing I by $I - A$) and we have the following result:

Proposition 4
- *A realist does not invest any of his wealth*
- *Optimists invest their own wealth up to a certain level, namely, an optimist invests* $\max(A, I - \frac{1-p}{2}L)$

The first point just reflects optimal risk-sharing: setting A aside yields A with certainty, while investing it in the project is risky. As the investor is risk neutral, he finances the whole project. The second point is a little more subtle: for any dollar that he borrows above$\frac{1-p}{2}I$, the entrepreneur feels he is giving away $\frac{2}{1+p} - 1$ to the investor and therefore is better off investing out of his pocket (because in the entrepreneur's view, the investor underestimates his chances of success). $\frac{1-p}{2}I$ is the threshold at which the claim on the bad state is totally transfered to the investor. For any dollar invested below that threshold, the entrepreneur believes he has an amazing deal: he borrows against a claim of value zero. He will fully exploit this "arbitrage opportunity".

3 Tests

Our test consists in investigating the real effects of entrepreneurial optimism. It has two parts. First, we exhibit evidence of heterogeneity in beliefs using a

dataset of French entrepreneurs, by comparing their growth expectations with their actual growth. Since we only observe one expectation error per entrepreneur, we look for systematic biases within particular categories of observables. As we discuss below, these categories are chosen in accordance with a simple model –in appendix– of entrepreneurial belief formation. We find that certain categories of entrepreneurs –those that implement their own idea, those that lack expertise, the very educated etc.– tend to systematically overestimate their growth prospects - at least more than the others. These findings are also discussed in line with evidence from the management and psychology literatures.

We then use the predictor of expectation error given observed characteristics as our measure of optimism. We test two main predictions of our model of financial contracting: (1) optimists prefer inside equity and borrow more short-term and (2) optimists who use more short-term debt perform better. The data support these two predictions, although we are not in a position to say anything about causality. We then perform various robustness and constitency checks to verify that our results are not spurious.

3.1 Data Description

Our dataset consists of the merging of two sources (see data appendix for more details). The first dataset comes from a survey conducted by the French statistical institute (INSEE) on a sizeable portion of new businesses started in 1994 and 1998. This survey (SINE), provides us with the entrepreneur's main socio demographic caracteristics (age, education, social background), and on his *growth expectations* as he starts/takes over/inherits the business. Other qualitative questions relate to (1) the reasons for which the firm was started and (2) the conditions under which it was started (financing, initial research, customer prospection).

This survey does not however, provide much detail on corporate performance and finance. We thus matched this information with accouting data compiled from tax reports (Bénéfices Industriels et Commerciaux). Accounting data provide fairly detailed information on firm's balance sheet, profit account and employment. In addition, they are exhaustive for firms with a turnover above 110,000 euros. They span over the 1994 - 2000 period.

Given our focus on "pure creations" (some firms surveyed are simply taken over or inherited), and the fact that we want firms to be in both samples, we end up with a basic sample of some 23,000 firms. The upper panel of table 1 displays the observable caracteristics of firms the year they were started (so this exclude firms that were taken over from others by the entrepreneur). In their first year of existence, the ventures are small: they typically employ

1.5 workers, and use 35,000 euros of fixed assets, to make up no more than 200,000 euros of total sales. Breaking down the sample into corporations and non corporations, and into small and big (at least two employees) highlight the considerable skewness of firm size distribution. Firms with at most one employee tend to have on average 0.4 employees, meaning that only 40% have any employee beside the firm's owner. In constrast, firms with more than 1 employee employ on average 5 people.

Table 1: Summary Statistics on Initial Characteristics of The Venture

	Sole Proprietors	Corporations	Small	Big
Employment (number of employees)	0.4	2.5	0.2	5.1
Fixed assets (thousands euros)	17	52	22	73
Total Sales (thousands euros)	117	245	90	458
Observations	11,007	12,179	17,263	5,923
Equity / (debt + equity)	0.74	0.65	0.72	0.58
Observations	4,324	11,685	10,828	5,181
(Equity + Inside Debt) / (Debt + Equity)	0.80	0.76	0.82	0.76
Short term bank loans / Bank loans	0.44	0.46	0.49	0.44
Credit lines / Bank loans	0.34	0.36	0.38	0.34
Observations	250	2,750	1,168	1,832

Source: 1994 and 1998 SINE surveys and tax files. Size indicators and capital structure in the first year the firm is observed from the tax files. We restricted ourselves to firms that where first present in the tax file at most 1 year after they were started (hence 1994 or 1995 for the first wave, and 1998 or 1999 for the second one). There are fewer observations for the detailed capital structure because the tax files do not reported detailed financing for small business (with sales below 230,000 euros). "Corporations" corresponds to firms whose owner enjoys formal limited liability. "Big" firms are firms that employ at least 2 workers (in addition to the owner).

Our theory has predictions on the determinants of (1) the share of inside finance in total corporate finance and (2) the share of short term loans in outside finance. Our first measure of inside finance will be the ratio of equity to (financial debt + equity). For our sample of very young firms, equity is the principal source of finance, since it accounts for some 70% of total finance. For a subset of the firms[11], we can break down financial debt into bank debt

[11] Basically, all firms with turnover above 250,000 euros (see appendix).

and "other financial debt". For our small firms, "other financial debt" mostly consists of loans made to the firm by the owners and their relatives. Given that these loans are likely to be junior to any bank loan, our second measure of "inside finance" is thus going to be the ratio of (equity + "other debt") to (financial debt + equity).

It therefore seems fair to assume that bank loans are the sole source of outside finance for these small firms. For a subset of firms, the data allow to break down bank debt into short term debt (all loans with maturity of less than two years) and long term debt (the rest). In addition, the data provide us with the share of short term bank debt that takes the form of bank overdrafts and negociated credit lines. Hence, our first measure of short term loans in outside finance is going to be the fraction of bank loans whose maturity is below 2 years. It is on average a little less than 50%. Our second measure is the ratio of credit lines to bank loans (some 33% on average). The lower panels of table 1 provide descriptive statistics for these measures of corporate finance, depending on firm size and on the firm being a corporation. Unsurprisingly, these factors look like important determinants of capital structure, and we will have to include them as controls in our regressions.

3.2 Determinants of Optimism

Before we start testing our model's predictions, we first need to construct a measure of optimism at the entrepreneur level. In the model, optimism is the difference between an entrepreneur's subjective probability of success and the objective probability of success. What the data give us however, is only the entrepreneur's initial expectation of success and the ex post venture performance. Hence, the data allow to compute an expectation error, not the bias that we are looking for. To go around this problem, we compute the average expectation error for given categories of entrepreneurs. If expectations were rational, it should be that the average expectation error within each category should equal zero (or at least be the same for everyone in an industry).

To choose the relevant categories within which to compute average expectation errors, we need a model. The model we propose in this paragraph has predictions analoguous to those of De Meza and Southey [1996], but uses alternative assumptions on the agents' limited rationality. There are initially many agents, each of which having an idea. The NPV μ of this idea is drawn from a known distribution. Instead of observing μ directly, each agent observes a noisy signal $S = \mu + \varepsilon$, where ε is drawn from another, independant distribution. Were agents fully rational, they would compute the objective expected value of their idea $E(\mu|S)$, compare it to their outside option V and select into entrepreneurship as soon as $E(\mu|S) > V$. We assume, however,

that agents are subject to a well documented psychological bias called "base rate neglect" (see Barberis and Thaler [2003] for a thorougher description). When they observe a large signal value S, agents try to infer the probability that the project has a high NPV μ. The contiditionnal expectation of μ given S is, however, the product of two things: (1) the *a priori* probability that the project is actually a good one (the base rate) and (2) the probability that good projects generate high signals S. While the first term may be small, the second term is likely to be large. Psychologists have shown, however, that in their inferences, agents tend to overweight the second term, and forget about the base rate.[12] In this model, base rate neglect amounts to assuming that agents select into entrepreneurship if $S > V$. In looking at S instead of looking at $E(\mu|S) = S - E(\varepsilon|S)$, they omit the term in $E(\varepsilon|S)$, which states that large signals may be generated by large noises instead of large project NPVs.

This model is detailed in appendix, but what matters here is the following two comparative statics. First, agents with larger outside options should be, on average, more optimistic about their project's NPV. Hence, we expect that more educated, and more experienced agents that select into entrepreneurship should be more optimistic, because they could claim a higher wage on the labor market. Second, agents with more precise information (ε has a low variance) make a smaller mistake when they neglect the base rate. Hence, they are less optimistic. We thus expect agents with more expertise in the industry to be less optimistic. On the contrary, agents whose motivation is to implement a "novel idea" have a noisier signal and are expected to be more optimistic, provided they chose to become entrepreneurs.

