

Learning from Errors in Entrepreneurship

Camille Hebert *

April 2021

Abstract

I use administrative and survey-based micro data to study the relationship between expectation errors, belief updates, and subsequent corporate decisions of a representative sample of French entrepreneurs. After overestimating their development and hiring prospects, optimistic entrepreneurs update downward, entrepreneurs who underestimate their prospects update upward. Although optimistic and pessimistic types are persistent over time, I show that expectation errors decline over time *within* individuals, suggesting that entrepreneurs learn from their past errors over time. Making errors and learning from them have real effects. The ability to correctly forecast growth and update after an error lead to better start-ups' performance.

Keywords: Entrepreneurs, beliefs, optimism, learning, growth

JEL Codes: D83, D84, E37, G02, G41

*University of Toronto. email: camille.hebert@rotman.utoronto.ca. I would like to thank Anat Admati, Paul Beaumont, Sabrina Howell, Michelle Lowry, Song Ma, Filippo Mezzanotti, and Ting Xu for helpful comments, as well as participants at the Junior Entrepreneurial Finance and Innovation lunch group, York University and McGill University. This work is supported by a public grant overseen by the French National Research Agency as part of the "Investissements d'avenir" program (reference: ANR-10-EQPX-17 – CASD).

“Failure is an option here. If things are not failing, you are not innovating enough.”

— Elon Musk.

1. Introduction

Entrepreneurs must make choices, often with incomplete information and uncertainty about the future, leaving open the possibility to experiment, to make mistakes, and to learn from their past errors. How entrepreneurs form their expectations has important implications for their success and the broader economy in terms of pursuing the best ideas and creating jobs. Entrepreneurs’ perception of their future development and hiring prospects and their attitude and ability to incorporate new information to form their beliefs are likely to influence the actual persistence of macroeconomic growth and the unemployment rate.

In this paper, I study how entrepreneurs incorporate newly available information into beliefs. I focus on entrepreneurs’ beliefs about their own businesses’ future development and hiring prospects. I show that entrepreneurs do not necessarily start with the same priors about the future but learn from their past errors to form new expectations. Despite a large volume of research on behavioral biases in the cross-section of CEOs, managers and analysts, very little is known about the *dynamics* of individuals’ beliefs formation.

A valuable strategy to test whether entrepreneurs learn over time consists of observing the dynamics of expectation errors and subsequent updates of expectations *within* individuals over time. An expectation error is defined as the difference between the expectation about the future realization of a micro- or macroeconomic variable and its actual realization later on (e.g., Landier and Thesmar, 2008; Malmendier and Nagel, 2016). However, without a panel dataset of individuals’ expectations observed at different points in time, there is no way to analyze the dynamics of entrepreneurs’ expectations and thereby tell whether entrepreneurs learn and which learning pattern fits the data best.

I take advantage of the panel structure of a unique survey of French entrepreneurs available from the French Bureau of Statistics (Insee) to study the dynamics of entrepreneurs’ beliefs about their own business’ future development and hiring prospects. I combine a large-scale survey of more than 200,000 entrepreneurs that is representative of the population of start-ups founders in France (*Système d’information des nouvelles entreprises*, SINE) with the corporate tax files available for every firm in France every year from 1998 to 2017 (see Hebert, 2020). The first advantage of using the SINE survey is its high response rate (approx. 90%), which makes it

representative of the population of start-up founders in France. Every four years between 1998 and 2014, a new cohort of randomly selected entrepreneurs representing approximately 25% of the population of new firms founded that year takes the survey. Second, the dataset contains individual entrepreneurs' detailed biographical information and extensive project characteristics, including their development and hiring expectations for the new venture. Third, the availability of corporate performance measures and employment composition early in the firm's life cycle allows for a comparison of entrepreneurs' expectations to realizations (Landier and Thesmar, 2008). Therefore, I identify entrepreneurs who make expectation errors and characterize errors as either optimistic or pessimistic. Fourth, a unique feature of the data is that they follow the same entrepreneur over five years and report his expectations about the future at several points in time, as well as other variables. Thus, I construct a panel dataset of individual expectations to observe whether entrepreneurs update their expectations to characterize potential learning effects *within* individuals.

I formalize the idea that entrepreneurs learn from their past errors by building on the existing Bayesian learning literature, in which agents form their expectations using rules from historical data (e.g., Malmendier and Nagel, 2016). I introduce a simple model the possibility that entrepreneurs update their beliefs as a consequence of past errors. I argue that entrepreneurs are influenced more strongly by their past expectation errors experienced during the firm's lifetime than by other firm-level or macroeconomic news. Specifically, I assume that individuals use their experience of past errors to recursively update their own-business' growth expectations. The gain, that is the strength of updating in response to past expectation errors, depends on the sign of the error, i.e., whether it is optimistic or pessimistic.¹

An advantage of this approach is that it allows entrepreneurs to start with non-uniform priors but to also learn and update beliefs (Morris, 1994; Coval and Thakor, 2005). In the benchmark case, the entrepreneur is rational and does not make an expectation error, thus, the update of expectations does not depend on past errors, and the correlation between updates and errors is equal to zero. By contrast, if the entrepreneur made an optimistic error in the period before, her expectations exceeding the growth realization, she should update her beliefs downward, such that it exists a positive correlation between making an optimistic error and revising downward. In the case of an initial pessimistic error, with expectations that are below the actual growth realization, an entrepreneur who learns from past errors should update her

¹Note that the approach used in this model is different from the method introduced by Coibion and Gorodnichenko (2015), which consists of computing the correlation between current forecast revisions and future forecast errors. The goal of this approach is to highlight information frictions in the prediction of macroeconomic variables and rely on the observation of revisions of the same forecast at different points in time.

beliefs upward in the next period.

The raw data highlights that a substantial portion of the population of entrepreneurs overestimate their prospects which is in line with the literature on optimistic entrepreneurs (Landier and Thesmar, 2008; Puri and Robinson, 2013). 16% of entrepreneurs overestimate their hiring prospects, and 21% overestimate their development prospects. More surprisingly perhaps, I find that another important portion of the population of start-up founders underestimate their hiring and development prospects.² A total of 37% of entrepreneurs make pessimistic errors. The raw data also show that an important part of entrepreneurs change their beliefs over time: 39% of entrepreneurs update their hiring expectations and 23% update their development expectations. Interestingly, most of them update their beliefs downward while entrepreneurs who make optimistic errors represent a lower proportion of the population than pessimistic errors, suggesting that either most of entrepreneurs receive bad news or that pessimistic errors are stickier than optimistic errors.

I provide three pieces of evidence that collectively suggest that entrepreneurs update their beliefs as a consequence of the past errors they made. First, I take the prediction of the model to the data and test whether past expectation errors predict current updates of expectations. I use the panel structure of my data to correlate belief updates with past expectation errors *within* individuals. I find that entrepreneurs are more likely to update their expectations downward if they held optimistic beliefs in the previous period. They are also less likely to update their expectations upward if they overestimated their forecasts in the previous period. Regarding pessimistic expectation errors, I find that entrepreneurs who underestimated their prospects are more likely to update their hiring and development beliefs upward. They are also significantly less likely to update their expectations downward. The evidence suggests that entrepreneurs who have made expectation errors are significantly more likely to revise their expectations in the next wave of the survey they take and to correct their expectations in the opposite direction of the mistake. The results are consistent with entrepreneurs who learn from their past errors, even when starting with different priors.

Second, I correlate current updates and future expectation errors in the spirit of Coibion and Gorodnichenko (2015); Bordalo et al. (2020).³ I find that current updates to hiring ex-

²Expectation errors are based on expectations: 24% of entrepreneurs in France report that they plan to hire in the next period, and 39% of entrepreneurs plan to develop or continue to develop the new venture.

³The approach in the macro-behavioral literature consists in correlating forecast errors with forecast revisions (Coibion and Gorodnichenko, 2015). One strand of this literature argues that the predictability of forecast errors arises from informational frictions, and it documents an underreaction to new information (Coibion and Gorodnichenko, 2015; Bouchaud et al., 2019). Another strand finds evidence of extrapolative behaviors and an overreaction to new information (Greenwood and Shleifer, 2014; Bordalo et al., 2019; Barrero, 2020; Bordalo et al., 2020). Consistent with Bordalo et al. (2020), I investigate this correlation within individual entrepreneurs over

pectations have ambiguous effects on future expectation errors which depends on the update's direction. Entrepreneurs who update their expectations upward are significantly more likely to make optimistic errors and they are less likely to make pessimistic errors. Consistently, I find that entrepreneurs who update downward are less likely to make optimistic errors in the next period but are also more likely to underestimate their hiring prospects, thus making pessimistic errors in the future. Overall, the evidence shows that entrepreneurs who learn make less errors in the subsequent periods. It also highlights the importance of the priors, i.e., whether the errors was optimistic or pessimistic, which determines the direction of the update.

Third, I look at the dynamics of expectation errors within individuals. In my representative panel of French entrepreneurs, I find that expectation errors decline over time within individual entrepreneurs. Entrepreneurs who made errors in the previous periods are also significantly less likely to make forecast errors again in the future. The autocorrelation coefficient of optimistic (pessimistic) hiring forecast errors is $-.47$ ($-.34$) within an individual entrepreneur over time. This test suggests not only that the likelihood of making the same errors over time decreases but also that the entrepreneurs' updating behavior found earlier is inconsistent with a mean-reversion pattern overtime within individuals.

Next, I remove the individual fixed effects and I look at the dynamic of expectations across entrepreneurs who started in the same sector the same year. In contrast with the within individuals evidence, I find a positive auto-regressive coefficient on expectation errors. This result suggests that expectation errors are persistent across individual entrepreneurs. Entrepreneurs who are likely to make either optimistic or pessimistic expectation errors in the first period are likely to continue to do so in the subsequent periods compared those in the same industry who started the same year but who correctly forecast future outcomes (Landier and Thesmar, 2008; Ma et al., 2020). Thus, the evidence shows that even if optimistic and pessimistic types are persistent over time across individuals, these behavioral attitudes are declining within individuals over time, which is consistent with the existence of learning.

I examine two alternative explanations for the documented learning effects. First, entrepreneurs may have different risk attitudes or perhaps different abilities to learn and may update their expectations as a result of these unobservable individual effects. I include individual fixed effects in the main specifications to neutralize any individual unobservable factors that may confound my results. Note that this kind of specification is only possible when using a panel dataset of individual expectations and has shortcomings. Specifically, the introduction of individual fixed effects requires observing the entrepreneur over at least two periods, thereby ex-

cluding from the analysis start-ups that survive fewer than three periods and creating a survival bias in the sample. I discuss the observable differences between start-ups that survive and those that do not. However, without looking at expectation formation within individual entrepreneurs, there is no way to analyze expectation formation dynamics and empirically characterize learning patterns.

Second, entrepreneurs may update their expectations not only as a consequence of their past expectation errors but also due to the arrival of new information. I consider three types of new information: firm-level news (e.g., recent employment growth, recent sales growth), sector-level news (e.g., recent sector growth), and market-wide news (e.g., changes in GDP, inflation rate, or the unemployment rate). I correlate these different micro and macro signals with entrepreneurs' updates in beliefs. The evidence shows that firm-level changes have little to no effect on updates to hiring expectations. However, micro-level changes in employment size and sales growth lead to less positive and more negative updates of development expectations. More interestingly, both hiring and development updates appear to be pro-cyclical. Note that to identify the macroeconomic effects, I remove the year fixed effects from the empirical model. I show that when the economy is booming, e.g., there is a positive change in GDP or the inflation rate or a decrease in the unemployment rate, entrepreneurs are more likely to update both their hiring and development expectations positively and less likely to update them negatively. Overall, the evidence shows that entrepreneurs are less sensitive to good than to bad macro conditions.

Besides, I characterize the types of errors entrepreneurs make in the first place. I correlate expectation errors with recent firm-level news, as in Barrero (2020); Ma et al. (2020). I find that when news is in the positive domain, entrepreneurs form overly optimistic beliefs about their hiring and development prospects. Indeed, if a start-up experiences employment growth in one year, the entrepreneur's hiring and development expectations for the next year will be over-optimistic. If, instead, the firm experiences shrinking employment, the entrepreneur tends to be over-pessimistic. Consistently, positive corporate news is associated with less pessimistic beliefs regarding hiring prospects. The evidence suggests that entrepreneurs overestimate the persistence of recent growth and is consistent with extrapolative expectations, which overweight future outcomes that become more likely in light of incoming news.⁴

In the last part of the paper, I show that making errors and then learning from these errors have real effects on corporate performance. I find that entrepreneurs who overestimate their hiring prospects then hire less in the three years after relative to years when they do

⁴Other studies in the forecasting literature find evidence of extrapolative behaviors: Bordalo et al. (2019) and Bordalo et al. (2020) among analysts, Rozsypal and Schlafmann (2017) among US households, and Barrero (2020) among US CEOs.

not make errors. I also find that start-ups generate lower sales when entrepreneurs overestimate their development prospects. Finally, start-ups whose entrepreneurs make hiring or development expectation errors have a lower probability of surviving five years after creation relative to start-ups run by entrepreneurs who do not make expectation errors within the same sector cohort. In summary, expectation errors are associated with worse corporate performance in the cross-section and in the time series of start-ups.

However, my results show that although updates to expectations are not significantly associated with better performance in isolation, the interaction of current updates and past expectation errors is positively and significantly associated with corporate growth and a higher probability of surviving five years or longer. I show that learning from past expectation errors is associated with 8% more sales and 11% more employment growth over the three years after the expectations are revised. The start-ups of these entrepreneurs have a higher probability of surviving five years or longer. A broader implication of my results is that learning mitigates entrepreneurial optimism's negative effects and leads to better corporate performance within and across firms.

Related literature. This paper is primarily related to recent works documenting that firm managers, entrepreneurs, households, and professional forecasters have biased beliefs and make forecast errors as a result. A growing body of work tests the systematic predictability of forecast errors using survey data and looking at inflation and other macro forecasts (Malmendier and Nagel, 2011, 2016; Coibion and Gorodnichenko, 2012, 2015; Coibion, Gorodnichenko and Ropele, 2020), the stock market (Greenwood and Shleifer, 2014; Bordalo et al., 2019), credit spreads bordalo2018diagnosticcredit, and corporate decisions and earnings (Ben-David, Graham and Harvey, 2013; Bachmann, Elstner and Sims, 2013; Bachmann and Elstner, 2015; Gennaioli, Ma and Shleifer, 2016; Bouchaud et al., 2019; Tanaka et al., 2019; Altig et al., 2020; Barrero, 2020; Ma et al., 2020).⁵ Another strand of the literature focuses on the real effects of managerial optimism (Malmendier and Tate, 2005, 2008, 2015; Hirshleifer, Low and Teoh, 2012; Graham, Harvey and Puri, 2013; Gennaioli, Ma and Shleifer, 2016), including specifically, in the context of entrepreneurship, see Cooper, Woo and Dunkelberg (1988); Åstebro, Jeffrey and Adomdza (2007); Landier and Thesmar (2008); Puri and Robinson (2013).⁶⁷ Using survey data

⁵Expectation errors have also been studied in laboratory-controlled experiments (Hommes et al., 2005; Kuhnen, 2015; Beshears et al., 2013; Frydman and Nave, 2017; Landier, Ma and Thesmar, 2019).

⁶Further evidence of overconfidence or optimism among entrepreneurs includes Camerer and Lovallo (1999); Arabsheibani et al. (2000); Moskowitz and Vissing-Jørgensen (2002); Hayward, Shepherd and Griffin (2006); Koellinger, Minniti and Schade (2007).

⁷Related papers in household finance show that individuals' expectations are central to explaining their savings, consumption, and investment choices Kuhnen and Miu (2017); Das, Kuhnen and Nagel (2020); Fermann et al.

representative of the population of start-up founders in France, I show that entrepreneurs make heterogeneous forecast errors about their development and hiring prospects. Entrepreneur's biased beliefs have real effects on corporate growth and the probability the firm survives.

My findings also contribute to the strands of literature in economics and psychology that investigate the determinants of belief formation. This paper contributes to studies of learning. Several studies have also focused on the specific role of attention (Enke and Zimmermann, 2019; Hartzmark, Hirshman and Imas, 2019; Enke, 2020), context-dependent stereotypes (Coffman, 2014; Bordalo et al., 2016, 2019; Hebert, 2020) and the importance of prior experience in beliefs formation and financial decision making (Kuhnen and Knutson, 2011; Kuhnen, 2015; Malmendier and Nagel, 2011, 2016; Nagel and Xu, 2019; Malmendier, Nagel and Yan, 2020).⁸ Relatedly, models of associative memory highlight how memory recall affects decision making (Mullainathan, 2002; Bordalo, Gennaioli and Shleifer, 2020; Wachter and Kahana, 2020). Overall, empirical evidence on the role of learning in belief formation remains limited, and my findings provide a new application. The evidence presented in this paper sheds light on the process by which entrepreneurs incorporate newly available information into beliefs that do not necessarily start from objective priors, and documents domain-specific departures from Bayesian learning. Although optimism and pessimism are persistent types over time, entrepreneurs learn from their expectation errors and update their beliefs accordingly.⁹

Finally, this paper is related to a recent literature that views entrepreneurship as experimentation. The value of entrepreneurship arises from the real options available from experimenting with new ideas (Kerr, Nanda and Rhodes-Kropf, 2014; Manso, 2016). Related to my study, Howell (2019) studies how entrepreneurs learn from negative feedback received in venture competitions and finds that entrepreneurs delay their exit, therefore considering continuation as a real option. Xu (2018) finds evidence that, crowdfunding can reduce the risk of experimentation by providing early market feedback.¹⁰ My paper shows that entrepreneurs start with heterogeneous beliefs, a substantial part make expectation errors, and some of them update their beliefs, thus mitigating the adverse effects of entrepreneurial optimism on their start-up's growth and exit.

(2018); D'Acunto et al. (2019, 2020).

⁸The literature on the informational role of financial markets considers that stock prices contain valuable information from which firm managers can learn to guide their real decisions (see e.g., Bakke and Whited, 2010; Bond, Edmans and Goldstein, 2012; Foucault and Fresard, 2014). Additionally, managers can learn about their ability through market performance (Seru, Shumway and Stoffman, 2010; Howell, 2019).

⁹Theory models in the entrepreneurship literature focus on the persistence of entrepreneurial optimism over time (Bernardo and Welch, 2001; Coval and Thakor, 2005; Landier and Thesmar, 2008).

¹⁰Other papers show that constraints on the ability to experiment can therefore impact entry into entrepreneurship (Gottlieb, Townsend and Xu, 2018; Hombert et al., 2020), financing (Ewens, Nanda and Rhodes-Kropf, 2018) and re-entry (Landier, 2005; Cahn, Girotti and Landier, 2020).

2. Model of Learning in Entrepreneurship

Consider an entrepreneur who forms expectations about next period growth for her business. The formation of such expectations about the future depends on learning from the last period's expectations errors, which reflects the difference between the entrepreneur's past expectation and the subsequent past realization.

I model the next period growth of entrepreneur i 's business as the expectation for the next period's growth formed at time t and an error:

$$\Delta x_{t,i} = \underbrace{\mu_{t,i}}_{\text{Expectation}} + \underbrace{\varepsilon_{t,i}}_{\text{Error}} \text{ with } \varepsilon_{t,i} \sim \mathcal{N}(0, \sigma) \quad (1)$$

A Bayesian entrepreneur uses the history of growth $H_{t,i} = (\Delta x_{1i}, \Delta x_{2i}, \Delta x_{3i}, \dots, \Delta x_{t,i})$ to estimate the posterior mean $\mu_{t,i}$, which is the equal-weighted average of all available information on corporate growth until time t , as follows $\hat{\mu}_{t,i} = \frac{1}{t} \sum_{s=1}^t \Delta x_{s,i}$ with t , the size of the data. (see e.g., Evans and Honkapohja 2001).

I rewrite equation 1 using a recursive representation with gain γ , as in Malmendier and Nagel (2016).

$$\underbrace{\hat{\mu}_{t,i} - \hat{\mu}_{t-1,i}}_{\text{Update}} = \underbrace{\frac{1}{t}}_{\gamma} \underbrace{(\Delta x_{t-1,i} - \hat{\mu}_{t-1,i})}_{\text{Past Error}} + \underbrace{\frac{1}{t}(\Delta x_{t,i} - \Delta x_{t-1,i})}_{\text{Average corporate growth}} \quad (2)$$

The difference in expectations formed at time t and $t - 1$, $\hat{\mu}_{t,i} - \hat{\mu}_{t-1,i}$, corresponds to the expectation update between periods. The decreasing gain $\gamma = \frac{1}{t}$ determines the degree of updating an entrepreneur applies when faced with a past expectation error $\Delta x_{t-1,i} - \hat{\mu}_{t-1,i}$. If the past expectation error is negative, such that $\Delta x_{t-1,i} < \hat{\mu}_{t-1,i}$, corporate growth realizations are below the expectation. Hence, the expectation error is optimistic and the gain γ is positive to compensate for overly optimistic expectations. In contrast, if the past expectation error is positive, such that $\Delta x_{t-1,i} > \hat{\mu}_{t-1,i}$, the realization exceeds the expectation. The expectation error is pessimistic, and in this case, γ is negative to balance expectations that are overly negative. In addition, when the entrepreneur does not make any expectation errors, $\Delta x_{t-1,i} = \hat{\mu}_{t-1,i}$, $\gamma = 0$. $\gamma = 0$ means that the entrepreneur is rational or good at planning for the future; it also means that the entrepreneur in this framework does not have the opportunity to learn from her past errors since she did not make any errors. Thus, the gain $|\gamma|$ indicates the degree to which the entrepreneur learns. When $|\gamma|$ is large, the entrepreneur learns a lot and is more

likely to update her expectations as a consequence of her past mistakes.

In addition to past mistakes, I allow other information to affect expectations. First, the arrival of new information between $t - 1$ and t directly related to corporate growth can affect the formation of entrepreneurs' expectations about their own firms. $\Delta x_{t,i} - \Delta x_{t-1,i}$ can be interpreted as the average corporate growth between $t - 1$ and t , which I denote by A_i . Second, I capture the influence of information other than learning from their past errors and the average corporate growth by assuming the existence of a common component F_t that is available to all entrepreneurs at time t ; examples are an economic crisis, the contraction of credit in the economy or a pandemic that affects all firms in the economy. Let $U_{T;T-1|\delta,i}$ be the expectation update between period T and the past period $T - 1$ made by entrepreneur i , given that expectations are formed at time T and $T - 1$ regarding the future times $T + \delta$ and $T - 1 + \delta$, respectively. The past-error-based component of entrepreneurs' future-time- δ expectations is obtained from equation 2 as $\Phi_{T-1|\delta,i} = \gamma(\Delta x_{T-1+\delta,i} - \hat{\mu}_{T-1,i})$.

I assume that the update of subjective expectations is a weighted average of the learning-from-past-error component $\Phi_{T-1|\delta,i}$ and the average corporate growth and other macroeconomic information as follows:

$$U_{T;T-1|\delta,i} = \beta\Phi_{T-1|t+\delta,i} + (1 - \beta)(F_t + A_i) \quad (3)$$

The coefficient β captures the incremental contribution of past errors $\Phi_{T-1|\delta,i}$ to the update of subjective expectation $U_{T;T-1|\delta,i}$, over and above common and individual news. Hence, entrepreneurs not only rely on the past errors realized during their firms' lifetimes but also use these experiences to form new expectations about their own firms' future.

Empirically, I estimate a modification of equation 3:

$$U_{T;T-1|t+\delta,i} = \beta\Phi_{T-1|t+\delta,i} + \alpha_i + \lambda_t + \varepsilon_{t,i} \quad (4)$$

where $U_{T;T-1|\delta,i}$ is the estimated expectation update computed from survey data. The fixed effects λ_t absorb the unobserved F_t vector of macroeconomic news and the individual fixed effects α_i absorb the time-unvarying firm-level variables, including the average corporate growth A_i . An important advantage of including individual fixed effects α_i in the equation is that they also account for an individual's persistent unobservable attitudes toward learning (e.g., different abilities to learn). Heterogeneity of this type may create a downward bias if estimated in the cross-section of the data. Specifically, optimistic entrepreneurs tend to make negative

expectation errors and thus update negatively too often, leading to a spurious positive correlation between expectation updates and expectation errors.

The presence of individual fixed effects in equation 4 implies that I identify β and γ and, hence, the learning-from-past-errors effect from the time series of differences in subjective expectations over time within individuals. Thus, lagged values of individual entrepreneurs' expectation errors and updates allow the identification of learning patterns at the individual level.

However, the introduction of individual fixed effects also comes with shortcomings. First, individual fixed effects do not allow individual-firm fixed effects to be disentangled from individual-entrepreneur fixed effects. Doing so would necessitate observing all potential companies founded by the same entrepreneur and her expectations about the future prospects of each of them (i.e., serial entrepreneur). In this case, the effect would be identifiable only for these entrepreneurs who have founded multiple companies and may be fundamentally different from that for first-time founders.

Second, specifications with individual fixed effects require at least two observations over time per entrepreneur to identify the effect, and thus the start-ups must survive at least two periods to provide two observations of the entrepreneur's expectations. This second shortcoming has two implications for the empirical analysis of entrepreneurs' expectation formation. First, it creates a survival bias. Start-ups that survive at least two periods (5 years) may be fundamentally different from those that do not. I discuss the observable differences between firms that survive at least five years and those that do not in section 4.4. Second, it limits the number of observations for each entrepreneur for each series, decreasing statistical power and making it difficult to reliably estimate β and γ . However, without looking at expectation formation within individual entrepreneurs, there is no way to analyze the dynamics of entrepreneurs' expectations and tell whether entrepreneurs learn and which learning pattern best fits the data.

3. Data and Descriptive Statistics

3.1. Data sources

My dataset merges the SINE survey with the corporate tax files and the matched employer-employee dataset available from the French Bureau of Statistics (Insee).

Survey of entrepreneurs. The *Système d'Information des Nouvelles Entreprises* (SINE) survey is a large-scale survey of entrepreneurs conducted by the French Bureau of Statistics every

four years. For each cohort, questionnaires are sent to approximately 25% of the population of entrepreneurs who started or took over a business in France in 1998, 2002, 2006, 2010, and 2014 (cohorts). The surveyed firms are randomly selected from the firm registries. However, the SINE survey is adjusted at the margin to be representative of the industrial composition and geographic repartition of new firms in France. The response rate to the SINE survey is high (approximately 90%) because the tax authorities supervise the sending of questionnaires. The business owner is responsible for completing the documents.¹¹

Three years after creating the new start-up or the takeover by a new entrepreneur, these firms are presented with follow-up questionnaires. A total of 65% of the firms in the initial wave of questionnaires responded after three years. This attrition is explained by failed businesses and businesses changing locations and not being located by survey administrators. Five years after business creation/takeover, a last wave of questionnaires is sent, and the average attrition rate is 45%. Hence, each firm selected to be part of a cohort is followed up to five years after creation if it survives. The dataset consists of a repeated panel of 30,000 to 60,000 firms per cohort, which are then matched to the corporate tax files and the matched employer-employee dataset.

Tax Files and the Matched Employer-Employee Dataset. *Bénéfices Industriels et Commerciaux* and *Bénéfices Non-commerciaux* augmented by the matched employer-employee dataset (*Déclarations Annuelles des Données Sociales*) provide detailed yearly accounting (balance sheet and income statements) and employment information at the firm level between 1994 and 2017. The tax files cover all firms annually subject to either the regular corporate tax regime or the simplified corporate tax regime from creation to death.¹² From the tax files, I retrieve sales, employment size, total assets, earnings before interest and tax (EBIT), and net income. Location and industrial activity are also collected from the tax files.¹³

3.2. Main Variables

Expectations. The entrepreneur is asked about his development and hiring expectations, respectively, for the next six or twelve months after the firm is started/taken over. The first

¹¹More information about these data sources: www.insee.fr/sine and www.cnis.fr/sine. See also Landier and Thesmar (2008); Hebert (2020) for other uses of the data.

¹²Small firms with annual sales below €32,600 (€81,500 in retail and wholesale trade) can opt out and choose a special micro-business tax regime (called *micro-entreprise*). Income falling into this category is taxed at the personal level. These firms do not, therefore, appear in the corporate tax files.

¹³France is divided into 101 counties (*départements*). The French SIC is the *Nomenclature des Activités Françaises* (NAF) and consists of 540 sectors at the 4-digit level.

question is, “What do you plan to do over the next 6 months?”, and the possible answers are as follows: (1) “To develop the company”, (2) “To maintain the current balance”, (3) “To recover from a difficult situation”, (4) “To shut down the firm”, (5) “To sell it”, and (6) “I do not know”. The variable *Development Expectation* takes the value of one if the entrepreneur answers (1) and zero otherwise. The entrepreneur is then asked about his hiring expectations. The question is, “Do you plan to hire over the next 12 months?”. The variable *Hiring Expectation* takes the value of one if the entrepreneur answers “Yes” and zero otherwise. The dummy variables *Uncertainty Development* and *Uncertainty Hiring* equal one when the entrepreneur answers “I don’t know” and zero if he answers with any of the other items.

The responses are confidential and collected by the French Statistical Institute for national statistics purposes, so entrepreneurs have few motives to misreport their beliefs (Bertrand and Mullainathan, 2001). A critical advantage of the SINE survey is that it covers a large and representative sample of the population of French start-ups.¹⁴ The panel structure of the data allows me to document variations in the reported expectations over time within individuals, which suggests that entrepreneurs do not systematically misreport their beliefs.

Expectation errors. I assess *Expectation Errors* by comparing entrepreneurs’ expectations about the next year to the venture’s actual sales and employment growth, which I observe using the tax files and the matched employer-employee dataset (Landier and Thesmar, 2008). An entrepreneur makes an expectation error if there is a difference between the entrepreneur’s *expectation* and subsequent realizations. The expectation can be optimistic or pessimistic depending on the sign of the bias.

The variable *Optimistic Development Error* takes the value one if the entrepreneur answers that she wants to develop the company and if sales remain 5% lower in the baseline measure. The variable takes the value of zero if the entrepreneur matches her expectations and achieves sales growth or if she does not have any positive expectations and does not grow accordingly (i.e., a realistic entrepreneur). The variable *Pessimistic Development Error* takes the value of one if the entrepreneur answers that she does not intend to develop the company and if sales growth exceeds 5% in the baseline measure, and zero otherwise. For robustness, I also consider 3%, 10% and 20% as alternative sales growth thresholds for both *Optimistic Development Error* and *Pessimistic Development Error*.

¹⁴Note that the questions asked in the SINE survey do not allow us to elicit subjective probability distributions about future own-firm sales and employment growth, as in Ben-David, Graham and Harvey (2013); Altig et al. (2020); Barrero (2020). Consequently, my analysis of entrepreneurs’ beliefs focuses on the first moment they form their expectations, which allows them to identify optimistic or pessimistic attitudes. However, it does not allow them to identify uncertainty and overconfident attitudes.

Similarly, the variable *Optimistic Employment Errors* takes the value of one if the entrepreneur answers that she expects to hire employees over the next year and if the firm's employment size remains unchanged at the end of the next year. The variable takes the value of zero if the entrepreneur matches her expectations and grows by at least one employee or if she does not have any hiring expectations and does not hire accordingly. The variable *Pessimistic Employment Error* takes the value of one if the entrepreneur answers that she does not intend to hire over the next year and if the firm's employment size grows by at least one employee in the baseline measure, and zero otherwise. For robustness, I also use two and zero as alternative employment growth thresholds.

Updates. Entrepreneurs can update and revise their expectations over time. A unique feature of the data is their panel structure, which allows me to measure entrepreneurs' expectations regarding sales and employment growth over the next year at three points in time: at the end of the first year of creation ($t=1$), at the end of the third year ($t=3$) and at the end of the fifth year ($t=5$) after the initial period. I create the variables *Update Development* and *Update Hiring* by comparing reported expectations over time. If the entrepreneur changes her expectations, the dummy variable *Update* takes the value of one and zero if her expectations remain unchanged.¹⁵ The update can be *Positive* if the entrepreneur expects to hire or to develop the firm in the next year. It can also be positive if she does not expect this in the period before or if her development or hiring forecasts remain unchanged relative to the previous period. The update can be *Negative* if the entrepreneur does not expect to hire or develop the firm. It can also be negative if positive expectations in the previous period or if her development or hiring forecasts remain unchanged relative to the previous period.