Before estimating biases, let us start with "expectation errors". Our expectational variables are discrete: we know whether the entrepreneur initially expects business sales to "develop" ($EXPGR = 1$) or not ($EXPGR = 0$) within the next year. We also know whether the entrepreneur initially expects to hire additional employee(s) ($EXPEM = 1$) or not ($EXPEM = 0$, see appendix and table A1 for further description of these variables). Besides, we know from the accounting data by how much firm sales and employment actually grew over the first two years. We therefore construct expectation error as the difference between expectations and realizations. Since expectation variables are discrete, we also discretize realizations of sales and emploment growth such that:

$$\begin{aligned} \Delta_S &= EXPGR - 1_{(\Delta \ln(SALES) > 3\%)} \\ \Delta_E &= EXPEM - 1_{(\Delta(employment) > 0)} \end{aligned}$$

[12] This bias is also called "representativeness". Assume that it is true that large signals are *representative* of large NPVs. For their inference, however, agents assume that large signals *always* come from high NPV projects. Agents therefore often overestimate the representativeness of their information (this reasonning also generates a bias called "belief in the law of small numbers").

where Δ_s and Δ_e are expectation errors relative to sales and employment. $\Delta_s = 1$ when then entrepreneur expects "development" in the year to come but sales grow by less than 3% over the first two years. $\Delta_s = -1$ when the entrepreneur expects stagnation, but sales grow by more than 3%. $\Delta_E = 1$ when the entrepreneur expects to hire but does not within the first two years. $\Delta_E = -1$ when the entrepreneur does not plan to hire but does so within the first two years.

These measures are clearly noisy, first because the accounting data may not be that reliable. This, however, should weaken, not strengthen, our estimates. Second, because expectations are not quantified, the 3% threshold is arbitrary - what do entrepreneurs mean by grow instead of stagnate ? Our choice matches the average consumer price increase of the French economy over the period, and is therefore very conservative: an entrepreneur did not overestimate growth if his business's growth was more than zero in real terms. We therefore underestimate the magnitude of optimism in the sample, if "reasonnable growth" is above zero. Provided all entrepreneurs understand the term "growth" in the same way (above X%), this is not going to affect too much our results - and indeed changing the threshold does not really affect our regression results, as long as there remains enough observation per categories. If, however, different entrepreneurs were to interprete the question differently - as is certainly the case - this could bias our results. We try to control for this issue by incorporating industry dummies as explanatory variables, as "growth" standards are most likely to vary across industries. Given the cross sectional nature of our dataset, however, we saw no other way of dealing with this problem.

We then regress these two errors on a series of entrepreneur characteristics, as suggested by our small model:

$$\Delta_{S,i} = \beta Z_i + \varepsilon_i \quad (3)$$

$$\Delta_{E,i} = \gamma Z_i + \nu_i \quad (4)$$

where Z_i include variables suggested by our small model of belief formation, as well as existing evidence from the psychology and economics literature. The precise way these variables are constructed, as well as the accurate phrasing to the questions are given in the appendix of this paper (in particular, see table A2):

- **Entrepreneur education**, broken down into four levels (high school dropout / graduate, college graduate, post graduate/grande école level). Educated entrepreneurs enjoy a larger outside option on the labor market, and can be argued to have a larger number of ideas. Our small model of belief formation suggests that they should therefore exhibit more optimism. Psychology theory is more ambiguous about possible biases

arising from education. First, general education gives entrepreneurs a view on the "big picture" and Kahneman and Lovallo [1993] argue that those decision makers that adopt an "outside view" of a problem do not exhibit any bias in their expectations. More specific to France and interesting to us is the highly selective "grande école" system. Using this information to learn on their own ability, successful students may be easily overestimating their own ability. Psychology provides two reasons for this. First, agents tend to attribute a large share of their successes to their own ability, and discard chance or other explanation because it makes them happier (*self serving attribution of outcome*). Second, agents put too much weight on the information flow, and too little on priors, a phenomenon known as *base rate neglect*, or *representativeness*.

- **Entrepreneur age**, as a proxy for general experience. Experience is likely to increase entrepreneurs' outside options on the labor market, and thus have a positive impact on optimism. But it could also be argued that experienced entrepreneurs are likely to observe more precise signals. In this case, optimism should be less prevalent among older entrepreneurs. The expertise variable - described below - is therefore more likely to capture this effect.

- **Entrepreneur gender**: using a dataset on positions and trading records for some 35,000 investors, Barber and Odean [2001] show that the turnover rate of common stocks for men is one and half times larger than that of women. Because of transaction costs, they estimate that annual returns of portfolios held by men are 1 percentage point lower than for women. They rely on the psychological literature to interpret this difference as evidence that men are more overconfident (i.e. overestimate the precision of their information) than women. In our setup, overconfident agents believe that the signal they receive is more accurate. In this context, men should therefore exhibit more optimism. We therefore add a dummy equal to one when the entrepreneur is a man.

- **Serial entrepreneur**: a dummy equal to one when then entrepreneur has already started a business before this one. Serial entrepreneurs may be either optimistic or realistic. Successful entrepreneurs have high outside options, and are therefore more likely to exhibit optimism. However, repeated experiences should allow beliefs about one's ability to be updated and converge toward realistic levels. According to psychologists, the impact of past entrepreneurial experience is, however, ambiguous; several authors (see e.g. Babcock and Loewenstein [1997]) have argued that optimism tends to persist, as entrepreneurs tend to asymetrically attribute failure to external causes and success to own action. Belief

updating therefore takes the form of wishful thinking, and reinforces optimism. In this case, it is likely that serial entrepreneurs are a selected subsample of those that exhibit more self serving attribution of outcome - the others have quit. In this case, serial entrepreneurs are more likely to be optimistic than a random sample of beginners.

- **Expertise in the industry**: a dummy equal to one when the entrepreneur was previously working in the same industry. Our model suggests that experts receive more accurate signals, and that for them, base rate neglect is therefore not much of a concern: they are less optimistic. In the management literature, Russo and Shoemaker [1992] provide statistical evidence that expertise allows to "know what one does not know", i.e. to exhibit less optimism in the field of expertise. De Bondt and Thaler [1995] do, however, argue otherwise. Self declared areas of expertise are those areas where the agent is personnaly commited the most, and personal commitment is likely to foster optimism (Weinstein [1980]).

- **Desire to implement a new idea:** A dummy equal to one when the entrepreneur's motivation was the implementation of a new idea. This should be positively correlated with optimism, as new ideas are much more difficult to assess (signal is noisier). Psychology theory gives, this time, a concordant and ambiguous insight. First, the desire to implement an own, new, idea is a sign of high self commitment in the project. Commitment is, in general, a source of optimism. Second, novelty prevents entrepreneurs from keeping their eyes on the "big" picture; Kahneman and Lovallo [1993] argue that it forces them to do "scenario thinking" (Shane and Venkataraman [2000] call it "information corridors"), i.e. explore all possibilities in a given direction, while forgetting some essential aspects. This, they argue, tends to generate biases in the project's success expectations.

- **Desire of autonomy**: A dummy equal to one when the entrepreneur's motivation was to achieve independance. We view these individuals as those who are among the most commited to the project - as opposed to heirs or people that did not have any better option. As we argued for example by Weinstein [1980], personnal commitment is likely to foster optimism.

We regress our expectation error variable on these observable entrepreneurial caracteristics. We added to the regressions (1) a year-of-survey dummy, indicating the possibility that expectations errors may depend on the aggregate state of the economy and (2) industry dummies to account for specific industry expectations. We use simple OLS and allow error terms to be correlated

within each industry, in order to capture part of the heterogeneity in industry cycles and trends.

Table 2: Predicting Expectation Errors

	Expectation Error Based on	
	Employment	"Development"
High School graduate	0.04**	0.05***
	(0.02)	(0.01)
College graduate	0.06***	0.10***
	(0.02)	(0.02)
"Grandes Ecoles" or postgard	0.06***	0.15***
	(0.02)	(0.03)
Age>38 years	-0.01*	0.01
	(0.01)	(0.01)
Male Entrepreneur	0.03***	-0.03
	(0.01)	(0.03)
Serial entrepreneur	0.03***	0.09***
	(0.01)	(0.02)
Area of expertise	0.00	-0.04***
	(0.01)	(0.01)
Motive: Implement own idea	0.06***	0.09***
	(0.01)	(0.01)
Motive: Need for autonomy	0.03***	0.02**
	(0.01)	(0.01)
Starting year: 1998	0.00	0.00
	(0.00)	(0.00)
2 digit industry dummies	yes	yes
Observations	19,391	18,916

Source: 1994 and 1998 SINE surveys. The "expectation error" on sales and employement as given by equations (3) and (4) are regressend on the above variables, and 40 2 digit industry dummies using OLS. Within each industry, error terms are allowed to be correlated in a broad form using White's correction method.

Results are reported in table 2. Most of the variables we described above seem to predict a bias in expectation. First, notice that while the 40 industry dummies are jointly significant determinants of expectation errors, no industry dummy comes out significant: expectation bias has apparently little to do with the environement. We interpret it as a reassuring hint that expectation bias depend on the entrepreneur, not the market. Second, entrepreneur

caracteristics come out jointly and separately significant. We interpret this as evidence of systematic expectational biases for given entrepreneurial caracteristics. Whatever the definition of expectational error we chose, education came out strongly significant. It seems that educated entrepreneurs expects systematically more growth than non educated ones. Second, entrepreneurs implementing their own idea tend to systematically overestimate their growth prospect, as opposed to those feeling they had no other choice. In addition, the desire of autonomy comes up strongly positive and significant. A high personnal involvement goes along with systematic upward biases, which is equally consistent with psychological evidence. Last, entrepreneurs that have already started a business before tend to systematically overestimate their growth prospects. We do not know, however, whether the past entrepreneurial experience (1) was successful - in which case entrepreneurs would self servingly attribute the positive outcome to their own ability, or (2) whether was unsuccesful, in which case optimism may stem from unsufficient learning from past experience - another feature of the self serving bias. Some variable come out significant in one specification only. The first regression result is consistent with Barber and Odean's study: men tend to systematically overestimate the future hiring behaviour. In the second regression, expertise seems to reduce optimism over sales growth.