Entrepreneurs' biographical information. Gender, age, and citizenship dummy variables are also collected from the SINE survey. Education information is recoded such that cohorts can be compared over time. Education dummy variables include *No degree*, *High school*, *Bachelor's*, *Master's/PhD*, and *Elite engineering school*. Additionally, entrepreneurs are asked about the number of years they have worked in the industry and the number of start-ups they have founded. I code a dummy *Expert* if the entrepreneur reports at least three years of industry experience. The dummy variable *Serial* indicates whether the entrepreneur had founded a start-up before the one targeted by the questionnaire.

¹⁵Note that the different expectations concern the year following the year in which the questionnaire is conducted and are not a pure update of expectations measured at different dates and concern the same time horizon of a given variable (e.g., Coibion and Gorodnichenko, 2015).

In the survey, entrepreneurs are asked about their motivations for founding a start-up and their desire to grow the founded start-up. I identify an entrepreneur as *High-growth oriented* if she aims “to develop the company” as opposed “to create her own job”. In a separate question, entrepreneurs report up to three of their main motivations for founding a start-up among the following propositions: *Add earnings* to the household; desire for *Independence*; address unemployment; pursue a *Taste* for entrepreneurship and new challenges; take on an *Opportunity*; and explore a *New idea* for a product, service, or market. I use information that is time-invariant in cross-sectional tests.

3.3. Descriptive Statistics

Table 1 reports the statistics of the raw data for entrepreneurs’ expectations about their hiring and development prospects, their expectation errors and updates to expectations.

Expectations, errors and updates. In total, 39% of entrepreneurs in my sample expect to develop their company over the next year. Other entrepreneurs expect to stabilize the current situation (42%) or recover from a difficult situation (10%); 5% of them expect to shut the firm down and 3% to sell it. After three years of operations, 3% of entrepreneurs expect to shut down, and 5% expect to sell the firm. Regarding hiring forecasts, 24% of entrepreneurs expect to hire workers over the next year. However, 24% of them indicate that they do not know whether they will hire or not, and 13% do not know what they will do in the coming year.

When we compare entrepreneurs’ development and hiring forecasts to their firm’s subsequent sales and employment growth realizations, the evidence reveals that a significant proportion of entrepreneurs make forecast errors: 16% of entrepreneurs in my sample make optimistic forecast errors when growing by at least one employee in the next year, and 19% of entrepreneurs are optimistic when I set the employment growth threshold to two employees. In addition, 44% of entrepreneurs make pessimistic hiring forecast errors, meaning that they still hire when they did not expect to. Regarding entrepreneurs who expected to develop the company, 21% make optimistic forecast errors, and 36% make pessimistic development forecast errors.

A substantial proportion of entrepreneurs revise their forecasts between periods. Thirty-five percent of entrepreneurs in my sample revise their development, and 22% revise their hiring forecasts. More specifically, 13% of entrepreneurs revise their development forecasts upward. Those who did not plan to develop their start-up during the previous period indicate the next period that they plan to do so over the coming year. In addition, 21% of entrepreneurs revise

their development forecast downward. While they planned to develop the firm the last time they were asked, they do not plan to do so anymore. In addition, 7% of entrepreneurs in my sample revise their hiring forecasts upward, and 15% revise their hiring forecasts downward. Thus, entrepreneurs revise their forecasts downward more often than upward. In addition, even though the evidence shows that a significant proportion of entrepreneurs revise their development or hiring forecasts, the average entrepreneur does not revise her expectations either because she was right in the first place or possibly because she does not learn from new information.

Entrepreneurs' biographical characteristics In my sample, 30% of start-ups are female-led, and the median entrepreneur is between 35 and 44 years old at the year of creation/takeover. Regarding higher education, 35% of surveyed entrepreneurs graduated with a bachelor's or/and a master's/PhD degree. In addition, 61% of entrepreneurs indicated having at least three years of experience in the sector before starting up. Thirty-four percent of them have 10 years or more experience in the sector. Most of the entrepreneurs in my sample (42%) were employed before starting up, whereas 34% were unemployed. Others were independent workers, CEOs, or students (3%). Regarding entrepreneurial experience, 27% of entrepreneurs in my sample had already founded a start-up, and 3% of them had founded more than three start-ups.

In my sample, 79% of firms are newly created firms, and 21% are private firms taken over by new entrepreneurs. In total, 52% are incorporated firms. However, only 30% of entrepreneurs indicate that their main objective is to grow the company instead of creating their own jobs. Digging into motivations for creating a start-up, the average entrepreneur's main motivation is to become independent (63%) and, to a lesser extent, because of a taste for entrepreneurship (47%). Other motivations include founding a company to seize an opportunity (28%), to explore a new idea (14%), or to increase earnings (25%).

3.4. Expectations, errors and updates for the cross-section of entrepreneurs

Heterogeneous hiring and development expectations. Appendix table [A1](#) reports entrepreneurs' expectations about their start-ups' future, which are correlated with entrepreneurs' individual characteristics. I report correlations for hiring and development expectations (columns 1 and 2) and expectations to stabilize the start-up and recover from a difficult situation (columns 3 and 4, respectively). Entrepreneurs can also answer that they plan to shut down the operations or sell the company, which I combine into one answer (column 5). In the second and third waves of the survey, entrepreneurs can also report that they plan to downsize the company and let employees go. The expectation to downsize is reported in column 6. In table [A1](#), I compare

expectations about the future in the cross-section of entrepreneurs within the same SIC-2 sector in the same cohort.

The results show that female entrepreneurs are 3.4% less likely to plan to hire employees in the next year relative to male entrepreneurs who started in the same industry the same year (column 1). They are 1.2% less likely to say that they plan to develop their business in the coming year (column 2). However, female entrepreneurs are equally likely to plan to sell the company, shut down the operation, or downsize relative to male entrepreneurs in the same sector cohort.

Entrepreneur age is also an important factor in entrepreneurs' hiring and development expectation formation. Older entrepreneurs are less likely to have positive hiring and development prospects. The magnitude of the effect increases with age. Entrepreneurs with a college education are more likely to expect to hire employees and develop the company and mechanically less likely to plan to only stabilize the company or recover from a difficult situation. Industry expertise is positively related to hiring expectations but negatively correlated with overall development expectations. Similarly, serial entrepreneurs are more likely to plan to hire but not significantly more likely to develop the company overall than those with no prior entrepreneurial experience.

Finally, the results show that high-growth-oriented entrepreneurs and incorporated start-ups are strongly more likely to hire and strongly more likely to plan to develop the company. Accordingly, those entrepreneurs are less likely to plan to keep the current balance, to recover from a challenging situation, or to shut down the new venture. Thus, the evidence suggests that stated motivations are an important predictor of expectation formation.

Heterogeneous optimistic and pessimistic expectation errors. If expectation errors were random, they would not correlate with some entrepreneurs' characteristics. Appendix table [A3](#) tests this hypothesis and shows that entrepreneurs who started the same year in the same industry make expectation errors and, if they do, make different types of expectation errors. Within the same industry, some entrepreneurs who start the same year are optimistic while others are pessimistic, and others can forecast the future state of their own business correctly.

Female entrepreneurs are approximately 1.9% less optimistic than their male counterparts regarding their hiring expectations. However, female entrepreneurs are 1.3% more likely to underestimate their hiring prospects and make pessimistic errors. However, note that, even if female entrepreneurs are less optimistic than men in hiring, my results show no significant

gender differences regarding development forecasts.

A more persistent predictor of entrepreneurs' expectation errors is age. Older entrepreneurs (45 or older) are significantly less optimistic and significantly more pessimistic than younger entrepreneurs. A college education (bachelor's degree or a higher degree) is consistently associated with more optimistic errors and significantly less pessimistic errors.

The results on industry and entrepreneurial experience are more ambiguous. Industry experts who have at least three years of working in the industry before starting up are more likely to make optimistic errors regarding their hiring prospects and make less pessimistic errors regarding this aspect. However, my results also show that they are significantly less likely to make optimistic errors regarding their development overall. In addition, serial entrepreneurs are optimistic overall; they overestimate both their hiring and development prospects. At the same time, some other serial entrepreneurs are overly pessimistic about their hiring prospects. Thus, the evidence suggests that prior entrepreneurial experience reinforces disagreements about their company's future hiring prospects, which highlights the importance of the hiring decision for start-up companies.

Finally, entrepreneurs who self-identify themselves as high-growth oriented or who choose an incorporated company are strongly and significantly more likely to make optimistic errors about their hiring and development and are symmetrically less pessimistic.

Heterogeneous updates to expectations. Heterogeneity in expectation errors in the later periods can also be related to heterogeneity in the likelihood of updating hiring and development expectations. If entrepreneurs were all Bayesian individuals, updates in expectations would be concentrated among some characteristics of entrepreneurs. Appendix table [A4](#) reports a significant heterogeneity in entrepreneurs' likelihood to revise expectations across periods. On the one hand, female entrepreneurs seem to update their hiring expectations less often than their male counterparts, following both an optimistic and a pessimistic expectation error (columns 1 to 3). On the other hand, they are equally likely to update their development expectations (columns 2 and 4).

In addition, the evidence shows that older entrepreneurs are significantly less likely to revise their hiring and development expectations. The magnitude of the effect is stronger for older age categories. For instance, entrepreneurs who are 55 years old or older are 8% less likely to revise their expectations than entrepreneurs who are 34 years old or younger (columns 1 and 4). The effect is particularly striking, as it is persistent across both development and hiring expectations

and persistent across both optimistic and pessimistic errors.

In addition, entrepreneurs with a college education are significantly less likely to update their expectations after making an optimistic error but significantly more likely to do so after a pessimistic error. Entrepreneurs with prior entrepreneurial experience are significantly more likely to update their expectations after making both an optimistic and a pessimistic error. Finally, entrepreneurs with self-described high-growth orientation and those who have chosen to incorporate the young firm are significantly more likely to update in every situation. Overall, the evidence in this section suggests that an entrepreneur with a strong motivation

Overall, the evidence in this section motivates the wide use of individual fixed effects to neutralize concerns about entrepreneurs' unobservable and personal traits that could confound the formation of expectations and the likelihood of learning from past mistakes.

4. Main Results

4.1. Learning from errors

In this section, I provide three pieces of evidence suggesting that entrepreneurs learn over time from their past mistakes. First, I show that entrepreneurs who make expectation errors are more likely to update their expectations. Second, I find that entrepreneurs who updated their expectations are less likely to make expectation errors in the future. Third, I provide evidence that entrepreneurs who made expectation errors are less likely to make expectation errors again in the future. Notably, all tests presented in this section include individual fixed effects and rely on the time series of entrepreneurs forming expectations about their own businesses.

4.1.1 Updates and past expectation errors

I begin by testing the model's main prediction, which is that entrepreneurs update their expectations as a result of past expectation errors. Table 2, panel A reports the relationship between updates to hiring and development expectations and past optimistic errors within individuals. Panel B reports the same correlations, but for past pessimistic errors, when realizations exceeded expectations. I report the decomposition between positive and negative updates to hiring and development expectations for both optimistic and pessimistic expectation errors. All specifications include individual fixed effects to compare the same entrepreneur over time and to offset unobservable confounding effects toward individual attributes and the ability to learn.

The results show that entrepreneurs are significantly more likely to update their expectations when they made optimistic errors in the previous period (Panel A, columns 1 and 4). More specifically, entrepreneurs who overestimated their hiring and development prospects are significantly more likely to change their forecasts from positive (in the initial period) to negative (in the next period) (columns 3 and 6). Consistently, I find that entrepreneurs who made optimistic hiring and development expectation errors in the past are able to update their forecasts positively and significantly (columns 2 and 5).

In panel B, I find that entrepreneurs who make pessimistic expectation errors are overall less likely to update their expectations in the next period (Panel B, columns 1 and 4). Indeed, entrepreneurs who did not expect growth in the initial period still do not forecast growth and therefore do not update their expectations (the forecasts are still negative), thus driving the negative relationship between pessimistic errors and subsequent updates. This finding is confirmed in columns 3 and 6 of panel B, which shows that entrepreneurs who made pessimistic errors are significantly less likely to negatively update their expectations than those who did not. Consistently, the evidence in columns 2 and 5 shows that entrepreneurs who make pessimistic errors are more likely to update their expectations positively in the next period.

Overall, the evidence shows that entrepreneurs update their forecasts in reaction to past expectation errors. However, I also find evidence that pessimism is stickier than optimism within an individual. Entrepreneurs who make pessimistic errors are relatively less likely to update their expectations (positively) than entrepreneurs who overestimate their prospects and are likely to update (negatively). Although this finding suggests the existence of asymmetric learning between pessimistic and optimistic entrepreneurs, my results show that the average entrepreneur can update her hiring and development expectations and learn from her past mistakes.

Cross-sectional tests. In table A4, I regress entrepreneurs' hiring and development expectation updates on past optimistic and pessimistic errors in the cross-section of entrepreneurs within the same industry in the same year. I include SIC-2-industry-year fixed effects to control for any potential industry shocks the year expectations are formed. I also include time-invariant observable biographical characteristics of entrepreneurs such as gender, age, citizenship, education, industry, and entrepreneurial experience, as well as dummies for a new firm and for the entrepreneur's high-growth orientation. Standard errors are clustered at the firm level.

Consistent with the findings in table 2, I find that optimistic expectation errors about both hiring and development prospects are associated with a higher probability of updating expecta-

tions in the next period (columns 1 and 2). In addition, pessimistic errors or underestimating hiring and development prospects are associated with a lower probability of updating expectations in the next period (columns 3 and 4). The evidence for the cross-section of entrepreneurs within an industry cohort is consistent with results for the time series, suggesting that learning attitudes depend on the initial type of mistakes made.

Heterogeneous learning. Table ?? investigates the heterogeneous effects of making an error on the updating of subsequent beliefs. The specification is the same as in table ??, but the past expectation error is interacted with the entrepreneur’s gender (panel A), age (panel B) and high-growth orientation (panel C).

The evidence shows that female entrepreneurs are significantly less likely to update positively after an optimistic error and significantly more likely to update negatively (panel A, columns 1 to 3). I also find that entrepreneurs 40 years old or older are significantly more likely to update positively after a past optimistic error (panel B, columns 1 to 3). The effect is reversed for high-growth oriented entrepreneurs, who are less likely to update negatively after a past optimistic error and more likely to update positively relative to entrepreneurs who start their companies to create their own job (panel C, columns 1 to 3).

Regarding pessimistic expectation errors, I find that female and older entrepreneurs are less likely to update their beliefs positively and more likely to update negatively even after a pessimistic error (panel B, columns 4 to 6). In contrast, I find that high-growth oriented entrepreneurs are even more likely to update positively after an optimistic error and even more likely to update negatively after a pessimistic error (panel C, columns 4 to 6). Overall, the evidence shows that female entrepreneurs, older entrepreneurs and those who are motivated by the creation of a small business are likely to update their beliefs in the correct direction after an optimistic error, whereas men, younger and high-growth entrepreneurs do not change their beliefs. Interestingly, the effect is reversed after a pessimistic error.

4.1.2 Updates and future expectation errors

Next, I investigate the relationship between expectation errors and updates. Table 4 reports the relationship between optimistic and pessimistic expectation errors and updates to hiring expectations. Importantly, all specifications exploit the panel structure of the data and include individual fixed effects to compare the same entrepreneur over time and control for entrepreneurs’ unobservable individual learning abilities.

At first sight, I do not find any significant relationship between updates to hiring expectations and future optimistic expectation errors (column 1). However, when I decompose the effect between positive and negative updates, significant relationships appear to exist (columns 2 and 3), suggesting that entrepreneurs' priors matter and determine the update sign. More specifically, my results show that entrepreneurs who negatively update their hiring expectations between two periods of the survey are less likely to make optimistic expectation errors than those who positively update them (column 3). In contrast, entrepreneurs who update positively, who previously had negative hiring expectations and who now have positive expectations, are significantly more likely to overestimate their hiring prospects in the future (column 2).

Regarding updates and the likelihood of making pessimistic expectation errors, I find an overall negative and significant relationship (column 4) that appears to be driven by positive updates to hiring expectations. Indeed, entrepreneurs who update their expectations positively are less likely to make pessimistic errors in the future (column 5). However, entrepreneurs who update negatively are significantly more likely to make a pessimistic expectation error in the future (column 6). Overall, the evidence shows that positive updates of hiring expectations are associated with higher chances of optimizing optimistic expectations and less pessimistic errors. Symmetrically, negative updates of hiring expectations are associated with less frequent future optimistic errors but more frequent pessimistic errors. However, from table 5, we know that optimism and pessimism are persistent behavioral types across individual entrepreneurs, highlighting the importance of initial expectation errors for understanding the dynamics of expectation formation and drawing conclusions regarding learning patterns.

4.1.3 Expectation errors over time within individuals

Finally, I analyze the likelihood of errors in decision-making within and across individuals. In table 5 columns 1 and 2, I report the relationship between current optimistic expectation errors and past optimistic expectation errors within individuals. In columns 3 and 4, I report the same relationship for pessimistic expectation errors. The regression models include individual and year fixed effects. The individual fixed effects allow me to compare the expectation formation and potential errors by the same individual over time, neutralizing time-invariant characteristics, including risk aversion. However, the inclusion of individual fixed effects requires us to observe the same individual several times over time, leading to a decrease in the number of observations and potentially inducing survival bias. Standard errors are clustered at the individual firm level.

Using panel data, I show that entrepreneurs learn from their past mistakes and make fewer

expectation errors over time. Entrepreneurs who made an optimistic expectation error regarding their hiring and development prospects in the previous period are, respectively, 38% and 57% significantly less likely to make an optimistic expectation error in the current wave of the survey (columns 1 and 2). The same conclusion applies to entrepreneurs who made pessimistic expectation errors. Indeed, pessimistic entrepreneurs are 35% and 47% less likely to make pessimistic errors regarding their future hiring and development prospects over time, respectively (columns 3 and 4, respectively).

Cross-sectional tests In panel B of table 5, I regress entrepreneurs' optimistic and pessimistic errors on past optimistic and pessimistic errors, respectively, in the cross-section of entrepreneurs within the same industry for the same year. I include SIC-2-industry-year fixed effects control for any potential industry shocks in the year expectations are formed. I also control for several time-invariant observable biographical characteristics of entrepreneurs, including gender, age, citizenship, education, industry, and entrepreneurial experience. In addition, I include dummies for the new firm's incorporation status and the entrepreneur's high-growth orientation. Standard errors are clustered at the firm level.

Consistent with Landier and Thesmar (2008), I find that expectation errors are positively correlated across individuals over time. Entrepreneurs who made optimistic expectation errors in the previous period are more likely to also make optimistic expectation errors in the future (columns 1 and 2). This finding is robust to both the use of entrepreneurs' hiring expectations and development expectations compared to their respective realizations one year ahead. Similarly, entrepreneurs who made pessimistic errors in the previous period are more likely to make pessimistic expectation errors in the next wave of the survey (columns 3 and 4). In other words, optimism and pessimism biases are persistent over time across individuals but decline within individuals over time.

4.2. Learning from recent signals

4.2.1 Updates and signals

Entrepreneurs may also update their expectations between periods as a reply to signals they receive in addition to the learning-from-past-errors pattern highlighted previously. In this section, I regress entrepreneurs' updates to expectations on several micro and macro signals they may observe. Table 6 reports the results for changes in the firms' employment size (panel A), changes in the firm's sales (panel B), changes in the national GDP (panel C), changes in the

inflation rate (panel D), and changes in the unemployment rate (panel D) between the year the new expectation is formed and the year before it is formed. In panels A and B, I include individual fixed effects as well as year fixed effects to control for macro changes that could affect micro signals. In panels C to E, the models include only individual fixed effects but not year fixed effects to study the effects of macroeconomic variable changes on individual entrepreneurs' updates. Standard errors are clustered at the individual entrepreneur level.

The results in panels A and B show that entrepreneurs are not significantly likely to update their hiring expectations because of changes in the firms' employment size or because of sales growth in the year t they form their expectations relative to the previous year $t - 1$ (columns 1 to 3). By contrast, changes at the firm level appear to have a stronger effect on updates to development expectations. Surprisingly, a positive change in the firm's employment size leads to a higher probability of a negative update and a lower probability of a positive update, behaviors that appear to be consistent with mean-reversion patterns (columns 5 and 6).

In panels C to E, I repeat the analysis using macrolevel news, which affects all firms in the economy. To be able to identify potential effects, I remove year fixed effects. At first sight, the results show that entrepreneurs are significantly less likely to update their development and hiring expectations when the economy is booming. When GDP grows by one standard deviation, the entrepreneur is -2.061 percentage points less likely to update her hiring expectations and -2.11 percentage points less likely to update her development expectations relative to periods in which GDP decreases (panel C, columns 1 and 4). I find similar effects for increases in the inflation rate and positive changes in the unemployment rate (panels D and E, columns 1 and 4).

When I decompose the effect between positive and negative updates, I find that negative updates drive the total negative effect of booming macroeconomic conditions on updates to expectations. Entrepreneurs' negative forecast updates as a reply to bad macroeconomic conditions are stronger than their positive updates as a reply to good macroeconomic conditions (panels C to E, columns 3 to 6). In other words, entrepreneurs are more sensitive to bad macro conditions than they are good macro conditions.

Consistent with trends I find for changes in GDP and the inflation rate, the decrease in the unemployment rate is associated with significantly more frequent updates to hiring and development expectations (panel E, columns 1 and 4). Note that a one-standard-deviation increase in the unemployment rate leads to 0.007 p.p. less positive updates and 0.048 p.p. more negative updates (panel D, columns 5 and 6). The effects are strongly significant for

both positive and negative updates but are economically stronger for negative updates, which is consistent with the previous finding that entrepreneurs are more sensitive to bad macro news than to positive macro news.

Overall, the evidence shows that variations at the firm level have little to no effect on updates to hiring expectations. However, micro changes in employment size and sales growth lead to less positive updates to development expectations and more negative updates to development expectations, which is in line with mean-reversion patterns. More interestingly, both hiring and development expectations appear to be pro-cyclical. When the economy is booming, that is, there is a positive change in the GDP or the inflation rate or a deterioration in the unemployment rate, entrepreneurs are more likely to update both their hiring and development expectations positively and less likely to update them negatively. Finally, entrepreneurs seem less sensitive to good macro conditions than to good micro conditions. Overall, the evidence in panels C and E highlights the importance of controlling for macro trends in individual-level learning tests.

4.2.2 Expectation errors and signals

I show that entrepreneurs make extrapolative expectation errors. I regress entrepreneurs' expectation errors on employment and sales growth between the year before the expectation is formed and the year it is formed. I include individual fixed effects to compare the same entrepreneurs over time and year fixed effects to control for macroeconomic trends. Table 7 reports the results. Panel A reports the results for optimistic expectation errors, and panel B reports the results for pessimistic expectation errors.

Panel A shows that a firm's employment growth is positively related to optimistic employment expectation errors. Start-ups growing one standard deviation above average in the year they form new hiring expectations tend to overestimate their future ability to hire by approximately 0.038 percentage points, approximately 23% ($= \frac{0.038}{0.16}$) times the absolute value of the mean of the dependent variable (panel A, column 1). Positive employment growth is also positively and significantly related to the likelihood of making an optimistic expectation error concerning the firm's development in one year (column 3). In columns 2 and 4, I use the firm's sales growth. I find that start-ups that are growing one standard deviation above average in the year they form new hiring and development expectations tend to overestimate their future ability to hire and develop the firm. Overall, entrepreneurs' hiring and development expectations tend to exceed realizations when those expectations are formed during a relatively high-performing year. The evidence is consistent with entrepreneurs making extrapolative expectation errors at

the individual level, whereby entrepreneurs overestimate how much future business conditions will resemble current conditions.

In Panel B, I find that the effect is reversed for entrepreneurs who make pessimistic expectation errors about their hiring prospects. During relatively high-performing years, entrepreneurs are less likely to form pessimistic hiring expectations, followed by lower realizations in employment size in the coming year. The effect is robust to using the change in the firm's employment size and the firm's sales change. Overall, the evidence presented in this section is consistent with entrepreneurs making extrapolative expectation errors at the individual level, whereby entrepreneurs overestimate how much future business conditions will resemble current conditions and overinterpret the last micro signal they receive about their firm.

4.3. The Real Effects of Learning

In table 8, I investigate the real effects of expectation updates in relation to past expectation updates on a firm's growth measured as the variation in sales and employment size between the year before the new expectation is formed and three years after it is formed (columns 1 and 2). In columns 3 and 4, I test the real effects of learning from past expectation errors on the likelihood that the firm will survive at least five years after creation. Specifications in columns 1 and 2 include individual firms and year fixed effects, which allows me to compare the same firm over time, as the effect is identified for firms that make expectation errors, and update their forecasts. Specifications in columns 3 and 4 include sector \times cohort-year fixed effects and individual biographical entrepreneur and time-invariant firm characteristics, as the dummy variable $Survival_{t+5}$ does not vary at the firm level.

The evidence shows that entrepreneurs who made expectation errors at a given point in time are significantly likely to perform worse in terms of all start-up performance measures. Their sales are 7% lower in the next three years when they make expectation errors about their development prospects (column 1). Their employment size is 10% lower in the next three years when they make expectation errors about their development prospects (column 2). Finally, start-ups run by optimistic entrepreneurs are also significantly less likely to survive five years or more.

Entrepreneurs who update their hiring and development forecasts do not experience significantly more significant employment and sales growth, respectively. However, my results show that entrepreneurs who made an expectation error and updated their expectations in the next period experience significant growth in the three years after updating their expectations. Learn-

ing from past errors is associated with 8% more sales and 11% more employment growth over three years (columns 1 and 2).

In the cross-section of entrepreneurs, I also find that updating expectations after past errors is positively associated with a higher probability of surviving at least five years (from 3% to 4% more likely, columns 3 and 4). However, the cross-sectional evidence also reveals that entrepreneurs who update their expectations are also associated with a lower probability of surviving five years or more relative to entrepreneurs who do not update their expectations. One possible explanation for this finding is that learning is associated with a negative selection bias. Only entrepreneurs who made expectation errors can update and learn from their past mistakes in my setting. Overall, the evidence shows that expectation errors and updates to expectations have real, significant, and long-lasting effects on firms' growth.

4.4. Survival bias

5. Conclusion

This paper studies how entrepreneurs form and update their expectations over time. I rely on a large and unique survey of French entrepreneurs that is representative of the population of start-ups founded in France. Specifically, my analysis is based on self-reported entrepreneurs' expectations about their hiring and development prospects. I identify optimistic and pessimistic entrepreneurs by comparing their hiring and development prospects to actual realizations in terms of employment and sales growth. A unique feature of the survey is its panel structure, which allows us to track detailed information about an entrepreneur from the start-up's creation year to five years onward. I compute the update to hiring and development expectations by comparing changes in expectations over time.

The raw data show that more than half of entrepreneurs make expectation errors. Approximately 20% of new entrepreneurs make optimistic expectation errors, whereas approximately 30% of entrepreneurs make pessimistic errors. The surprisingly high number of pessimistic entrepreneurs is explained by the fact that the dataset is representative of the population of newly created firms and includes not only high-growth oriented start-ups but also new small businesses. I begin by documenting that the average entrepreneur extrapolates new information. Indeed, I find a positive correlation between expectation errors and recent changes in employment and sales growth within individuals.

Next, I ask whether entrepreneurs learn from their past errors. A valuable strategy in the

macroeconomics behavioral literature consists of observing the dynamics of expectation errors and subsequent updates of expectations over time *within* individuals. I formalize the intuition that entrepreneurs learn from their past mistakes by building on the existing Bayesian learning literature. I introduce into these standard models updates to expectations as a consequence of past expectation errors. The model shows that if the entrepreneur does not make expectation errors, the update of expectations does not depend on past errors. In contrast, if the entrepreneur is optimistic, the entrepreneur learns and negatively updates her expectations. If the entrepreneur makes pessimistic errors, the entrepreneur learns and positively updates her expectations.

I take these predictions to the data. I document three stylized facts consistent with entrepreneurs who learn from their past mistakes over time. First, I show that optimistic errors lead to negative updates of expectations and pessimistic expectation errors to positive updates. The finding is robust for both hiring and development expectations. Second, although optimistic and pessimistic types are persistent across entrepreneurs, my results show that expectation errors decline within individuals over time. Third, I show that updates to expectations lead to fewer future expectations errors.

Finally, I show that expectation errors have real effects and lead to lower sales growth, employment growth, and survival by comparing the same firm over time. However, my results also prove that learning from past errors mitigates these real negative effects. Entrepreneurs who correct past errors experience high sales, employ more employees after three years, and have a higher probability of surviving five years or longer. Overall, my findings show that mistakes influence corporate success but are not deterministic since entrepreneurs seem to learn over time.

References

- Altig, David, Jose Maria Barrero, Nicholas Bloom, Steven J Davis, Brent Meyer, and Nicholas Parker.** 2020. "Surveying business uncertainty." *Journal of Econometrics*.
- Arabsheibani, Gholamreza, David De Meza, John Maloney, and Bernard Pearson.** 2000. "And a vision appeared unto them of a great profit: Evidence of self-deception among the self-employed." *Economics Letters*, 67(1): 35–41.
- Åstebro, Thomas, Scott A Jeffrey, and Gordon K Adomdza.** 2007. "Inventor perseverance after being told to quit: The role of cognitive biases." *Journal of Behavioral Decision Making*, 20(3): 253–272.
- Bachmann, Rüdiger, and Steffen Elstner.** 2015. "Firm optimism and pessimism." *European Economic Review*, 79: 297–325.
- Bachmann, Rüdiger, Steffen Elstner, and Eric R Sims.** 2013. "Uncertainty and economic activity: Evidence from business survey data." *American Economic Journal: Macroeconomics*, 5(2): 217–49.
- Bakke, Tor-Erik, and Toni M Whited.** 2010. "Which firms follow the market? An analysis of corporate investment decisions." *Review of Financial Studies*, 23(5): 1941–1980.
- Barrero, Jose Maria.** 2020. "The micro and macro of managerial beliefs." *Working Paper*.
- Ben-David, Itzhak, John R Graham, and Campbell R Harvey.** 2013. "Managerial miscalibration." *Quarterly Journal of Economics*, 128(4): 1547–1584.
- Bernardo, Antonio E, and Ivo Welch.** 2001. "On the evolution of overconfidence and entrepreneurs." *Journal of Economics & Management Strategy*, 10(3): 301–330.
- Bertrand, Marianne, and Sendhil Mullainathan.** 2001. "Do people mean what they say? Implications for subjective survey data." *American Economic Review*, 91(2): 67–72.
- Beshears, John, James J Choi, Andreas Fuster, David Laibson, and Brigitte C Madrian.** 2013. "What goes up must come down? Experimental evidence on intuitive forecasting." *American Economic Review*, 103(3): 570–74.
- Bond, Philip, Alex Edmans, and Itay Goldstein.** 2012. "The real effects of financial markets." *Annual Review of Financial Economics*, 4(1): 339–360.
- Bordalo, Pedro, Katherine Coffman, Nicola Gennaioli, and Andrei Shleifer.** 2016. "Stereotypes." *Quarterly Journal of Economics*, 131(4): 1753–1794.
- Bordalo, Pedro, Katherine Coffman, Nicola Gennaioli, and Andrei Shleifer.** 2019. "Beliefs about gender." *American Economic Review*, 109(3): 739–73.
- Bordalo, Pedro, Nicola Gennaioli, and Andrei Shleifer.** 2020. "Memory, attention, and choice." *Quarterly journal of economics*, 135(3): 1399–1442.
- Bordalo, Pedro, Nicola Gennaioli, Yueran Ma, and Andrei Shleifer.** 2020. "Overreaction in macroeconomic expectations." *American Economic Review*.
- Bouchaud, Jean-Philippe, Philipp Krueger, Augustin Landier, and David Thesmar.** 2019. "Sticky expectations and the profitability anomaly." *Journal of Finance*, 74(2): 639–674.
- Cahn, Christophe, Mattia Girotti, and Augustin Landier.** 2020. "Entrepreneurship and Information on Past Failures: A Natural Experiment." *Journal of Financial Economics*.
- Camerer, Colin, and Dan Lovallo.** 1999. "Overconfidence and excess entry: An experimental approach." *American Economic Review*, 89(1): 306–318.
- Coffman, Katherine Baldiga.** 2014. "Evidence on self-stereotyping and the contribution of ideas." *Quarterly Journal of Economics*, 129(4): 1625–1660.