It is important to recall here that we have submitted these results to various robustness checks[13]. More importantly, the variable on the right hand side of equation (3-4) is categorical - it can be equal to -1, 0 or +1 depending on whether growth was above, in line with, or below expectations. We therefore replicated the results from table 4 using an ordered probit regression and found exactly the same results in terms of signs and significance.

Another concern may be that our results come from some correlation between entrepreneurial caracteristics and the industry in which the firm is started - skilled entrepreneurs go to, say, high tech industries. In this case, these entrepreneurs fail more often because they are in more risky industries.[14] To adress this, we first reran the above regressions using 4 digit industry dummies instead of 2 digit ones (this makes 507 different industries instead of 50). Results were unaffected, except for the male dummy, whose significance in the first equation was weakened, which is a hint that some self selection of women into less risky industry might occur. We also looked at firm specific risk, by regressing a "death dummy", equal to 1 when we know that the firm is going to disappear within 2 (or 4) years. It turns out that all of our explanatory variables predict *less*, not more, probability of death. We will come back to this issue later when we shall look at capital structure.

[13] These are not included here to save space, but are available from the authors upon request.

[14] More precisely, industries where the payoff distribution is more *skewed* toward the left.

One might equally be worried that our results can be driven by one particular category of projects. We therefore investigated the robustness of our results by breaking down our sample (1) into corporations/sole proprietorships, (2) into small/big[15] firms and (3) into firms started in 1994/firms started in 1998. Each time, estimates under both subsamples were extremely similar with each other and with the results of table 4.

In the following we will use the estimates of table 2 to compute two indices of optimism at the level of the entrepreneur. These estimates indeed allow us to compute predictors of average expectation errors on sales and on employment given observable caracteristics. We use these predictors as our measures of expectation bias: a bias on employment growth and a bias on sales growth. Here, the important identifying assumption is that all entrepreneurs that have the same caracteristics share the same bias. Then, their average expectation error provides us with an estimate of their systematic bias. While this identifying assumption is certainly wrong, it has the merit of both simplicity and transaprence. It is difficult to do much better given that starting a business is a one time event, specific to both the entrepreneur and the project, for which it is almost impossible to observe repeated observations. Since we cannot control for unobserved heterogeneity, we will try to test the robustness of our interpretations to alternative explanations as much as it is possible.

3.3 Optimism and Financial Contracting

We are now set to test the relation between optimism and financial structure that is the main prediction of our model.

3.3.1 Financing Structure I: Short-Term Debt and Inside Equity

One of the key feature of financial contracting with optimists is that (1) optimists tend to prefer inside equity to outside finance and (2) they tend to prefer short-term debt contracts even when they are risk averse. When available, inside equity is less expensive than outside finance because the banker seems to underestimate the project's chances of success. When inside equity is not available, short-term debt contracts come closest to optimal contracts because the it allocates claims contingent on failure to the realistic investor who values them the most.

To check the validity of this prediction we regress (1) the inside finance in total finance and (2) the share of short-term debt in total outside finance on our measures of expectation bias. We have two measure of expectation bias: the predictor of the expectation error on sales growth (model 1) and

[15] We label "big" those firms employing at least 2 or 3 workers.

Table 3a: Financing of Optimistic Entrepreneurs: Inside Equity Finance

	Equity		"Inside Finance"	
	Model 1	Model 2	Model 1	Model 2
Expectation bias	-0.05	0.13***	0.15*	0.17***
	(0.09)	(0.03)	(0.09)	(0.04)
Limited liability	0.20***	0.20***	-0.03	-0.02
	(0.04)	(0.03)	(0.02)	(0.02)
Initial log (assets)	-0.11***	-0.12***	-0.06***	0.06***
	(0.01)	(0.01)	(0.01)	(0.00)
Started in 1998	-0.01***	-0.01***	-0.00	-0.01**
	(0.00)	(0.00)	(0.00)	(0.00)
2 digit industry dummies	yes	yes	yes	yes
Observations	15,361	14,916	4,128	3,916

Source: 1994 and 1998 SINE surveys. The dependant variables are (1) the ratio of equity (debt+equity) and (2) the ratio of (equity+debt by owner and relatives) over (debt+equity). These ratio are averaged over the firm's life cycle. Model 1 uses expectation biases based on employment forecasts, while model 2 uses expectation biases based on "development" forecasts. Results are two step OLS estimates: first, we estimate the regressions reported in table 4. This allows us to build a predictor of expectation bias at the entrepreneur level. The second step consists in regressing the ex post expectation variable on this bias predictor. A dummy for the year of creation, as well as industry dummies are included in the first and second steps. Error terms are allowed to be correlated in a broad form using White's correction method.

Table 3b: Financing of Optimistic Entrepreneurs: Maturity of Debt

	Short term Bank Loans		Credit lines	
	Model 1	Model 2	Model 1	Model 2
Expectation bias	0.53***	0.42***	0.49***	0.40***
	(0.18)	(0.10)	(0.14)	(0.07)
Limited liability	0.01	0.01	0.03***	0.03**
	(0.03)	(0.02)	(0.01)	(0.01)
Initial log (assets)	-0.03***	-0.03***	-0.03***	-0.03***
	(0.01)	(0.01)	(0.01)	(0.01)
Started in 1998	-0.02***	-0.02***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
2 digit industry dummies	yes	yes	yes	yes
Observations	3,334	3,202	3,329	3,198

Source: 1994 and 1998 SINE surveys. The dependant variables are (1) the ratio of bank loans that have less than two years of maturity over (debt+equity) and (2) the ratio of credit lines over (debt+equity). These ratio are averaged over the firm's life cycle. Model 1 uses expectation biases based on employment forecasts, while model 2 uses expectation biases based on "development" forecasts. Results are two step OLS estimates: first, we estimate the regressions reported in table 4. This allows us to build a predictor of expectation bias at the entrepreneur level. The second step consists in regressing the ex post expectation variable on this bias predictor. A dummy for the year of creation, as well as industry dummies are included in the first and second steps. Error terms are allowed to be correlated in a broad form using White's correction method.

the predictor of the expectation error on employment growth (model 2). As discussed above, we have two measures of inside finance: the ratio of equity to (debt + equity) and, for a subset of firms, the ratio of (equity + "other" debt) to (debt + equity). Regressions results using the two optimism indices are reported in table 3a. Similarly, we have two measures of short term debt: the ratio of short term loans to total bank loans and the ratio of credit lines to total bank loans. Regressions results are reported in table 3b. Results presented in tables 3a and 3b use the average of these four measures over each firm's life cycle.[16] Since the nature of the project may have obvious implications on financing structure, we add firm size, year of creation and 50 two digit industry dummies as controls on the left hand side of the regression. As it turns out, the share of short-term debt is positively and strongly correlated with our measure of expectation bias. Results are somewhat less conclusive with our measures of outside finance, but they go in the right direction, and are strongly significant for the "development" based measure of expectation bias.

One possible concern with this approach, however, is that our controls may not be capturing all the aspects of the project that affect capital structure. First, our measure of optimism may be very correlated with project's *risk* - because the entrepreneur implements a novel idea, because he is skilled and therefore likely to be more ambitious. In addition, it seems natural that risky projects tend to be more financed with short term debt - the banks prefers to be able to "pull out" sooner. Second, it is a priori plausible to argue that our measure of optimism correlates with overall corporate performance. After all, given our results above, skilled entrepreneurs, with a new idea, who have already started a business, are going to have a high level of optimism. Given this, we are simply showing that good projects use more short term debt, because they can afford to, and it is less expansive.

While it is not possible to perfectly adress these concerns given the data limitations that we face (we cannot control for unobserved heterogeneity), we can perform several convincing robustness checks. First, we reran the regressions reported in tables 3a,b adding entrepreneur's education and age as further controls. This did not qualitatively change the results. Also, we reran these regressions breaking down the sample into corporations / non corporations, or small / big firms. Again, the results were not significatively affected, and differences between categories came out insignificant.

It is possible, however, to provide more compelling checks. Let us start with the risk objection. First, we need to (1) to compute a proxy for expected

[16] The first two columns of table 5a have 5 times as much observations as the last two columns of 5a and the four columns of 5b. This is due to the fact that we require from firms that they report the detail of their debt structure, which happens on average 20% of the time in this sample of very small firms.

risk, conditionnally on our observables and (2) add the proxy in the regressions reported in tables 3a,b. Our dataset provides us with the firm's year of death when this is relevant. We thus regressed a dummy of death within the first two years of existence (alternatively, within the first 4 years) on the entrepreneur's observables predicting optimism. Predictors of this first stage regression give us the *expected* probability of firm death (within 2,4 years) given entrepreneurial caracteristic, for each project. We then add this index of expected risk as another control in the regressions of table 3a,b. We do not report these results to save space, but as it turns out, most estimates are unaffected by this additionnal control.