- Coibion, Olivier, and Yuriy Gorodnichenko.** 2012. “What can survey forecasts tell us about information rigidities?” *Journal of Political Economy*, 120(1): 116–159.
- Coibion, Olivier, and Yuriy Gorodnichenko.** 2015. “Information rigidity and the expectations formation process: A simple framework and new facts.” *American Economic Review*, 105(8): 2644–78.
- Coibion, Olivier, Yuriy Gorodnichenko, and Tiziano Ropele.** 2020. “Inflation expectations and firm decisions: New causal evidence.” *Quarterly Journal of Economics*, 135(1): 165–219.
- Cooper, Arnold C, Carolyn Y Woo, and William C Dunkelberg.** 1988. “Entrepreneurs’ perceived chances for success.” *Journal of Business Venturing*, 3(2): 97–108.
- Coval, Joshua D, and Anjan V Thakor.** 2005. “Financial intermediation as a beliefs-bridge between optimists and pessimists.” *Journal of Financial Economics*, 75(3): 535–569.
- D’Acunto, Francesco, Daniel Hoang, Maritta Paloviita, and Michael Weber.** 2019. “IQ, expectations, and choice.”
- D’Acunto, Francesco, Ulrike Malmendier, Juan Ospina, and Michael Weber.** 2020. “Exposure to grocery prices and inflation expectations.”
- Das, Sreyoshi, Camelia M Kuhnen, and Stefan Nagel.** 2020. “Socioeconomic status and macroeconomic expectations.” *Review of Financial Studies*, 33(1): 395–432.
- Enke, Benjamin.** 2020. “What you see is all there is.” *The Quarterly Journal of Economics*, 135(3): 1363–1398.
- Enke, Benjamin, and Florian Zimmermann.** 2019. “Correlation neglect in belief formation.” *Review of Economic Studies*, 86(1): 313–332.
- Ewens, Michael, Ramana Nanda, and Matthew Rhodes-Kropf.** 2018. “Cost of experimentation and the evolution of venture capital.” *Journal of Financial Economics*, 128(3): 422–442.
- Fernand, Elyas, Camelia M Kuhnen, Geng Li, and Itzhak Ben-David.** 2018. “Expectations Uncertainty and Household Economic Behavior.” *Working Paper*, , (20018-25): 19–3.
- Foucault, Thierry, and Laurent Fresard.** 2014. “Learning from peers’ stock prices and corporate investment.” *Journal of Financial Economics*, 111(3): 554–577.
- Frydman, Cary, and Gideon Nave.** 2017. “Extrapolative beliefs in perceptual and economic decisions: Evidence of a common mechanism.” *Management Science*, 63(7): 2340–2352.
- Gennaioli, Nicola, Yueran Ma, and Andrei Shleifer.** 2016. “Expectations and investment.” *NBER Macroeconomics Annual*, 30(1): 379–431.
- Gottlieb, Joshua D, Richard R Townsend, and Ting Xu.** 2018. “Does Career Risk Deter Potential Entrepreneurs?”
- Graham, John R, Campbell R Harvey, and Manju Puri.** 2013. “Managerial attitudes and corporate actions.” *Journal of Financial Economics*, 109(1): 103–121.
- Greenwood, Robin, and Andrei Shleifer.** 2014. “Expectations of returns and expected returns.” *Review of Financial Studies*, 27(3): 714–746.
- Hartzmark, Samuel M, Samuel Hirshman, and Alex Imas.** 2019. “Ownership, Learning, and Beliefs.” *Working Paper*.
- Hayward, Mathew LA, Dean A Shepherd, and Dale Griffin.** 2006. “A hubris theory of entrepreneurship.” *Management Science*, 52(2): 160–172.
- Hebert, Camille.** 2020. “Gender stereotypes and entrepreneur financing.” *Working Paper*.
- Hirshleifer, David, Angie Low, and Siew Hong Teoh.** 2012. “Are overconfident CEOs better innovators?” *Journal of Finance*, 67(4): 1457–1498.

- Hombert, Johan, Antoinette Schoar, David Sraer, and David Thesmar.** 2020. “Can unemployment insurance spur entrepreneurial activity? Evidence from France.” *Journal of Finance*, 75(3): 1247–1285.
- Hommel, Cars, Joep Sonnemans, Jan Tuinstra, and Henk Van de Velden.** 2005. “Coordination of expectations in asset pricing experiments.” *Review of Financial Studies*, 18(3): 955–980.
- Howell, Sabrina.** 2019. “Learning from feedback: Evidence from new ventures.” *Working Paper*.
- Kerr, William R, Ramana Nanda, and Matthew Rhodes-Kropf.** 2014. “Entrepreneurship as experimentation.” *Journal of Economic Perspectives*, 28(3): 25–48.
- Koellinger, Philipp, Maria Minniti, and Christian Schade.** 2007. “ãI think I can, I think I canã: Overconfidence and entrepreneurial behavior.” *Journal of Economic Psychology*, 28(4): 502–527.
- Kuhnen, Camelia M.** 2015. “Asymmetric learning from financial information.” *Journal of Finance*, 70(5): 2029–2062.
- Kuhnen, Camelia M, and Andrei C Miu.** 2017. “Socioeconomic status and learning from financial information.” *Journal of Financial Economics*, 124(2): 349–372.
- Kuhnen, Camelia M, and Brian Knutson.** 2011. “The influence of affect on beliefs, preferences, and financial decisions.” *Journal of Financial and Quantitative Analysis*, 46(3): 605–626.
- Landier, Augustin.** 2005. “Entrepreneurship and the stigma of failure.”
- Landier, Augustin, and David Thesmar.** 2008. “Financial contracting with optimistic entrepreneurs.” *Review of Financial Studies*, 22(1): 117–150.
- Landier, Augustin, Yueran Ma, and David Thesmar.** 2019. “Biases in expectations: Experimental evidence.” *Working Paper*.
- Malmendier, Ulrike, and Geoffrey Tate.** 2005. “CEO overconfidence and corporate investment.” *Journal of Finance*, 60(6): 2661–2700.
- Malmendier, Ulrike, and Geoffrey Tate.** 2008. “Who makes acquisitions? CEO overconfidence and the market’s reaction.” *Journal of Financial Economics*, 89(1): 20–43.
- Malmendier, Ulrike, and Geoffrey Tate.** 2015. “Behavioral CEOs: The role of managerial overconfidence.” *Journal of Economic Perspectives*, 29(4): 37–60.
- Malmendier, Ulrike, and Stefan Nagel.** 2011. “Depression babies: Do macroeconomic experiences affect risk taking?” *Quarterly Journal of Economics*, 126(1): 373–416.
- Malmendier, Ulrike, and Stefan Nagel.** 2016. “Learning from inflation experiences.” *Quarterly Journal of Economics*, 131(1): 53–87.
- Malmendier, Ulrike, Stefan Nagel, and Zhen Yan.** 2020. “The making of hawks and doves: Inflation experiences on the FOMC.” *Journal of Monetary Economics*.
- Manso, Gustavo.** 2016. “Experimentation and the returns to entrepreneurship.” *Review of Financial Studies*, 29(9): 2319–2340.
- Ma, Yueran, Tiziano Ropele, David Sraer, and David Thesmar.** 2020. “A quantitative analysis of distortions in managerial forecasts.” *Working Paper*.
- Morris, Stephen.** 1994. “Trade with heterogeneous prior beliefs and asymmetric information.” *Econometrica*, 1327–1347.
- Moskowitz, Tobias J, and Annette Vissing-Jørgensen.** 2002. “The returns to entrepreneurial investment: A private equity premium puzzle?” *American Economic Review*, 92(4): 745–778.
- Mullainathan, Sendhil.** 2002. “A memory-based model of bounded rationality.” *Quarterly Journal of Economics*, 117(3): 735–774.

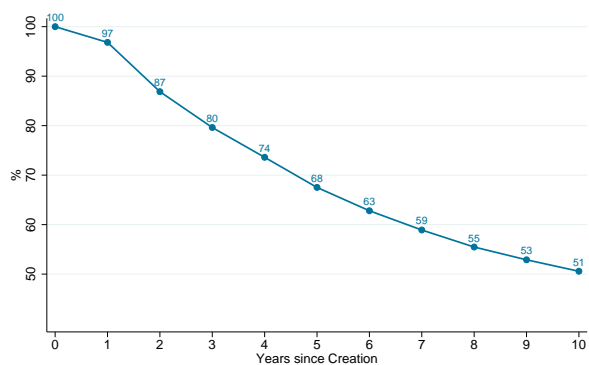
- Nagel, Stefan, and Zhengyang Xu.** 2019. “Asset pricing with fading memory.” *Working Paper*.
- Puri, Manju, and David T Robinson.** 2013. “The economic psychology of entrepreneurship and family business.” *Journal of Economics & Management Strategy*, 22(2): 423–444.
- Rozsypal, Filip, and Kathrin Schlafmann.** 2017. “Overpersistence bias in individual income expectations and its aggregate implications.” *Working Paper*.
- Seru, Amit, Tyler Shumway, and Noah Stoffman.** 2010. “Learning by trading.” *Review of Financial Studies*, 23(2): 705–739.
- Tanaka, Mari, Nicholas Bloom, Joel M David, and Maiko Koga.** 2019. “Firm performance and macro forecast accuracy.” *Journal of Monetary Economics*.
- Wachter, Jessica A, and Michael Jacob Kahana.** 2020. “A retrieved-context theory of financial decisions.” *Working Paper*.
- Xu, Ting.** 2018. “Learning from the crowd: The feedback value of crowdfunding.” *Working Paper*.

Tables

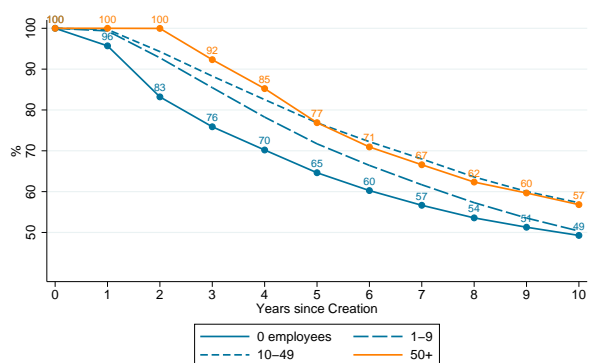
Figure 1. Firm Survival

Source: Firm registry 2000–2018 and SINE surveys. This figures plot the percentage of firms that survive after several years since creation ($t = 0$). Figure (a) includes all new firms founded between 2000 and 2018 ($N=43,390,785$). Figure (b) includes all new firms founded between 1998 and 2018 and split the distributions by employment size categories ($N=43,390,785$). Figure (c) includes new firms founded in the 2002, 2006, 2010, and 2014 cohorts and that are present in the SINE surveys ($N=1,284,426$).

(a) All firms



(b) All firms by employment size at start



(c) SINE cohorts

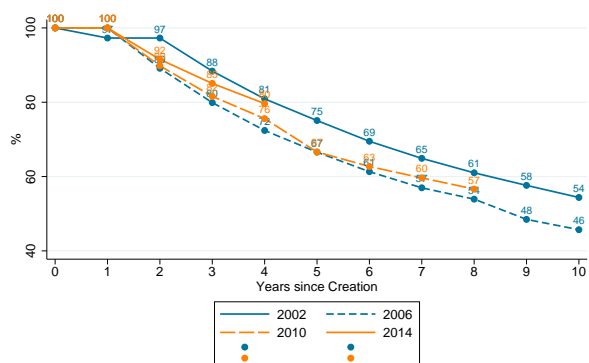


Figure 2. Firm Survival, Optimism and Pessimism

Source: Firm registry, SINE surveys 2002–2018 and tax files. Source: New firms founded in the 2002, 2006, 2010, and 2014 cohorts and that are present in the SINE surveys. This figure plots the percentage of firms that survive after several years since creation ($t = 0$) by initial type of expectation error at creation ($T = 1$). *Optimistic* equals one if the entrepreneur over-estimate her development expectation relative to the one-year ahead sales growth realization. *Pessimistic* equals one if the entrepreneur under-estimate her development expectations relative to the one-year ahead sales growth realization. *Rational* equals one if the entrepreneur correctly forecasts her development expectation relative to the one-year ahead sales growth realization.

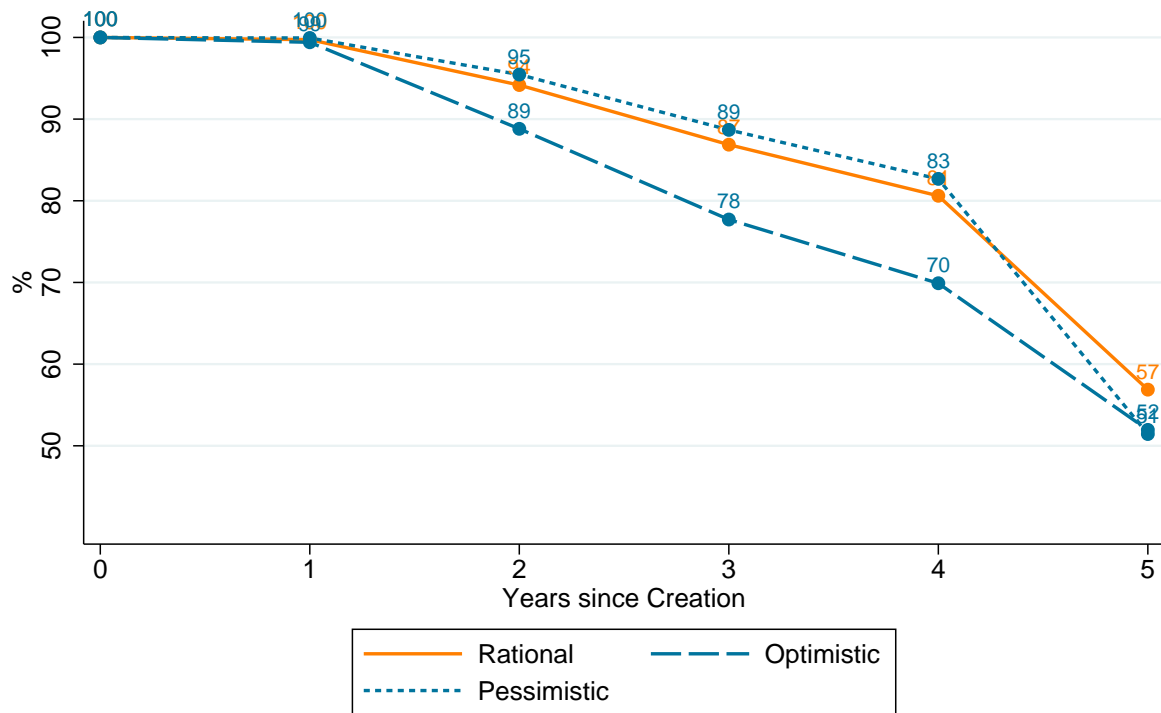


Figure 3. Distribution of Optimism and Pessimism by Industry

Source: SINE surveys 2002, 2006, 2010, and 2014 cohorts linked to the tax files ($N=158,249$). This figure plots the distributions of firms in the regression sample by SIC-1 industry and by initial type of expectation error at creation ($T = 1$). *Optimistic* equals one if the entrepreneur over-estimate her development expectation relative to the one-year ahead sales growth realization. *Pessimistic* equals one if the entrepreneur under-estimate her development expectations relative to the one-year ahead sales growth realization. *Rational* equals one if the entrepreneur correctly forecasts her development expectation relative to the one-year ahead sales growth realization.

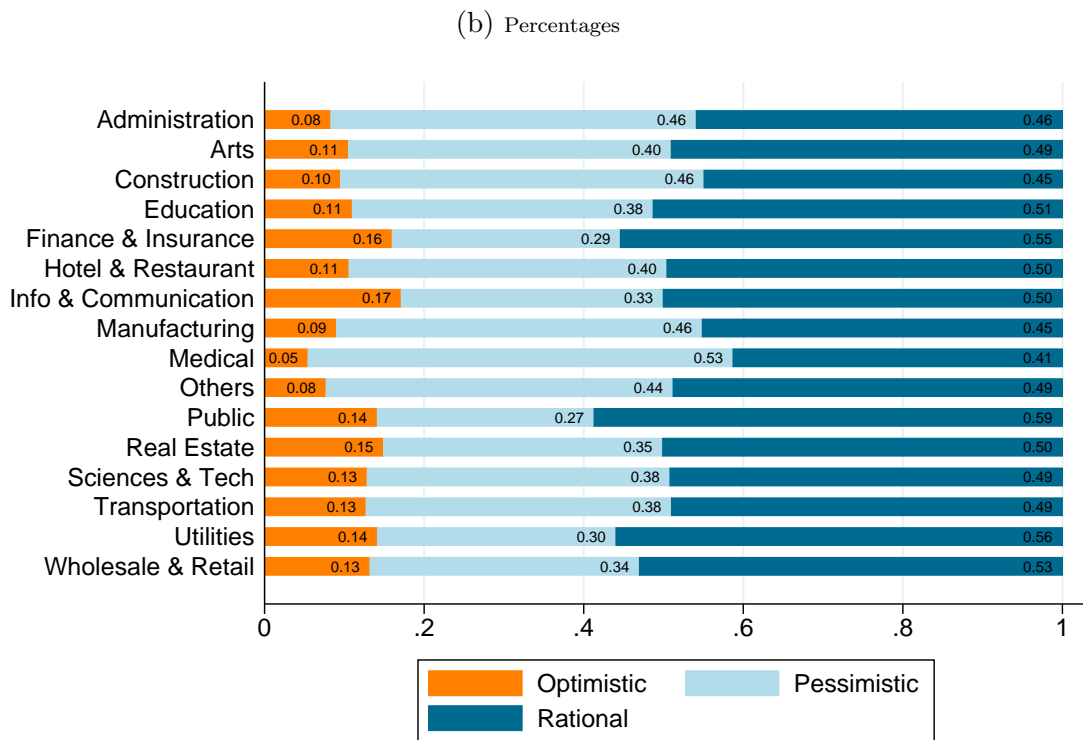
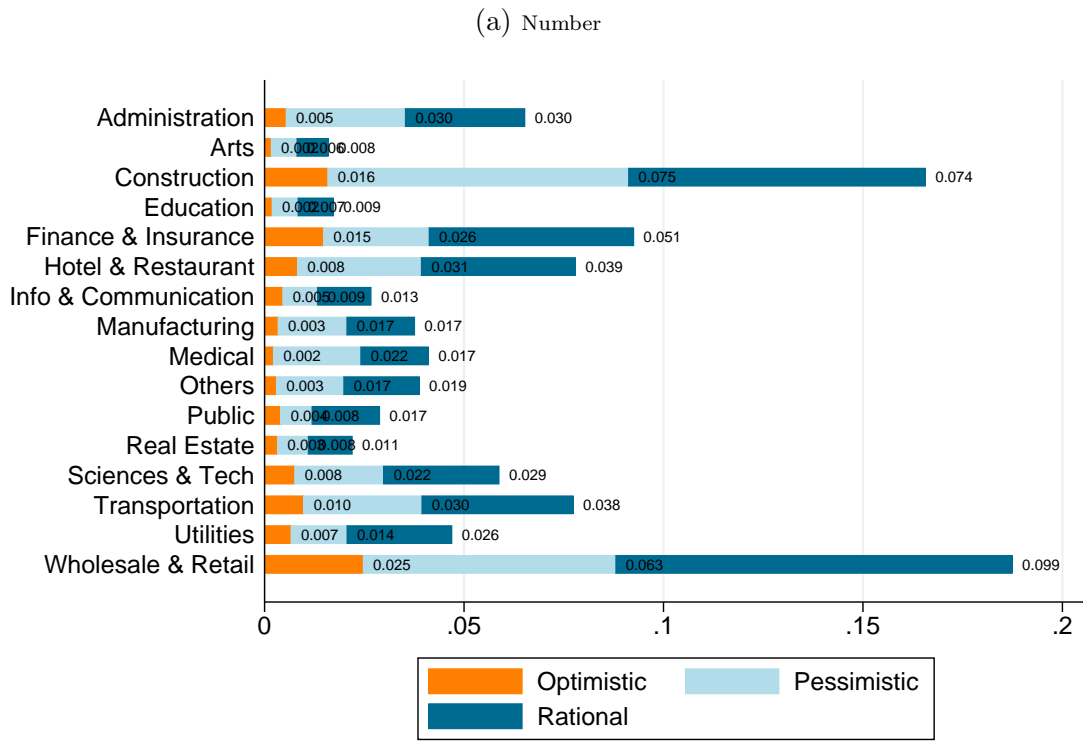


Table 1. Entrepreneurs' Characteristics

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. The table presents entrepreneurs' expectations, errors and updates (panel A), biographical characteristics (panel B), motivation items and composition of the founding team (panel C), micro and macro signals (panel D), and corporate outcomes (panel E). Variable definitions and data sources are provided in Appendix table B.

Variables	Count	Mean	Sd	P10	Median	P90
Panel A. Expectations, Errors and Updates						
<u>Beliefs:</u>						
Hiring	289435	0.24	0.43	0.00	0.00	1.00
Development	383088	0.39	0.49	0.00	0.00	1.00
Stabilize	383061	0.42	0.49	0.00	0.00	1.00
Recover	383061	0.10	0.29	0.00	0.00	1.00
Shut down	336491	0.05	0.21	0.00	0.00	1.00
Sell	292716	0.03	0.18	0.00	0.00	1.00
Lay-off	105629	0.04	0.20	0.00	0.00	1.00
Uncertainty Development	383056	0.13	0.34	0.00	0.00	1.00
Uncertainty Hiring	383088	0.24	0.43	0.00	0.00	1.00
<u>Optimistic Errors_T:</u>						
Sales \geq 3%	164317	0.21	0.41	0.00	0.00	1.00
Sales \geq 5%	169027	0.21	0.41	0.00	0.00	1.00
Sales \geq 10%	179869	0.23	0.42	0.00	0.00	1.00
Sales \geq 20%	192547	0.26	0.44	0.00	0.00	1.00
Employment \geq 1	175448	0.16	0.37	0.00	0.00	1.00
Employment \geq 2	184825	0.19	0.39	0.00	0.00	1.00
Employment \geq 0	83498	0.09	0.29	0.00	0.00	1.00
<u>Pessimistic Errors_T:</u>						
Sales $<$ 3%	209919	0.38	0.49	0.00	0.00	1.00
Sales $<$ 5%	207572	0.36	0.48	0.00	0.00	1.00
Sales $<$ 10%	201924	0.32	0.47	0.00	0.00	1.00
Sales $<$ 20%	193908	0.26	0.44	0.00	0.00	1.00
Employment $<$ 1	260925	0.44	0.50	0.00	0.00	1.00
Employment $<$ 2	254232	0.41	0.49	0.00	0.00	1.00
Employment $<$ 0	281639	0.73	0.44	0.00	1.00	1.00
<u>Updates:</u>						
Update Development _{T;T-1}	190509	0.39	0.49	0.00	0.00	1.00
Positive	190509	0.17	0.37	0.00	0.00	1.00
Negative	190509	0.22	0.41	0.00	0.00	1.00
Update Hiring _{T;T-1}	117114	0.23	0.42	0.00	0.00	1.00
Positive	117114	0.07	0.26	0.00	0.00	1.00
Negative	117114	0.16	0.37	0.00	0.00	1.00
Panel B. Biographical characteristics						
Female	383088	0.30	0.46	0.00	0.00	1.00
24 or younger	383088	0.05	0.23	0.00	0.00	1.00
25-34	383088	0.31	0.46	0.00	0.00	1.00
35-44	383088	0.33	0.47	0.00	0.00	1.00
45-54	383088	0.22	0.41	0.00	0.00	1.00
55 or older	383088	0.08	0.28	0.00	0.00	1.00
French	383088	0.92	0.27	0.00	1.00	1.00
Bachelor's	383088	0.16	0.37	0.00	0.00	1.00
Master's/PhD	383088	0.19	0.39	0.00	0.00	1.00
College education	383088	0.35	0.48	0.00	0.00	1.00
Industry expert	382383	0.61	0.49	0.00	1.00	1.00
Serial entrepreneur	383088	0.29	0.45	0.00	0.00	1.00

Entrepreneurs' Characteristics

Source: SINE survey and tax files.

Variables	Count	Mean	Sd	Min	Median	Max
<hr/> Panel C. Motivations <hr/>						
New firm	383088	0.79	0.41	0.00	1.00	1.00
Incorporated	334092	0.52	0.50	0.00	1.00	1.00
High-growth oriented	291470	0.30	0.46	0.00	0.00	1.00
<u>Motivation for entry:</u>						
Independence	334089	0.63	0.48	0.00	1.00	1.00
Taste	383075	0.47	0.50	0.00	0.00	1.00
Add earnings	245758	0.25	0.43	0.00	0.00	1.00
Opportunity	383071	0.28	0.45	0.00	0.00	1.00
New idea	383073	0.15	0.35	0.00	0.00	1.00
Example relatives	383068	0.10	0.31	0.00	0.00	1.00
Unemployed	383072	0.21	0.41	0.00	0.00	1.00
<u>Team composition:</u>						
Alone	383088	0.36	0.48	0.00	0.00	1.00
Spouse	383088	0.23	0.42	0.00	0.00	1.00
Siblings	383088	0.23	0.42	0.00	0.00	1.00
Associates	383088	0.09	0.29	0.00	0.00	1.00
<hr/> Panel D. Micro and Macro Signals <hr/>						
<u>Micro signals:</u>						
Δ Employment size $_{t-1,t}$	78210	-0.10	0.96	-2.00	0.00	2.00
Δ Sales $_{t-1,t}$	155764	0.02	0.45	-2.00	0.02	2.00
<hr/> Panel E. Outcomes <hr/>						
Survival 3 years	414736	0.80	0.40	0.00	1.00	1.00
Survival 5 years	411373	0.67	0.47	0.00	1.00	1.00
Δ Employment $_{t,t+1}$	77578	0.02	0.82	-0.67	0.00	0.67
Δ Employment $_{t,t+2}$	67964	0.03	0.87	-1.00	0.00	1.00
Δ Employment $_{t,t+3}$	53353	0.06	0.89	-1.00	0.00	1.00
Δ Employment $_{t,t+4}$	48168	0.08	0.90	-1.00	0.00	1.00
Δ Employment $_{t,t+5}$	40463	0.11	0.91	-1.00	0.00	1.20

Table 2. Updates and Expectation Errors

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table uses OLS to test whether entrepreneurs update their expectations due to past expectation errors. The dependent variable in columns (1) to (3) is the $Update\ Hiring_{T;T-1}$, which equals one when the entrepreneur changes her Hiring Expectation between two successive periods of the survey. The update is *Positive* if the entrepreneur changes her Hiring Expectation to "hire", while she did not plan to "hire" in the previous period. The update is *Negative* if the entrepreneur changes her Hiring Expectation to "not hire", while she planned to "hire" in the previous period. The dependent variable in columns (4) to (6) is the $Update\ Development_{T;T-1}$, which equals one when the entrepreneur changes her Development Expectation between two successive periods of the survey. The update is *Positive* if the entrepreneur changes her Development Expectation to "develop," while she did not plan to "develop" in the previous period. The update is *Negative* if the entrepreneur changes her Development Expectation to "not develop," while she planned to "develop" in the previous period. The independent variable in columns (1) to (3) of panel A is the past $Optimistic\ Error\ Employment_{T-1}$, which equals one if the entrepreneur over-estimate her hiring expectations relative to the one-year ahead employment growth realization. The independent variable in columns (4) to (6) of panel A is the past $Optimistic\ Error\ Development_{T-1}$, which equals one if the entrepreneur over-estimate her development expectations relative to the one-year ahead sales growth realization. The independent variable in columns (1) to (3) of panel B is the past $Pessimistic\ Error\ Employment_{T-1}$, which equals one if the entrepreneur under-estimate her hiring expectations relative to the one-year ahead employment growth realization. The independent variable in columns (4) to (6) of panel B is the past $Pessimistic\ Error\ Development_{T-1}$, which equals one if the entrepreneur under-estimate her development expectations relative to the one-year ahead sales growth realization. All models include individual fixed effects and year fixed effects. Clustered standard errors at the firm level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

Panel A: Updates and Optimistic Errors

Type of update:	Update $Hiring_{T;T-1}$			Update $Development_{T;T-1}$		
Sign of the update:	All	Positive	Negative	All	Positive	Negative
	(1)	(2)	(3)	(4)	(5)	(6)
Optimistic Error $Employment_{T-1}$	0.449*** (0.009)	-0.217*** (0.006)	0.666*** (0.008)			
Optimistic Error $Sales_{T-1}$				0.409*** (0.008)	0.144*** (0.006)	0.265*** (0.004)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	19933	19933	19933	22196	22196	22196
Observations	39866	39866	39866	44392	44392	44392
R ²	0.639	0.519	0.596	0.492	0.647	0.703

Panel B: Updates and Pessimistic Errors

Type of update:	Update $Hiring_{T;T-1}$			Update $Development_{T;T-1}$		
Sign of the update:	All	Positive	Negative	All	Positive	Negative
	(1)	(2)	(3)	(4)	(5)	(6)
Pessimistic Error $Employment_{T-1}$	-0.190*** (0.005)	0.091*** (0.004)	-0.280*** (0.004)			
Pessimistic Error $Sales_{T-1}$				-0.229*** (0.004)	0.065*** (0.002)	-0.294*** (0.004)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	28960	28960	28960	34240	34240	34240
Observations	57920	57920	57920	68480	68480	68480
R ²	0.646	0.496	0.557	0.596	0.752	0.648

Table 3. Heterogeneous Updates and Expectation Errors

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table uses OLS to test whether entrepreneurs update their expectations due to recent corporate or economy-wide news. The dependent variable is the *Update Hiring* $_{T;T-1}$, which equals one when the entrepreneur changes her Hiring Expectation between two successive periods of the survey. The main independent variable in columns (1) to (3) is the past *Optimistic Error Employment* $_{T-1}$, which equals one if the entrepreneur over-estimate her hiring expectations relative to the one-year ahead employment growth realization. The main independent variable in columns (4) to (6) of panel B is the past *Pessimistic Error Employment* $_{T-1}$, which equals one if the entrepreneur under-estimate her hiring expectations relative to the one-year ahead employment growth realization. The main independent variable is interacted with *Female* gender in panel A, with *Age* ≥ 40 in panel B, and with *High-growth oriented* in panel C. All models include individual fixed effects and year fixed effects. Clustered standard errors at the firm level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

Panel A: Gender						
Type of update:	Update Hiring $_{T;T-1}$					
Direction of the update:	All	Positive	Negative	All	Positive	Negative
Type of error:	Optimistic Error $_{T-1}$			Pessimistic Error $_{T-1}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Expectation Error $_{T-1}$	0.448*** (0.011)	-0.204*** (0.007)	0.652*** (0.010)	-0.207*** (0.006)	0.097*** (0.005)	-0.305*** (0.005)
Expectation Error $_{T-1} \times$ Female	0.005 (0.021)	-0.052*** (0.015)	0.057*** (0.018)	0.055*** (0.010)	-0.022** (0.009)	0.077*** (0.009)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	39866	39866	39866	57920	57920	57920
R ²	0.639	0.520	0.596	0.647	0.496	0.558
Panel B: Age						
Type of error:	Optimistic Error $_{T-1}$			Pessimistic Error $_{T-1}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Expectation Error $_{T-1}$	0.423*** (0.013)	-0.222*** (0.008)	0.645*** (0.011)	-0.199*** (0.007)	0.093*** (0.006)	-0.293*** (0.006)
Expectation Error $_{T-1} \times$ Age ≥ 40	0.058*** (0.018)	0.011 (0.012)	0.047*** (0.016)	0.020** (0.010)	-0.006 (0.008)	0.026*** (0.009)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	39866	39866	39866	57920	57920	57920
R ²	0.640	0.519	0.596	0.646	0.496	0.557
Panel C: High-growth oriented						
Type of error:	Optimistic Error $_{T-1}$			Pessimistic Error $_{T-1}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Expectation Error $_{T-1}$	0.446*** (0.016)	-0.310*** (0.012)	0.756*** (0.013)	-0.119*** (0.006)	0.087*** (0.006)	-0.206*** (0.006)
Expectation Error $_{T-1} \times$ High-growth oriented	0.024 (0.022)	0.170*** (0.015)	-0.147*** (0.020)	-0.300*** (0.015)	0.030** (0.012)	-0.330*** (0.013)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28306	28306	28306	41720	41720	41720
R ²	0.647	0.528	0.606	0.663	0.498	0.582

Table 4. Future Errors and Updates

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table uses OLS to test whether entrepreneurs who update their expectations still make expectation errors in the future. The dependent variable in columns (1) to (3) is the *Optimistic Error_T*, which equals one if the entrepreneur over-estimate her hiring expectations relative to the one-year ahead employment growth realization threshold. The dependent variable in columns (4) to (6) is the *Pessimistic Error_T*, which equals one if the entrepreneur under-estimate her hiring expectations relative to the one-year ahead employment growth realization threshold. The independent variable is the *Update Hiring_{T;T-1}*, which equals one when the entrepreneur changes her Hiring Expectation between two successive periods of the survey. The update is *Positive* if the entrepreneur changes her Hiring Expectation to "hire", while she did not plan to "hire" in the previous period. The update is *Negative* if the entrepreneur changes her Hiring Expectation to "not hire", while she planned to hire in the previous period. All models include individual fixed effects and year fixed effects. Clustered standard errors at the firm level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

Type of Error: Expectation threshold:	Optimistic Errors _T ΔEmployment ≥ 1			Pessimistic Errors _T ΔEmployment < 1		
	(1)	(2)	(3)	(4)	(5)	(6)
Update Hiring	0.004 (0.008)			-0.110*** (0.007)		
Positive		0.493*** (0.010)			-0.476*** (0.011)	
Negative			-0.310*** (0.007)			0.028*** (0.007)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	17272	17272	17272	31163	31163	31163
Observations	34544	34544	34544	62326	62326	62326
R ²	0.602	0.699	0.662	0.643	0.657	0.640

Table 5. Do Entrepreneurs Learn over Time?