Let us now turn to the performance objection. First, we look a whether optimism correlates positively with performance. To do this, we regress (1) return on assets (2) return on equity (3) asset growth (4) employment growth and (5) sales growth on our index of optimism, controlling for project's size (log assets), industry specific effects, and a corporation dummy. We find that these five measures of corporate performance are *negatively* correlated with both our indices of optimism.[17] So if optimism correlates negatively with corporate performance, it can well be that results of tables 5a,b reflect the fact that bad projects are financed short term. To adress this concern, we add the firms average profitability (measured as ROE or ROA) as a control in regressions of table 3a,b. This average profitability term should capture the impact of performance on capital structure. As it turns out, the coefficient in front of the optimism index remains strong, positive and significant in most specification.

3.3.2 Financing Structure II: Performance of Optimists

A finer prediction of the model is that optimists who borrow more short-term should perform better, on average. Of course, this is an out of equilibrium prediction in the model we presented above - all optimists are financed short term, and thus perform well. For the sake of simplicity, assume here that there are some friction in the allocation of contracts to entrepreneurs, such that some entrepreneurs end up being financed long term - for example because investors make mistakes on the entrepreneur's beliefs.[18] In this context, optimists with long term debt are going to fail more often, as adaptation will be insufficient.

[17] We also looked at accounting performance measures set to zero when the firm disappears within its 2 or 4 years of existence. Results were not affected.

[18] In the more general model presented in appendix, this "mismatch" could arise because some projects give rise to a more informative signal than others. In this case, optimistic entrepreneurs with uninformative signal will prefer long term debt, because even though the project is good, it might fail to generate interim cash flows, which will force liquidation under short term debt.

On the contrary, bullish optimists with short-term debt will perform well because they are on short leash. Hence, optimists with short-term debt should perform better.

Table 4: Optimism and Economic Performance : Does Short Term Debt Matter ?

	RoA		RoE	
	Model 1	Model 2	Model 1	Model 2
Expectation Bias	1.1	1.0***	3.2*	1.7***
× Short Term Debt	(0.8)	(0.3)	(1.8)	(0.6)
Expectation Bias	-3.0***	-2.0***	-4.6***	-3.1***
	(0.6)	(0.3)	(1.3)	(0.6)
Short Term Debt	-0.3***	-0.2***	-0.8***	-0.6***
	(0.1)	(0.1)	(0.2)	(0.1)
Limited Liability	-0.3*	-0.3**	-0.1	-0.1
	(0.1)	(0.1)	(0.2)	(0.2)
Firm Started in 1998	-0.1***	-0.1***	-0.3***	-0.3***
	(0.0)	(0.0)	(0.0)	(0.0)
Initial log (assets)	0.1***	0.1***	0.2***	0.2***
	(0.0)	(0.0)	(0.0)	(0.0)
2 digit industry dummies	yes	yes	yes	yes
Observations	3,191	3,059	2,796	2,680

Source: 1994 and 1998 SINE surveys and tax files. The dependant variables are (1) the return of assets and (2) the return on equity. Model 1 uses expectation biases based on employment forecasts, while model 2 uses expectation biases based on "development" forecasts. Results are two step OLS estimates: first, we estimate the regressions reported in table 4. This allows us to build a predictor of expectation bias at the entrepreneur level. The second step consists in regressing the ex post expectation variable on this bias predictor (except in columns 5 and 6 where the second step model is a probit). Industry dummies are included in the first and second steps. Error terms are allowed to be correlated in a broad form using White's correction method in columns one to four.

We test this in table 4, by looking at the relation between short-term debt and performance, *at a given level of optimism*. We thus regress two measures of corporate performance (average returns on assets, on equity) on a dummy equal to 1 if the level of short term debt exceeds the median value, the level of optimism and an interaction term. Optimism is measured using the two indices described above. We also add controls such as size, industry dummies, and whether the firm is a corporation or not. If our "out of the equilibrium" predictions are right, we should expect from such a regression that the coefficient on the interaction term is positive, i.e. optimists perform better with short term debt.

In all specifications, optimism is on average bad for performance - as we noticed above in our robustness checks. With the second index of optimism (based on "growth expectations"), optimism is much less harmful to performance when loans have a shorter maturity. This property is much weaker with the first index of optimism (based on "employment expectations"). This twin pattern is robust to many robustness checks like using credit lines instead of short term debt or including entrepreneur's education and age as controls. All also tried to replace accounting measures of performance by a dummy equal to 1 if the firm disappears within 4 or 6 years after its creations. We then ran probit regressions including short term debt, optimism, the interaction terms and the same controls. Similarly, it turned out that probability of death is was lower when optimists used more short term debt with the second measure of optimism.

3.4 Optimism and Effort

3.4.1 Implementation Effort

A more straightforward prediction of the model is that optimists put in more effort in starting the firm. The intuition is that they overestimate their chances of success and hence the project's expected payoff. To look at this prediction, we use three very qualitative, self reported, measures of effort: (1) whether the entrepreneur has been actively looking for customers before starting the business, (2) whether ex ante research on technology has been done, and (3) whether ex ante research on competition has been done. Other, not reported here, measures of effort, like reliance on external advices, or research on the best way to finance the project yielded similar results. We then regress these measures on our bias measure; results are in table 5.

Correlations are strong, and robust. However, these measures of effort are self reported, and therefore likely to be biased upwards, in particular when the entrepreneur is optimist and holds self serving beliefs of the "I did my best, it can't fail" kind. While this would confirm that what we measure is really optimism, it would not be a proof that optimism promotes effort. In addition, we could expect that optimists, who adopt the "inside view", would make less use of external advices (which they do, but the regression is not reported), and be less interested in competitors, which they tend to underestimate (as in Camerer and Lovallo [2001]'s experiment). Regressions reported however, a strong tendency for optimists to evaluate competition and to make use of external advices.

Table 5: Effort of Optimistic Entrepreneurs

	Res. Competition		Res. Technology		Res. Customer	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Expectation bias	0.9***	0.4***	1.2***	0.6***	0.6***	0.2***
	(0.1)	(0.1)	(0.2)	(0.1)	(0.1)	(0.1)
Limited Liability	0.1	0.0	0.1***	0.8***	0.0	0.0
	(0.1)	(0.1)	(0.0)	(0.1)	(0.0)	(0.0)
Firm started in 1998	-0.0	0.0	-	-	-0.1*	-0.1
	(0.0)	(0.0)			(0.0)	(0.0)
Log (Initial Assets)	0.0	0.0	0.01**	0.01**	-0.1***	-0.1***
	(0.0)	(0.0)	(0.01)	(0.01)	(0.0)	(0.0)
Industry dummies	yes	yes	yes	yes	yes	yes
Observations	18,377	17,928	7,812	7,675	18,381	17,932

Source: 1994 and 1998 SINE surveys. The dependant variables are (1) a dummy equal to 1 if the entrepreneur reports having made research on its competitors before entering the business, (2) a dummy equal to 1 if the client declares to to have made research on technology (3) a dummy equal to 1 if the entrepreneur declares to have been actively looking for clients before starting the business. Model 1 uses expectation biases based on employment forecasts, while model 2 uses expectation biases based on "development" forecasts. Results are two step OLS estimates: first, we estimate the regressions reported in table 4. This allows us to build a predictor of expectation bias at the entrepreneur level. The second step consists in regressing the ex post expectation variable on this bias predictor. A dummy for the year of creation, the firm being a limited liability company, as well as industry dummies are included in the first and second steps. Error terms are allowed to be correlated in a broad form using White's correction method.

3.4.2 Adaptation of Optimists

More important to our model is the fact that optimists are bad at adapting. A test of this hypothesis is that optimistic entrepreneurs do not manage to *terminate* their project before it is too late, unless they are financed with short term debt. How can we measure whether termination occured too late or not ? An indication of this is given by the level of *own funds* remaining in the firm the year it is terminated. Own funds correspond to the difference between total assets (net of amortization) minus outstanding debt and other liabilities. They correspond to the shareholder's wealth remaining, measured with the firm's accounts. Of course, this measure is not uncontroversial, since shareholder's wealth might be much less that own funds: indeed, the accounting value of assets may be much larger than their true value.

With this caveat in mind, for those firms that are in their year of termination, we regress the ratio of own funds over assets on (1) the ratio of short term debt to assets, (2) the index of optimism and (3) an interaction term. We also control for industry specific effects, firm's age when terminated, the firm being a corporation and the log of total assets in the year of creation. We focus on the sample of firms created in 1994. If short term debt indeed does prevent optimists to terminate the firm too late, we should find more *own funds* left in their firm in their year of termination. Hence, the coefficient on the interaction term should come out positive.