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table uses OLS to test whether entrepreneurs' expectation error decline over time within and across individuals. The dependent variable in columns (1) and (2) is the *Optimistic Error_T*, which equals one if the entrepreneur over-estimate her hiring or development expectations relative to the one-year ahead employment growth or sales growth realization threshold. The dependent variable in columns (3) and (4) is the *Pessimistic Error_T*, which equals one if the entrepreneur under-estimate her hiring or development expectations relative to the one-year ahead employment growth or sales growth realization threshold. The independent variables in columns (1) and (2) are the corresponding past *Optimistic Error_{T-1}*. The independent variables in columns (3) and (4) are the corresponding past *Pessimistic Error_{T-1}*. All models in panel A include individual fixed effects and year fixed effects, whereas all models in panel B include SIC-2 sector \times cohort-year fixed effects and human capital and start-up controls. The human capital controls include the dummy variables *Female*, *Age ≥ 40* , *College education*, *Expert* and *Serial* entrepreneurs. The start-up controls include the dummy variables *New firm*, *Incorporated*, and *High-growth oriented*. Clustered standard errors at the firm level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

Panel A: Errors within individuals

Type of Error:	Optimistic Errors _T		Pessimistic Errors _T	
Realization threshold:	$\Delta\text{Employment} \geq 1$	$\Delta\text{Sales} \geq 5\%$	$\Delta\text{Employment} \geq 1$	$\Delta\text{Sales} \geq 5\%$
	(1)	(2)	(3)	(4)
Optimistic Error Employment _{T-1}	-0.386*** (0.008)			
Optimistic Error Sales _{T-1}		-0.573*** (0.007)		
Pessimistic Error Employment _{T-1}			-0.355*** (0.005)	
Pessimistic Error Sales _{T-1}				-0.467*** (0.004)
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Cluster	13627	14421	27703	26705
Observations	27254	28842	55406	53410
R ²	0.685	0.682	0.734	0.624

Panel B: Errors across individuals

Type of Error:	Optimistic Errors _T		Pessimistic Errors _T	
Expectation threshold:	$\Delta\text{Employment} \geq 1$	$\Delta\text{Sales} \geq 5\%$	$\Delta\text{Employment} < 1$	$\Delta\text{Sales} < 5\%$
	(1)	(2)	(3)	(4)
Optimistic Error Employment _{T-1}	0.068*** (0.007)			
Optimistic Error Sales _{T-1}		0.033*** (0.007)		
Pessimistic Error Employment _{T-1}			0.226*** (0.017)	
Pessimistic Error Sales _{T-1}				-0.001 (0.007)
Sector \times Cohort FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Cluster	236	179	257	179
Observations	38249	40126	74709	55635
R ²	0.078	0.026	0.260	0.026

Table 6. Expectation Updates and Micro-Macro Signals

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table uses OLS to test whether entrepreneurs update their expectations due to recent corporate or economy-wide news. The dependent variable in columns (1) to (3) is the $Update\ Hiring_{T;T-1}$, which equals one when the entrepreneur changes her Hiring Expectation between two successive periods of the survey. The update is *Positive* if the entrepreneur changes her Hiring Expectation to "hire", while she did not plan to "hire" in the previous period. The update is *Negative* if the entrepreneur changes her Hiring Expectation to "not hire", while she planned to hire in the previous period. The dependent variable in columns (4) to (6) is the $Update\ Development_{T;T-1}$, which equals one when the entrepreneur changes her Development Expectation between two successive periods of the survey. The update is *Positive* if the entrepreneur changes her Development Expectation to "develop," while she did not plan to "develop" in the previous period. The update is *Negative* if the entrepreneur changes her Development Expectation to "not develop," while she planned to "develop" in the previous period. The independent variable in panel A is the firm's employment size growth between years t and $t - 1$. The independent variable in panel B the firm's sales growth between years t and $t - 1$. In panels C to D, the independent variables are the change in GDP, the change in the inflation rate, and the change in the unemployment rate between years t and $t - 1$, respectively. Models in panels A and B include individual fixed effects and year fixed effects. Models in panels C, D, and E include individual fixed effects only. Clustered standard errors at the firm level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

Panel A: Delta employment

Type of update: Sign of the update:	Update $Hiring_{T;T-1}$			Update $Development_{T;T-1}$		
	All (1)	Positive (2)	Negative (3)	All (4)	Positive (5)	Negative (6)
Δ Employment size $_{t-1,t}$	-0.004 (0.005)	0.003 (0.004)	-0.007 (0.006)	-0.000 (0.004)	-0.006*** (0.002)	0.006** (0.003)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21954	21954	21954	53386	53386	53386
R ²	0.568	0.447	0.400	0.542	0.704	0.634

Panel B: Delta sales

	Update $Hiring_{T;T-1}$			Update $Development_{T;T-1}$		
	All (1)	Positive (2)	Negative (3)	All (4)	Positive (5)	Negative (6)
Δ Sales $_{t-1,t}$	-0.007 (0.005)	0.005 (0.004)	-0.012** (0.005)	-0.012** (0.005)	-0.019*** (0.003)	0.008** (0.003)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	54246	54246	54246	111396	111396	111396
R ²	0.615	0.467	0.445	0.554	0.719	0.624

Expectation Updates and Micro-Macro Signals
(continued)

Panel C: Delta GDP

	Update Hiring _{T;T-1}			Update Development _{T;T-1}		
	All (1)	Positive (2)	Negative (3)	All (4)	Positive (5)	Negative (6)
$\Delta \text{GDP}_{t-1,t}$	-2.061*** (0.092)	0.301*** (0.062)	-2.362*** (0.097)	-2.116*** (0.095)	1.482*** (0.058)	-3.598*** (0.072)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No	No
Observations	71372	71372	71372	145512	145512	145512
R ²	0.603	0.466	0.423	0.547	0.720	0.598

Panel D: Delta inflation rate

	Update Hiring _{T;T-1}			Update Development _{T;T-1}		
	All (1)	Positive (2)	Negative (3)	All (4)	Positive (5)	Negative (6)
$\Delta \text{Inflation}_{t-1,t}$	-0.044*** (0.002)	0.006*** (0.001)	-0.050*** (0.002)	-0.047*** (0.002)	0.031*** (0.001)	-0.077*** (0.001)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No	No
Observations	71372	71372	71372	145512	145512	145512
R ²	0.604	0.466	0.425	0.548	0.720	0.602

Panel E: Delta unemployment rate

	Update Hiring _{T;T-1}			Update Development _{T;T-1}		
	All (1)	Positive (2)	Negative (3)	All (4)	Positive (5)	Negative (6)
$\Delta \text{Unemployment rate}_{t-1,t}$	0.041*** (0.002)	-0.007*** (0.002)	0.048*** (0.002)	0.031*** (0.002)	-0.024*** (0.001)	0.055*** (0.002)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No	No
Observations	71372	71372	71372	145512	145512	145512
R ²	0.601	0.465	0.420	0.545	0.719	0.591

Table 7. Expectation Errors and Micro Signals

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table uses OLS to test whether entrepreneurs over- or under-react to recent corporate news. The dependent variable in panel A is *Optimistic Error_T*, which equals one if the entrepreneur over-estimate her hiring or development expectations relative to the one-year ahead employment growth or sales growth realizations. The dependent variable in panel B is *Pessimistic Error_T*, which equals one if the entrepreneur under-estimate her hiring or development expectations relative to the one-year ahead employment growth or sales growth realizations. The independent variable in columns (1) to (3) are the firm's employment size growth between year t and $t - 1$. The independent variable in columns (2) to (4) are the firm's sales growth between year t and $t - 1$. All models include individual fixed effects and year fixed effects. Clustered standard errors at the firm level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

Panel A: Optimistic expectation errors

Type of error:	Optimistic Error _T			
Expectation threshold:	Employment growth _{$t,t+1$} ≥ 1		Sales growth _{$t,t+1$} $\geq 5\%$	
	(1)	(2)	(3)	(4)
Δ Employment size _{$t-1,t$}	0.033*** (0.005)		0.006 (0.004)	
Δ Sales _{$t-1,t$}		0.012*** (0.005)		0.016** (0.006)
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Cluster	9798	22304	17722	33876
Observations	19596	44608	35444	67752
R ²	0.590	0.604	0.563	0.564

Panel B: Pessimistic expectation errors

Type of error:	Pessimistic Error _T			
Expectation threshold:	Employment growth _{$t,t+1$} < 1		Sales growth _{$t,t+1$} $< 5\%$	
	(1)	(2)	(3)	(4)
Δ Employment size _{$t-1,t$}	-0.116*** (0.005)		0.008* (0.004)	
Δ Sales _{$t-1,t$}		-0.104*** (0.005)		0.015** (0.007)
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Cluster	11873	31530	17533	37830
Observations	23746	63060	35066	75660
R ²	0.581	0.616	0.530	0.509

Table 8. Real Effects of Learning from Errors

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table uses OLS to test whether the real effects on corporate performance entrepreneurs' expectation errors and updates of expectations. The dependent variable in column (1) is the firm's sales growth between years t and $t + 3$. The dependent variable in column (2) is the firm's employment size growth between years t and $t + 3$. The dependent variable in columns (3) and (4) is a dummy variable which equals to one if the firm survives at least five years after creation. The independent variables in columns (1) to (3) are the *Optimistic Error_T*, which equals one if the entrepreneur over-estimate her development expectations relative to the one-year ahead sales growth realization threshold, the *Update Development_{T;T-1}*, which equals one when the entrepreneur changes her Development Expectation between two successive periods of the survey, and the interaction of these two variables. The independent variables in columns (2) to (4) are the *Optimistic Error_T*, which equals one if the entrepreneur over-estimate her hiring expectations relative to the one-year ahead employment size growth realization threshold, the *Update Hiring_{T;T-1}*, which equals one when the entrepreneur changes her Hiring Expectation between two successive periods of the survey, and the interaction of these two variables. Models in columns (1) and (2) include individual fixed effects and year fixed effects. Models in columns (3) and (4) include SIC-2 sector \times cohort-year fixed effects, as well as Human capital and Start-up's controls. Clustered standard errors at the firm level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

	Δ Sales _{$t-1;t+3$} (1)	Δ Employment _{$t-1;t+3$} (2)	Survival _{$t+5$} (3)	Survival _{$t+5$} (4)
Error Sales growth _{$T-1$}	-0.075*** (0.012)		-0.012** (0.005)	
Update Development _{$T;T-1$}	-0.009 (0.013)		-0.029*** (0.006)	
Update Development _{$T;T-1$} \times Error Sales growth _{$T-1$}	0.086*** (0.022)		0.030*** (0.009)	
Error Employment growth _{$T-1$}		-0.105*** (0.022)		-0.015** (0.007)
Update Hiring _{$T;T-1$}		-0.026 (0.028)		-0.038*** (0.009)
Update Hiring _{$T;T-1$} \times Error Employment growth _{$T-1$}		0.113*** (0.041)		0.041*** (0.012)
Individual FE	Yes	Yes	No	No
Sector \times Cohort FE	No	No	Yes	Yes
Controls	No	No	Yes	Yes
Observations	40752	10390	44868	37653
R ²	0.632	0.657	0.033	0.033

Internal Appendix

Table A1. Who Has Positive and Negative Expectations About the Future?

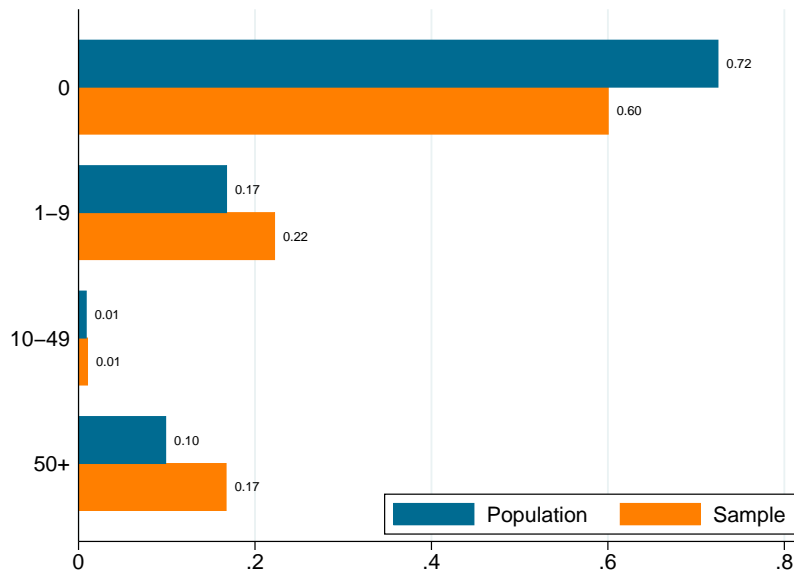
Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table investigates predictive power of entrepreneurs' and start-ups' characteristics on expectations about the future. Dependent variables come from two questions available in the survey. The first question is, "What do you plan to do over the next 6 months?", and the possible answers are as follows: (1) "To develop the company", (2) "To maintain the current balance", (3) "To recover from a difficult situation", (4) "To shut down the firm", (5) "To sell it", and (6) "I do not know". The second question is, "Do you plan to hire over the next 12 months?". Possible answers are "Yes", "No", "I don't know". Dependent variables are coded accordingly. Independent variables are the dummy variables *Female*, *Age* dummies, *College education*, *Expert* and *Serial* entrepreneurs, as well as the start-up's dummy variables *New firm*, *Incorporated*, and *High-growth oriented*. All models include SIC-2 sector \times cohort fixed effects and year fixed effects. Clustered standard errors at the sector-cohort level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