Table 6 reports these regressions results using two measures of short term debt: (1) the ratio of loans with less than 2 years of maturity to total loans (first two columns), and (2) the ratio of credit lines to bank loans (columns 3 and 4). Columns 1 and 3 use the measure of optimism based on hiring expectations. Columns 2 and 4 use the measure of optimism based on "development" expectations. The number of observations drops dramatically because we focus on firms created in 1994 (some 11,000 of them), who are shut down before 1999 (sample size drops to 2,500 observations) and who provide detailed information on debt (320 of them). In spite of this dramatic reduction of the sample, the interaction term turns out to be significant, suggesting that optimists on a tight leash indeed close their firms sooner.

3.5 Two Consistency Checks

In this section, we further test the consistency of our measure of optimism by using it to test two well documented facts. The first fact is that entrepreneurs are significantly more optimistic than non entrepreneurs. It is well documented in the management literature, and viewed as one of the most compelling reasons why some people do become entrepreneurs and other do not. The second

Table 6: Pre-Death Shareholder Wealth and Optimism: The Role of Short Term Debt

	Own Funds		Own Funds	
	Model 1	Model 2	Model 1	Model 2
Expectation Bias	2.7**	1.4***	-	-
× Short term bank loans	(1.2)	(0.5)		
Short term bank loans	-0.3***	-0.8	-	-
	(0.1)	(0.8)		
Expectation Bias	-	-	2.9***	1.6***
× Credit Lines			(1.1)	(0.4)
Credit Lines	-	-	-0.3***	-0.9
			(0.1)	(0.8)
Expectation Bias	-1.5	-0.9**	-1.5	-0.8*
	(1.0)	(0.5)	(0.9)	(0.4)
Limited Liability	-0.3***	-0.2**	-0.3***	-0.2***
	(0.1)	(0.01)	(0.1)	(0.1)
Initial log (assets)	0.6*	0.4	0.6*	0.4
	(0.3)	(0.3)	(0.3)	(0.3)
2 digit industry dummies	yes	yes	yes	yes
Age Dummies	yes	yes	yes	yes
Observations	166	162	160	156

Source: 1994 SINE survey and tax files. In all regressions, the dependant variables is the ratio of own funds (shareholder's equity plus retained earnings, or assets minus liabilities) to initial assets. Model 1 uses expectation biases based on employment forecasts, while model 2 uses expectation biases based on "development" forecasts. The first two columns measure short term debt as the ratio of bank loans with less than 2 years of maturity to total bank loans, while the last two columns use the ratio of credit lines to total bank loans. Results are two step OLS estimates: first, we estimate the regressions reported in table 4. This allows us to build a predictor of expectation bias at the entrepreneur level. The second step consists in regressing the ex post expectation variable on this bias predictor (except in columns 5 and 6 where the second step model is a probit). Industry dummies are included in the first and second steps. Error terms are allowed to be correlated in a broad form using White's correction method in columns one to four.

fact comes from the psychological literature nd states that optimism persist.

3.5.1 Are Entrepreneurs More Optimistic ?

First, we test whether entrepreneurs exhibit more optimism than non entrepreneurs. There exists a sizeable literature in management science that documents entrepreneur optimism (see Shane, Scott and Venkataraman [2000] for a recent survey). All in all, it seems that entrepreneurs are not more risk loving, but simply more optimistic than managers with equal responsibilities (Busenitz and Barney [1997]). According to Simon, Houghton and Aquino [1999], it requires both optimism (overestimation of the chances of success) and overconfidence (excess accuracy of one's beliefs) to start a business. In the economics literature, De Meza and Southey [1996] argue that the most over optimistic agents are those who self select into entrepreneurship because they leave otherwise worthwhile opportunities.[19]

We do not have non-entrepreneurs in our data, but we do have entrepreneurs that either took over, or inherited, the business from parents or partner. Hence, we re-run regressions (3-4) on a larger sample that consists of both (1) entrepreneurs that start their firms and (2) those that take it over. On the right hand side of (3-4), we add another determinant of error: a dummy variable equal to one when the entrepreneur actually starts his business. If "real" entrepreneurs actually exhibit more optimism, the coefficient in front of this dummy should be positive. It can be argued that heirs or relatives continuing a business are a selected population, and should exhibit more optimism than the average wage earner. This effect can weaken our estimate, but provided we find something significant, we can claim to have evidence of entrepreneurial optimism.

Results of such an augmented regressions are provided in table 7. Consistently with evidence from the management literature "real" entrepreneurs have a larger upward bias in their expectations. Coefficients on the other entrepreneurial caracteristics are not affected by the change in sample, nor by the inclusion of the "real" entrepreneur dummy variable. Given the enlarged sample size, coefficients tend to be more precisely estimated.

3.5.2 Does Optimism Persist ?

Another fact abundantly documented in the psychological litterature is that biases tend to persist. This is easy to understand in the context of bayesian

[19] Malmendier and Tate [2002], argue that CEOs of large corporation also display optimism, since some of them do not exercise their stock options when the are in the money.

Table 7: Optimism of Entrepreneurs

	Expectation Error Based on	
	Employment	"Development"
High School graduate	0.03**	0.06***
	(0.01)	(0.01)
College graduate	0.06***	0.11***
	(0.02)	(0.02)
"Grandes Ecoles" or postgard	0.06**	0.12***
	(0.02)	(0.03)
Age>38 years	-0.02***	-0.01
	(0.01)	(0.01)
Serial entrepreneur	0.01	0.07***
	(0.01)	(0.02)
Area of expertise	-0.02**	-0.05***
	(0.01)	(0.01)
Motive: Implement own idea	0.06***	0.09***
	(0.01)	(0.01)
Motive: Need for autonomy	0.02***	0.03***
	(0.01)	(0.01)
Real Start-up	0.11***	0.18***
	(0.01)	(0.02)
Male	0.02**	-0.02
	(0.01)	(0.02)
Starting year: 1998	0.00***	0.01*
	(0.00)	(0.00)
2 digit industry dummies	yes	yes
Observations	32,500	31,837

Source: 1994 and 1998 SINE surveys. The "expectation error" on sales and employement as given by equations (3) and (4) are regressend on the above variables, and 40 2 digit industry dummies using OLS. Within each industry, error terms are allowed to be correlated in a broad form using White's correction method.

updating, as agents that start with beliefs located "far" from the truth tend to take longer to update, than the ones that are initially close to it. In intuitive terms, information is attributed to errors rather than as an indication of the truth when one holds extreme beliefs. Agents, however, are far from being bayesian, and their beliefs tend to persist, even when challenged empirically (Ross and Anderson [1977]). First, they care about their self esteem: hence, some psychologists have suggested that agents select those signals that can improve their opinion about themselves. The pervasiveness of such self serving biases has however been challenged on both empirical and theoretical grounds (Ross and Anderson [1977]). An alternative explanation to the abnormal persistence of optimism is that agents' search for information tends to be biased toward confirmation of their beliefs (*confirmation bias*).

Let us now turn to the issue of persistence of optimism. We will not, here, be able to run a rigourous test of whether optimism persistence is "too" high compared to a bayesian learner. All we will be able to do is to compare the entrepreneurs expectation error three year after creation with his initial optimism index. If correlation is positive, this means that optimist still tend to hold biased beliefs on their business after 3 years. Whether this is a proof of "slow" non bayesian learning or not depends on the reader's priors on the normal speed of learning. What this test asks, however, is whether our optimism index is consistent over time.

To look at this, we first ran regressions (3-4) to construct a predictor of optimism for all entrepreneurs starting corporations in 1994 and 1998. Second, we regress on this predictor the entrepreneur's expectations three years after the business was started. We draw this variable from the questionnaire that was re-sent in 1997 (for the 1994 starters) and 2001 (for the 1998 starters) by the statistical office. Given the high level of attrition described above, we drop from some 19,000 to some 11,000 observations.

The results are gathered in table 8. Correlation across firms within a same industry was allowed, given that part of the expectation could be rooted in industry level market trends. The ex-post expectation variable is a dummy variable, worth 1 if the entrepreneur still expects growth three years after the business is started, 0 if he expects stagnation or decline. We control for industry and survey year. Table 8 confirms that entrepreneurs that tend - given their observable characteristics - to be initially optimistic, still tend to hold high expectations three years after the project started. This result is robust to the inclusion, or not, of entrepreneurs that did not really start, but took over, the firm. It is equally robust to the exclusion of non corporation from the sample.

Table 8: Persistence of Optimism: Are 1997 Expectation errors Correlated with 1994 Optimism ?

1997 Expectation Error on	Hiring		"Development"	
	Model 1	Model 2	Model 1	Model 2
1994 Expectation Bias in Hiring Behavior	0.44**	-	1.08***	-
	(0.23)		(0.34)	
1994 Expectation Bias in "Development"	-	0.36***	-	0.73***
		(0.12)		(0.17)
Organisation = Corporation	-0.06***	-0.07***	0.02	0.01
	(0.02)	(0.02)	(0.03)	(0.02)
Initial log assets	-0.03***	-0.03***	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
2 digit industry dummies	yes	yes	yes	yes
Observations	4,387	4,316	3,395	3,355

Source: 1994 SINE survey. The dependant variable is the difference between (1) 1997 future expectations (on employment change, on development) and (2) 1997-1999 growth realization (of employment change, of sales growth). Given that expectations are discrete, realizations of employment or sales growth are discretized variables equal to 1 if sales grow by more than 3% and employment by more than zero employee. These dummies are worth zero else. Results are two step OLS estimates: first, we estimate the regressions reported in table 4. This allows us to build a predictor of expectation bias at the entrepreneur level for the 1994-1997 period. The second step consists in regressing the 1997-1999 expectation error on this bias predictor. Industry dummies were included in the first and second steps, as well as a dummy equal to one when the firm is a limited liability company. Error terms are allowed to be correlated in a broad form using White's correction method.

4 Conclusion

This paper argues that differences in beliefs exist, have real effects, and therefore do matter in the design of financial contracts. We confront a simple model of contracting with optimistic entrepreneurs to the data. Our empirical tests support the prediction that optimists prefer short-term debt and perform relatively better under short-term debt contracts than long-term debt. Theoretically, the impact of optimism on performance is ambiguous. Empirically, we find that firms run by optimists tend to grow less, die sonner and be less profitable.

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6 Appendix

6.1 Entrepreneurial Optimism as a Winner's Curse Effect

Why are entrepreneurs so notably optimistic about their venture? Is it the result of a psychological tendency to optimism that these individuals share? In our view there is a more plausible explanation than an exogenous common bias of these individuals: Entrepreneurial overoptimism results of the economic process of the selection into entrepreneurship itself. Those who become entrepreneurs do so precisely because they made a "positive mistake" in the evaluation of their idea. The others don't become entrepreneurs. So, the very process of selecting ideas and comparing them to an outside option leads to "entrepreneurial optimism".

Consider an individual who has an idea and an estimate S of his idea based on his own valuation exercise. He will select into entrepreneurship if $S > V$ where V is his outside options. Now, if we assume that the signal is distributed around the true value ($S = \mu + \epsilon$), agents who make negative mistakes tend not to become entrepreneurs, which means that those we see becoming entrepreneurs tend to have an over-optimistic signal (high ϵ). Of course, since bayesian agents can not be biased on average, such an effect, commonly described as the "winner's curse", can only hold under some bounded rationality in the treatment of information. The "winner's curse" anomaly has been studied in the economic literature in the context of auctions and takeovers. Thaler (1988) surveys the evidence about the prevalence of a "winner's curse effect" in auctions and Roll (1988) explains the fact that many mergers destroy value in those terms. What is exactly the mistake these individuals make? They are not intrinsically biased upwards but those who want to become entrepreneurs forget to take into account the following effect:

The fact that they perceive their idea of being more valuable than V makes it likely that there is a positive error ϵ in their valuation process.

A Bayesian agent should correct for this error by taking into account the ex-ante distribution of μ. The failure to do so is called "base-rate neglect" in

the psychology literature.

Describing entrepreneurial overoptimism as a winner's curse effect enables us to relate the magnitude of optimism to characteristics such as education, expertise, or whether the idea is a new idea or not.

For example, expertise in the domain of the venture increases the quality of the signal[20] on which agents have based their decision to become entrepreneurs, and therefore should be associated with a smaller optimism bias.

If the outside option is high in a group of agent, the magnitude of overoptimism among those wo become entrepreneurs should be higher (the mistake ϵ should have a higher mean). This implies that controling for expertise, variables that increase the outside option, such as education, should be positively associated with optimism.

Last, when people incorporate totally new ideas, they forget to take into account that it is likely that those ideas are new precisely because some agents chose not to undertake them, which means in turn those agents must have had negative signals on these ideas. We provide in appendix a model that formalizes these insights.

STEP 1: EDUCATION, EXPERTISE

First, assume the following:

An agent gets n entrepreneurial ideas, $\mu_1, ..., \mu_n$.

Entrepreneurial returns μ_i, are ex ante distributed according to $N(\mu_0, \sigma_\mu)$.

Before deciding on becoming an entrepreneur the agent observes a signal $S_i = \mu_i + \epsilon_i$ where $\epsilon_i \sim N(0, \sigma_\epsilon)$.

Assumption:

- The agent believes $E\mu_i = S_i$. This bias is known as "base-rate neglect".
- The outside option of the agent is V.

We note $E_S\mu_i = S_i$, the subjective expectation of our bounded-rational agent.

In fact, the rational expectation is $E\mu_i = \alpha S_i + (1-\alpha)\mu_0$ where $\alpha = \frac{\sigma_\mu^2}{\sigma_\epsilon^2+\sigma_\mu^2}$.

So, $\frac{E_S\mu_i - E\mu_i}{E\mu_i} = (1-\alpha)(S_i - \mu_0) = (1-\alpha)(\underbrace{(\mu_i - \mu_0)}_{\eta_i} + \epsilon_i)$

As he compares S to his outside option V, the agent becomes an entrepreneur if:

$$Max(S_i) > V,$$

[20] i.e. decreases the variance of ϵ.

and chooses the idea with the highest signal.

Proposition 5

- *Entrepreneurs' expectations regarding the quality of their project are biased upwards and the relative bias is:*

$$E\frac{E_S\mu_i - E\mu_i}{E\mu_i} = \frac{\sigma_\epsilon^2}{\sigma_\epsilon^2+\sigma_\mu^2} E(\max(x_1,...,x_n)|\max(x_1,...,x_n) > V)$$
$$\text{where} \quad x_i \sim N(0, \sqrt{\sigma_\mu^2+\sigma_\epsilon^2})$$

- *This relative optimism bias (degree of overoptimism):*
  - *decreases as the signal becomes more precise (smaller σ_ϵ).*
  - *increases with the number of ideas n.*
  - *increases as the outside option V increases.*
  - *increases as the base-rate noise σ_μ increases, keeping $\sigma_\epsilon/\sigma_\mu$ constant.*

proof:

$$E\frac{E_S\mu_i - E\mu_i}{E\mu_i} = (1-\alpha)E(\eta_i+\epsilon_i|\eta_i+\epsilon_i > \eta_j+\epsilon_j, i\neq j, \eta_i+\epsilon_i > V+\mu_0)$$

How can we relate this to observable characteristics of the agent.

For example, **expertise** in the domain of the idea lowers σ_ϵ, and therefore decreases the degree of optimism.

On the other hand, a higher level of general **education** is likely to increase both the outside option of the agent and the number of ideas he has access to, which should increase the quality of their project, but also the degree of overoptimism.

This brings us two empirical predictions:

First, unsurprisingly:

Proposition 6 *The average quality of the project increases with education and expertise.*

Now, concerning the relative optimism bias, the two variables have opposite effects. Expertise decreases the bias, whereas education increases the bias:

Proposition 7 *The degree of overoptimism:*

- *decreases with the degree of expertise the entrepreneur has in the sector where he operates his venture,*
- *and increases with his level of general education.*

STEP 2: "OWN IDEA"

We now want to think about the following: should an entrepreneur who is implementing "his own idea" be more or less optimistic than an entrepreneur who is implementing an idea that he knows not to be a new one.

To isolate this effect, we make two simplifying assumptions and enrich the set-up.

Assumption: Each agent has only one idea and we normalize $V = 0$.

Remark that under this assumption, there is still a bias in the context of the previous set-up: $E(x_1|x_1 > 0)$.

We assume the following dynamic structure.

There are exactly N possible ideas $\mu_1, ..., \mu_N$, which are ex ante distributed according to $N(\mu_0, \sigma_\mu)$.

Every period, a new generation of P entrepreneurs is born, who get an idea with a signal S and get to observe the outcome of the ideas of the past generation $\mu_i + \epsilon'_i = S'_i$ which constitutes a signal S'.

Agents are semi-bayesian, they believe:

$$E_S(\mu) = \begin{cases} S_i & \text{if idea is new} \\ \frac{\sigma'^2_\epsilon}{\sigma^2_\epsilon + \sigma'^2_\epsilon} S_i + \frac{\sigma^2_\epsilon}{\sigma^2_\epsilon + \sigma'^2_\epsilon} S'_i & \text{if idea is not new} \end{cases}$$

Proposition 8 *Entrepreneurs who incorporate their "own idea" are relatively more over-optimistic.*

proof:

this results of two effects:

- Entrepreneurs with a new idea neglect the fact that if this idea is not observable in the previous generation, it is likely that some people chose not to implement it because their signal was too low. This increases their degree of optimism.
- Entrepreneurs with an existing idea forget to take into account that the entrepreneurs who undertook this project in the past must have done it on the basis of positive information. This pushes their degree of optimism down.

6.2 Theoretical Robustness: Moderate Optimism

The aim of this section is to show that the results of the financial models do not depend on our simplifying assumption of full optimism and in particular that all our results hold in a neighborhood of the case we consider. To focus on the effects of this simplfying assumption and keep the analysis simple, we assume away risk aversion of the entrepreneur. Hence, in this appendix, there is no a priori insurance gains from signing long term debt contracts, which is the driving force behind the realist's preference for long term debt in the main text.

The generalization of our results involves two new ingredients: First we assume that the entrepreneur believes the project to be good with probability $\theta > 1/2$.Second, we enrich the signal structure, so that it becomes possible for a good project to have a bad signal. The signaling structure is described by the following matrix:

$$\begin{array}{ccc} & \text{Good} & \text{Bad} \\ S = R & \alpha & \beta \\ S = 0 & 1-\alpha & 1-\beta \end{array}$$

Furthermore, we posit that $\alpha > 0.5 > \beta$. We start by computing ex post probabilities, depending on the interim signal. From viewpoint of a rational investor:

$$\left\{ \begin{array}{rcl} p(\text{good}|S=R) & = & \frac{\alpha}{\alpha+\beta} \\ p(\text{good}|S=0) & = & \frac{1-\alpha}{1-\alpha+(1-\beta)} \end{array} \right.$$

while for an optimistic entrepreneur, ex post probabilities are given by:

$$\left\{ \begin{array}{rcl} \widetilde{p}(\text{good}|S=R) & = & \frac{\theta\alpha}{\theta\alpha+(1-\theta)\beta} \\ \widetilde{p}(\text{good}|S=0) & = & \frac{\theta(1-\alpha)}{\theta(1-\alpha)+(1-\theta)(1-\beta)} \end{array} \right.$$

Ex ante, the objective probability - i.e. the realist's belief - that the signal is going to be high is:

$$\pi = (\alpha + \beta)/2$$

while an optimistic entrepreneur's subjective probability that the signal is going to be high is given by:

$$\widetilde{\pi} = \theta\alpha + (1-\theta)\beta > \pi$$

To make the analysis transparent, we assume entrepreneurs are risk-neutral. Our goal is to describe under what conditions an optimistic entrepreneur self-selects into a short-term debt contract rather than the long-term debt contract. The terms of the long-term debt contracts are those that prevail for a realist, which means that the break-even constraint assumes that the entrepreneur chooses the "safe" strategy if the signal is bad, as a rational would. That makes the contract potentially attractive for an optimist who sees it as an opportunity to follow the growth strategy even if the signal is bad.

An optimist trades off between the gains and the costs of short-term debt vs. long-term debt. The gains, $\mathcal{G}$, of the short-term debt contract arise from the "trading" effect between agents with different beliefs. The costs, $\mathcal{L}$, arise from the loss of control, which prevent the entrepreneur from undertaking the strategy which is optimal from his perspective.

Let us start by computing the gains that arise from choosing the short-term debt contract. The short-term debt contract is designed so that the investor breaks even with an optimist. With such an entrepreneur, the investor gets L when the signal is low cash flows - she takes control and imposes the safe and optimal strategy. When the signal is high cash flows, she gets the repayment D^{ST} given by $D^{ST} = \frac{I-(1-\pi)L}{\pi}$. Under the long term debt contract, investors only expect to select realists. Realists pursue the growth strategy only in case of high cash-flow. Because these cash-flows are more than the cost I, long-term debt is risk-free: $D^{LT} = I$.

The optimistic entrepreneur expects the following repayment in case of short-term debt:

$$\widetilde{\pi} D^{ST} + (1 - \widetilde{\pi})L = \frac{\widetilde{\pi}}{\pi} I + (1 - \frac{\widetilde{\pi}}{\pi})L$$

Under long-term debt, he plans to undertake the growth strategy in all cases, so that his expected transfers to the investor are:

$$\left[1 - (1-\theta)(1-\beta)\right] I$$

So the gain vis-a-vis long-term debt is simply:

$$\begin{aligned} \mathcal{G} &= (\frac{\widetilde{\pi}}{\pi} - 1)(L - I) - (1-\theta)(1-\beta)I \\ &= (2\theta - 1)\frac{\alpha - \beta}{\alpha + \beta}(L - I) - (1-\theta)(1-\beta)I \end{aligned}$$

The cost of short-term debt vis-a-vis long-term debt arises from the loss of control which depletes the NPV of the project: From the point of view of

the entrepreneur, the cost of this loss is that the safe strategy is going to be undertaken instead of the growth strategy. The cost of the loss of control is therefore:

$$\begin{aligned}\mathcal{L} &= p(S=0)(p(G|S=0)R - L) \\ &= \theta(1-\alpha)R - [\theta(1-\alpha) + (1-\theta)(1-\beta)]L\end{aligned}$$

So,

$$\begin{aligned}\mathcal{G} - \mathcal{L} &= (2\theta-1)\frac{\alpha-\beta}{\alpha+\beta}(L-I) + \theta(1-\alpha)L + (1-\theta)(1-\beta)(L-I) - \theta(1-\alpha)R \\ &= \left[(1-\theta)(1-\beta) + (2\theta-1)\frac{\alpha-\beta}{\alpha+\beta}\right](L-I) - \theta(1-\alpha)(R-L)\end{aligned}$$

Lemma 9 *A sufficient condition for* $\mathcal{L}(\theta=1) < \mathcal{G}(\theta=1)$ *is:*

$$\alpha > \alpha^\star$$

where $\alpha^\star$ *is the unique solution in* $(0,1)$ *of:*

$$\frac{2\alpha^\star}{(1-\alpha^\star)(\alpha^\star+1/2)} = \frac{R-L}{L-I}$$

proof:

a sufficient condition is $(1+\frac{\alpha-1/2}{\alpha+1/2})(L-I) > (1-\alpha)(R-L)$. Then apply the intermediate value theorem.

Corollary 10 *There exists* $\theta^\star \in (.5,1)$ *such that:*

$\forall(\alpha,\beta,\theta) \in \Omega = (\alpha^\star,1)\times(0,.5)\times(\theta^\star,1)$,

an entrepreneur with over-optimism θ *self-selects in the short-term contract rather than the long-term contract (i.e.* $\mathcal{G}(\alpha,\beta,\theta) > \mathcal{L}(\alpha,\beta,\theta)$*).*

proof: $\mathcal{G}(\alpha,\beta,\theta) - \mathcal{L}(\alpha,\beta,\theta)$ is continuous and therefore uniformly continuous on the compact set $[\alpha^\star,1]\times[0,.5]\times[.5,1]$.

This shows how the results we have seen in the particular case ($\theta=1, \alpha=1$) hold in a neighborhood of these values.

7 Data Appendix

7.1 Data Description

Our dataset consists of the merging of two sources. The first one is composed of the 1994 and 1998 waves of the SINE survey. In each of these years, the French stastical office (INSEE) sent questionnaires to between a sixth and a fourth of all entrepreneurs who started, took over or inherited a business in the current year. Answering this questionnaire was compulsory, so that a 85% reponse rate was achieved. Each survey wave (1994 and 1998) was then re-sent questionnaires three year after the business was started/taken over/inherited (in 1997 and 2001), in order to evaluate survival and young firm dynamics. The 1994 wave thus has 30,778 entrepreneurs present in 1994, and only 18,132 still there in 1997, yielding an attrition rate of 41% in three years. This is high: part of this attrition is natural, and part of it is due to firms moving and not being found again by survey managers. The 1998 survey wave has 30,068 entrepreneurs surveyed in 1998, and 27,136 present in 2001.

We thus have a representative sample of new firms. This survey on new businesses has information on the entrepreneur's main socio demographic caracteristics (age, education, social background), and on his *growth expectations* as he starts/takes over/inherits the business. Other qualitative questions relate to (1) the reasons for which the firm was started (2) the conditions under which it was started (financing, initial research, customer prospection) and (3) the management of the first three years of operation (change in product line, agressive commercial policy conducted). The first two types of questions correspond to variables collected in the very year the business is started, while the last type of variables corresponds to answers collected three years after.

The questions asked in this survey are very qualitative in nature. Accounting informations (have you used bank credit ? who was the major contributor to the start-up capital ?) is therefore hardly usable if we want to investigate the real effects of optimism on corporate finance and investment. This is why we matched the SINE datasets with accounting data. The accounting data are compiled from tax reports (Bénéfices Industriels et Commerciaux). They are therefore fairly exhaustive and include all firms making more than 110,000 euros of annual sales. Fortunately, the French statistical system is highly centralized, and firms in both databases share the same 9 digit identifying number, the SIREN. The accounting data are - theoretically - available for every year since the firm first shows up, so they allow us to follow the firms from their start. The available variables are detailed balance sheet information, operating income, and employment. Balance sheet information is more detailed for slightly larger firms. Small firms in France can choose between two ways of reporting their income to tax authorities: the "simplified" and the "regular"

tax regime. The regular tax regime becomes compulsory as soon as annual firm sales are above 230,000 euros, and requires from firm detailed information about the debt structure. Firms that fall into the "simplified" regime are not required to provide as much detail and just need to report their overall amount of financial debt. This is going to make our observation number drop severely when we will be looking at debt.

We match the two datasets, and first remove those firms whose accounts are not reported within their first two years of existence by the tax reports (1994 or 1995 for the first wave, 1998 or 1999 for the second one). We end up with 39,540 firms started either in 1994 or in 1998, present in the SINE surveys, and whose accounts are reported within their first two years of existence. We thus lose almost 20,000 firms in the merging process, but these are overwhelmingly small firms, whose sales are below 110,000 euros, and therefore do not have to complete the tax forms that form the basis of the accounting data.

Except for section 3.5, all the analysis below focuses on firms that were "pure creation", i.e. were not inherited/taken over and already existed. By focusing on this subsample, we further restrict our number of observations to 23,186, equally split between the 1994 and the 1998 wave.

7.2 Variables Description

From the SINE survey we extract several types of variables, that we used in the subsequent analysis.

1. **AGE:** is the entrepreneur's age, in years. In most regressions, however, we use instead a dummy equal to 1 when the entrepreneur's age is above median (37). This does not affect any of the results, since this variable is basically insignificant.

2. **EDUCATION:** education is broken down into four possible categories: high school drop out (reference), high school graduate (HSG), College graduate (CG), and Post graduate studies or "Grande Ecole" graduate (GE). The last category is especially interesting since the highly selective process to enter French Grandes Ecoles is likely to reinforce self esteem and confidence. The questionnaire does not allow to break down this last category into greandes écoles and post graduate studies, which are relatively frequent in France. This is, however, possible using the Labor Force Survey. Looking at entrepreneurs from the 1991-1993 waves of this survey, we find the more than 80% of the postgraduate-Grande Ecole entrepreneurs are actually graduates from Grandes Ecoles.

3. **SERIAL ENTREPRENEURS**: a dummy equal to 1 when the entrepreneur has started at least one business before this one.

4. **EXPERTISE:** a dummy equal to one when the entrepreneur has previous experience within the industry. The exact phrasing of the question is: "In your previous job experiences, did you acquire skills: (1) in the industry you are setting this business in ? (2) in a similar activity ? (3) in a very different activty ? and (4) you have very diverse skills. The EXPERT dummy is equal to one when the entrepreneur answers (1).

5. **MOTIVATION: A NEW IDEA:** The question on the entrepreneur's motivation is "About the main motivation that drove you into starting a firm: (1) a new idea (2) a taste for entrepreneurship (3) an opportunity (4) other entrepreneurs among family of friends (5) until then unemployed. The answers are non exclusive, but our IDEA dummy equals one when the entrepreneur selects (1).

6. **MOTIVATION: AUTONOMY :**our AUTO dummy equals one when the entrepreneur selects (3) in the above question.

7. **"DEVELOPMENT" EXPECTATION**: Here we use two types of variables. The entrepreneur is asked about his expectations for the next 6 or 12 months, roughly one year after it is started (which can be 1994 or 1998 depending on the survey wave). The question is phrased "What is your view of the future?", and the possible answers are: (1) the firm will develop, (2) the firm will keep its current balance, (3) I will have to struggle (4) I will have to shut down the firm (5) I will sell it (6) I do not know. Our EXPGR1 dummy equals to one when entrepreneur answers (1) and 0 when he answers (2), (3) or (4). Entrepreneurs responding (5) or (6) were removed from estimation. Pretty much the same question is the asked after 3 years of existence (1997 for the first wave, and 2001 for the second one). We construct the same variable (EXPGR2), which we use in section 3.5.

8. **"HIRING" EXPECTATION:** The second expectation variable is related to employement. Again, the entrepreneur is asked about his expectations for the next 6 or 12 months, roughly one year after it is started (which can be 1994 or 1998 depending on the survey wave). The question is phrased "WDo yo plan to hire in the next 12 month ?", and the possible answers are: (1) yes, (2) no or (3) I do not know. Our EXPEMP1 dummy equals to one when entrepreneur answers (1) and 0 when he answers (2). Entrepreneurs responding (3) were removed from estimation. Pretty much the same question is the asked after 3 years of existence (1997 for the first wave, and 2001 for the second one). We construct the same variable (EXPEMP2), which we use in section 3.5.

9. **RESEARCH IN FINANCE**: To the question "Have you done any research in finance before starting the firm ?", the entrepreneur may

answer yes, no, or I do not know. We construct a dummy variable equal to 1 if yes, zero if no, and of missing value if the entrepreneur does not answer.

10. **RESEARCH IN TECHNOLOGY**: To the question "Have you done any research in technology before starting the firm ?", the entrepreneur may answer yes, no, or I do not know. We construct a dummy variable equal to 1 if yes, zero if no, and of missing value if the entrepreneur does not answer. This variable is only available in the 1994 survey.

11. **RESEARCH IN FINANCE**: To the question "Have you done any marketing research before starting the firm ?", the entrepreneur may answer yes, no, or I do not know. We construct a dummy variable equal to 1 if yes, zero if no, and of missing value if the entrepreneur does not answer.

From the tax files, we use several measures related to corporate finance:

1. **INSIDE EQUITY 1:** is book value of equity over (equity+financial debt). Notice that book value of equity (capital social) includes both inside and outside equity. This should not be too much of a concern, given the small size of firms in our sample, and the extreme rarity of venture capital backed start ups in France (De Meza and Southey [1996] make the same observation for UK firms). Indeed, in 1998, barely 1% of the firms surveyed received equity finance from "specialized insitutions" (a category that included VCs). Financial debt includes bank debt and "other financial debt", but excludes debt owed to tax authorities and trade credit.

2. **INSIDE EQUITY 2**: is (book value of equity + "other financial debt") over (equity+debt). In general, "Other financial debt" contains loans from owners and their relatives. For subsidiaries, this also includes loans made by the group, which may be large. There are few group affiliate in our sample, so that "Other financial debt" may reasonnably be assumed to include mostly loans by owner and families. It seems fair to assume that these loans are very likely to be secured and junior to bank debt when there is some

3. **SHORT TERM DEBT 1:** is "bank loans with less than 2 years outstanding" over total bank loans

4. **SHORT TERM DEBT 2:** is "bank overdrafts or credit lines" over total bank loans.

The last three measures cannot be defined on all firms available from the tax files, as small firms are not required to deliver as much detail on the debt structure as large firms. It is only with turnovers above 250,000 euros in services, and 500,000 in manufacturing that firms have to report such level of detail.

We finally use the tax files to compute several measures of corporate performance, among which:

1. **RETURN ON EQUITY**: (ROE) is the ratio of gross cash flows (sales minus inputs minus labor costs minus interest payments) to equity.
2. **RETURN ON ASSETS**: (ROA) is operating profit (sales minus inputs minus labor costs) over total assets.

7.3 Descriptive Statistics

Table A1: Summary Statistics on Expectations

	1994 Survey	1998 Survey
At birth :		
Plans to hire within a year	0.26	0.31
Expects "development"	0.54	0.58
Expects "Difficulties"	0.06	0.06
Observations	19,069	11,794
After three years :		
Plans to hire within a year	0.12	0.19
Expects "development"	0.35	0.41
Expects "Difficulties"	0.20	0.13
Observations	7,148	8,564

Source: 1994 and 1998 SINE surveys. Most variables are dummies, so that the reported means stand for percentage in the category. The only exception is age.

Expectational variables form the focus of our study: summary statistics are displayed in table 2. Expectations are consistent with the business cycle: they improve in 1998 with respect to 1994. Unsurprinsingly, a very small number (6%) of all founders already expect difficulties in the year they start their business. This figure increases after 3 years: again, consistently with the business cycle and adaptative expectations, it is however smaller in 2001

than it is in 1997. The figures are also consistent with the firm progressively, but slowly, reaching its optimal size. While some 58% of entrepreneurs expect "development of the activity" after the starting year, only 41% do so after 3 year. Figures are lower for "hiring expectations" than they are for "development expectations". This is consistent with the entrepreneurs being more conservative about their employment prospects than sales growth.

Table A2: Summary Statistics on Entrepreneurial Caracteristics

	Non Corporation	Corporation	Small	Big
Has already started one business	0.02	0.15	0.07	0.13
Exprience in the industry	0.59	0.56	0.55	0.65
Motive: Desire to implement own idea	0.09	0.22	0.15	0.16
Motive: Desire for autonomy	0.58	0.48	0.54	0.50
Entrepreneurs in family	0.44	0.45	0.45	0.44
High school graduate	0.14	0.20	0.17	0.18
College graduate	0.08	0.17	0.11	0.14
Post graduate studies or Grandes Ecoles	0.03	0.14	0.08	0.10
Age (years)	35	39	36	38
Male Entrepreneur	0.75	0.77	0.75	0.78
Observations	10,929	10,493	16,360	5,063

Source: 1994 and 1998 SINE surveys. Most variables are dummies, so that the reported means stand for percentage in the category. The only exception is age.

As we will see below, the first stage of our empirical methodology consists of looking at the entrepreneurial determinants of theses expectation. Summary statistics of these determinants, and their relation to firm size, are provided in table 3. It seems that, on average, more experienced entrepreneurs undertake larger projects. When entrepreneurs state "autonomy" as one of their primary motives, they tend to create smaller firms. But when their motivation is the implementation of an original idea, the firm's size at start tends to be bigger. The existence of entrepreneurs within the family is an important determinant of the decision to start a business, since some 45% of all entrepreneurs already have an entrepreneur in their family. This is consistent with existing studies on entrepreneurs. As it turns out, most entrepreneurs are not even high school graduates, but this is especially true for the ones that start sole proprietorships or small firms (75% of sole proprietors are high school drop outs). When we focus on corporation, a little more than 50% of entrepreneurs turn out to be at least high school graduate, which is much more consistent with national

statistics given the age structure of entrepreneurs.[21] Also, older entrepreneurs tend to undertake larger project. Last, the data has a non trivial amount of female entrepreneurs (between 25 and 30%), who - weakly - tend to start larger firms.

[21] The proportion of high school graduates among younger people tends to be larger than 50% in France.