Dependent variable:	Expectations		Other Expectations			
	Hiring	Development	Stabilize	Recover	Shut down	Downsize
Development	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.034*** (0.003)	-0.012*** (0.004)	0.011*** (0.004)	-0.003 (0.002)	0.002 (0.002)	-0.000 (0.002)
25-34	0.002 (0.004)	0.008 (0.007)	0.004 (0.006)	0.000 (0.003)	-0.003 (0.002)	-0.004 (0.004)
35-44	-0.010** (0.005)	-0.000 (0.007)	0.006 (0.007)	-0.000 (0.004)	-0.002 (0.003)	-0.002 (0.004)
45-54	-0.030*** (0.005)	-0.024*** (0.007)	0.005 (0.007)	0.002 (0.004)	0.003 (0.003)	-0.004 (0.004)
55 or older	-0.061*** (0.006)	-0.104*** (0.009)	0.026*** (0.009)	-0.013*** (0.005)	0.024*** (0.003)	-0.002 (0.005)
French citizen	-0.039*** (0.010)	0.029*** (0.006)	0.023*** (0.007)	-0.002 (0.003)	0.001 (0.003)	-0.003 (0.003)
College education	0.021*** (0.004)	0.045*** (0.004)	-0.029*** (0.003)	-0.005** (0.002)	-0.001 (0.001)	0.004* (0.002)
Industry expert	0.016*** (0.003)	-0.026*** (0.004)	0.062*** (0.004)	-0.012*** (0.002)	-0.006*** (0.002)	-0.002 (0.002)
Serial entrepreneur	0.013*** (0.002)	0.000 (0.004)	-0.021*** (0.004)	0.008*** (0.002)	0.005*** (0.001)	0.002 (0.002)
New firm	0.007 (0.005)	0.103*** (0.005)	-0.103*** (0.005)	-0.006** (0.003)	-0.014*** (0.003)	-0.007** (0.003)
Incorporated	0.133*** (0.004)	0.058*** (0.004)	-0.025*** (0.004)	0.001 (0.002)	-0.003 (0.002)	0.016*** (0.002)
High-growth oriented	0.269*** (0.008)	0.153*** (0.006)	-0.094*** (0.007)	0.013*** (0.002)	-0.002 (0.001)	0.014*** (0.002)
Sector \times Cohort FE						
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	268	264	264	264	264	259
Observations	220793	183188	183185	183185	183188	66033
R ²	0.203	0.089	0.055	0.021	0.815	0.017

Figure A1. Distribution of firms

Source: Firm registry 2000–2018 and SINE surveys 2002, 2006, 2010, and 2014 cohorts. This figures plot the distributions of firms in the population of firms in France (Source: Firm registry 2000–2018, $N=6,971,794$) and in the regression sample (Source: SINE surveys 2002, 2006, 2010, and 2014 cohorts linked to the tax files, $N=158,249$). Figure (a) plots the distribution by employment size at creation. Figure (b) plots the distribution by SIC-1 industry.

(a) Distribution of firms by employment size



(b) Distribution of firms by industry

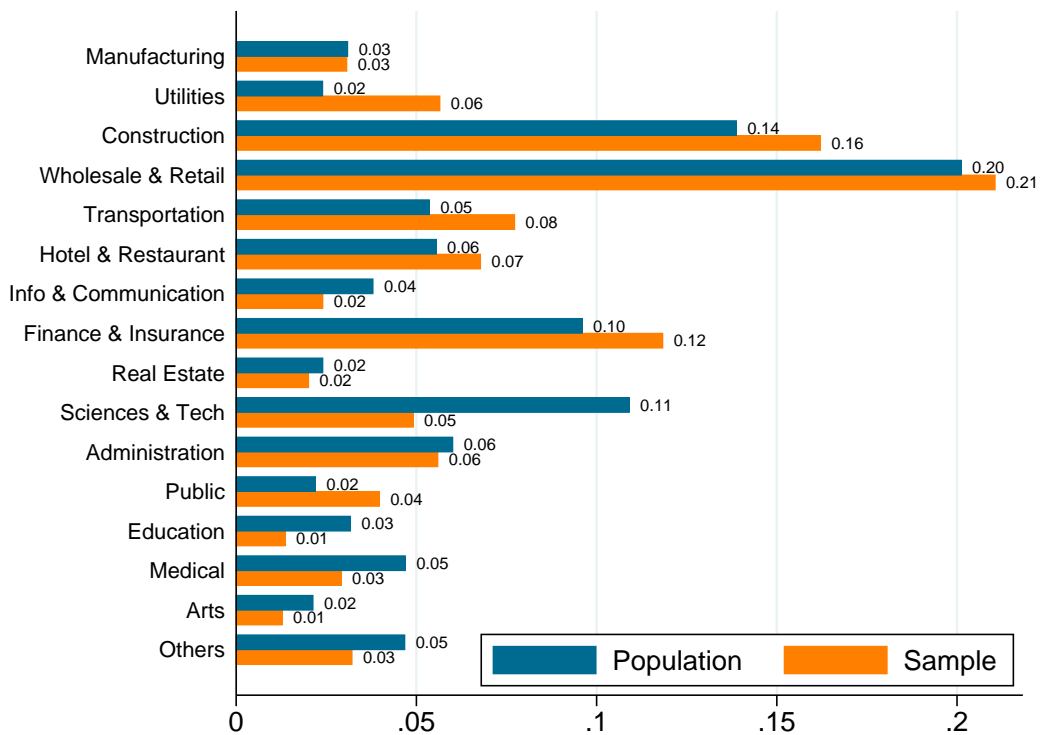


Table A2. Who Does Not Have any Idea about the Future?

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table investigates predictive power of entrepreneur’s and start-up’s characteristics on uncertainty about the future. The dependent variables come from two questions available in the survey. The first question is, “What do you plan to do over the next 6 months?”, and the possible answers are as follows: (1) “To develop the company”, (2) “To maintain the current balance”, (3) “To recover from a difficult situation”, (4) “To shut down the firm”, (5) “To sell it”, and (6) “I do not know”. The second question is, “Do you plan to hire over the next 12 months?”. Possible answers are “Yes”, “No”, “I don’t know”. Dependent variables are coded accordingly. They equal to one if the entrepreneur answer “I don’t know” to the question, and zero otherwise. Independent variables are the dummy variables *Female*, *Age* dummies, *College education*, *Expert* and *Serial* entrepreneurs, as well as the start-up’s dummy variables *New firm*, *Incorporated*, and *High-growth oriented*. All models include SIC-2 sector \times cohort fixed effects and year fixed effects. Clustered standard errors at the sector-cohort level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

Dependent variable:	Uncertainty	
	Hiring (1)	Development (2)
Female	-0.010*** (0.003)	0.003 (0.002)
25-34	-0.004 (0.004)	-0.007 (0.004)
35-44	-0.014*** (0.004)	-0.003 (0.004)
45-54	-0.034*** (0.004)	0.005 (0.004)
55 or older	-0.057*** (0.004)	0.032*** (0.005)
French citizen	-0.031*** (0.004)	-0.047*** (0.004)
College education	-0.027*** (0.002)	-0.025*** (0.002)
Industry expert	0.014*** (0.002)	-0.017*** (0.002)
Serial entrepreneur	-0.012*** (0.002)	0.001 (0.002)
New firm	-0.008* (0.004)	0.017*** (0.003)
Incorporated	0.044*** (0.004)	-0.030*** (0.003)
High-growth oriented	0.046*** (0.005)	-0.033*** (0.002)
Sector \times Cohort FE		
Year FE	Yes	Yes
Cluster	269	264
Observations	290910	183185
R ²	0.041	0.023

Table A3. Who Makes Expectation Errors?

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table investigates predictive power of entrepreneur's and start-up's characteristics on the likelihood of making expectation errors. The dependent variable in columns (1) and (2) is *Optimistic Error_T*, which equals one if the entrepreneur over-estimate her hiring or development expectations relative to the one-year ahead employment growth or sales growth realizations. The dependent variable in columns (3) and (4) is *Pessimistic Error_T*, which equals one if the entrepreneur under-estimate her hiring or development expectations relative to the one-year ahead employment growth or sales growth realizations. Individual predictors are the dummy variables *Female*, *Age* dummies, *College education*, *Expert* and *Serial* entrepreneurs, as well as the start-up's dummy variables *New firm*, *Incorporated*, and *High-growth oriented*. All models include SIC-2 sector \times cohort fixed effects and year fixed effects. Clustered standard errors at the sector-cohort level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

Type of Error: Expectation threshold:	Optimistic Errors _T		Pessimistic Errors _T	
	$\Delta\text{Employment} \geq 1$ (1)	$\Delta\text{Sales} \geq 5\%$ (2)	$\Delta\text{Employment} < 1$ (3)	$\Delta\text{Sales} < 5\%$ (4)
Female	-0.019*** (0.002)	0.001 (0.003)	0.013** (0.006)	-0.005* (0.003)
25-34	0.008* (0.004)	-0.011* (0.006)	-0.024*** (0.005)	-0.017*** (0.006)
35-44	0.003 (0.005)	-0.013** (0.006)	-0.028*** (0.007)	-0.019*** (0.006)
45-54	-0.008* (0.005)	-0.017** (0.007)	-0.020** (0.008)	-0.017** (0.007)
55 or older	-0.028*** (0.007)	-0.052*** (0.008)	0.009 (0.009)	-0.009 (0.007)
College education	0.006* (0.003)	0.012*** (0.003)	-0.028*** (0.005)	-0.021*** (0.003)
Industry expert	0.008*** (0.002)	-0.015*** (0.003)	-0.038*** (0.004)	0.017*** (0.003)
Serial entrepreneur	0.007*** (0.003)	0.009*** (0.003)	0.011*** (0.004)	-0.009*** (0.003)
New firm	-0.003 (0.004)	0.037*** (0.003)	0.098*** (0.016)	-0.029*** (0.004)
Incorporated	0.066*** (0.004)	0.019*** (0.003)	-0.140*** (0.011)	-0.035*** (0.004)
High-growth oriented	0.117*** (0.004)	0.047*** (0.004)	-0.122*** (0.005)	-0.078*** (0.004)
Sector \times Cohort FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Cluster	266	259	266	262
Observations	128759	125371	200358	156445
R ²	0.079	0.023	0.153	0.059

Table A4. Who Updates their Beliefs?

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table investigates predictive power of entrepreneur's and start-up's characteristics on the likelihood of updating expectations. The dependent variable in columns (1) and (3) is $Update\ Hiring_{T;T-1}$, which equals one when the entrepreneur changes her Hiring Expectation between two successive periods of the survey. The dependent variable in columns (2) and (4) is the $Update\ Development_{T;T-1}$, which equals one when the entrepreneur changes her Development Expectation between two successive periods of the survey. Individual predictors are the dummy variables *Female*, *Age* dummies, *College education*, *Expert* and *Serial* entrepreneurs, as well as the start-up's dummy variables *New firm*, *Incorporated*, and *High-growth oriented*. All models include SIC-2 sector \times cohort fixed effects and year fixed effects. Clustered standard errors at the sector-cohort level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

Type of update:	Hiring $_{T;T-1}$ (1)	Development $_{T;T-1}$ (2)	Hiring $_{T;T-1}$ (3)	Development $_{T;T-1}$ (4)
Female	-0.018*** (0.005)	0.006 (0.005)	-0.018*** (0.004)	-0.004 (0.005)
25-34	-0.028*** (0.010)	-0.006 (0.009)	-0.012 (0.007)	-0.014 (0.009)
35-44	-0.038*** (0.010)	-0.010 (0.009)	-0.026*** (0.008)	-0.027*** (0.008)
45-54	-0.058*** (0.011)	-0.021** (0.010)	-0.043*** (0.008)	-0.048*** (0.008)
55 or older	-0.081*** (0.013)	-0.046*** (0.011)	-0.062*** (0.010)	-0.089*** (0.009)
French citizen	-0.041*** (0.008)	-0.002 (0.007)	-0.031*** (0.007)	-0.006 (0.006)
College education	-0.014*** (0.005)	-0.013*** (0.004)	0.004 (0.004)	0.009** (0.004)
Industry expert	-0.000 (0.004)	0.003 (0.004)	0.005 (0.003)	-0.012*** (0.003)
Serial entrepreneur	0.021*** (0.004)	-0.007 (0.005)	0.015*** (0.003)	-0.000 (0.004)
New firm	0.027*** (0.009)	0.030*** (0.007)	0.019** (0.008)	0.048*** (0.006)
Incorporated	0.056*** (0.005)	0.012 (0.007)	0.084*** (0.004)	0.041*** (0.006)
High-growth oriented	0.128*** (0.005)	0.023*** (0.005)	0.149*** (0.006)	0.049*** (0.005)
L.Optimism Employment	0.391*** (0.017)			
L.Optimism Sales		0.248*** (0.015)		
L.Pessimism Employment			-0.093*** (0.005)	
L.Pessimism Sales				-0.143*** (0.010)
Sector \times Cohort FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Cluster	252	250	257	255
Observations	60207	70904	78418	93184
R ²	0.216	0.068	0.113	0.055

Table A5. Which Start-ups Survive 5 Years?

Source: SINE survey and tax files. *Sample:* New firms founded in 1998, 2002, 2006, 2010, and 2014. This table investigates predictive power of entrepreneur's and start-up's characteristics on the likelihood that the firm survives at least five years. The dependent variable is a dummy variable which equals one if the start-up survives five years or longer, and zero if it fails before. Individual predictors are the dummy variables *Female*, *Age* dummies, *College education*, *Expert* and *Serial* entrepreneurs, as well as the start-up's dummy variables *New firm*, *Incorporated*, and *High-growth oriented*. In column (2), I add the motivation dummy variables. All models include SIC-2 sector \times cohort fixed effects and year fixed effects. Clustered standard errors at the sector-cohort level are reported in parentheses. *, **, and *** indicate significantly different from zero at the 10, 5, and 1% levels, respectively.

	Survival _{t+5}	
	(1)	(2)
Female	-0.034*** (0.008)	-0.026*** (0.008)
25-34	0.072*** (0.010)	0.052*** (0.010)
35-44	0.096*** (0.012)	0.075*** (0.012)
45-54	0.096*** (0.011)	0.086*** (0.013)
55 or older	0.016 (0.012)	0.011 (0.013)
French citizen	0.067*** (0.019)	0.064** (0.025)
College education	0.018** (0.007)	0.009 (0.007)
Industry expert	0.055*** (0.006)	0.047*** (0.007)
Serial entrepreneur	-0.036*** (0.007)	-0.020*** (0.007)
New firm	-0.106*** (0.012)	-0.116*** (0.014)
Incorporated	0.146*** (0.013)	0.159*** (0.016)
High-growth oriented	-0.011 (0.008)	-0.003 (0.008)
Independence		0.018*** (0.004)
Add earnings		0.003 (0.004)
Opportunity		0.019*** (0.006)
New idea		-0.008 (0.007)
Example relatives		0.029*** (0.007)
Sector \times Cohort FE		
Year FE	Yes	Yes
Cluster	190	145
Observations	98141	67824
R ²	0.064	0.069

Variable Descriptions

Variable	Description
<u>Expectations (Source: SINE):</u>	
Development expectations items stem from the question “What do you plan to do over the next 6 months?”:	
Development Expectation	Dummy variable that equals one when the entrepreneur answers “Develop the company” and zero otherwise.
Stabilize	Dummy variable that equals one when the entrepreneur answers “Maintain the current situation” and zero otherwise.
Recover	Dummy variable that equals one when the entrepreneur answers “Recover from a difficult situation” and zero otherwise.
Shut down	Dummy variable that equals one when the entrepreneur answers “Shut down the company” and zero otherwise.
Sell	Dummy variable that equals one when the entrepreneur answers “Sell the company” and zero otherwise.
Development Uncertainty	Dummy variable that equals one when the entrepreneur answers “I don’t know” and zero otherwise.
Hiring forecasts items stem from the question “Do you plan to hire over the next 12 months?”:	
Hiring Forecast	Dummy variable that equals one when the entrepreneur answers “Yes” and zero otherwise.
Hiring Uncertainty	Dummy variable that equals one when the entrepreneur answers “I don’t know” to the question “Do you plan to hire over the next 12 months?” and zero otherwise.
<u>Expectation Updates (Source: SINE):</u>	
Update Development	Dummy variable that equals one when the entrepreneur changes her <i>Development Expectation</i> between two successive periods of the survey and zero otherwise. The variable is computed between periods 1 and 3 and 3 and 5.
Positive	Dummy variable that equals one if the entrepreneur changes her <i>Development Expectation</i> to “Develop the company” when the entrepreneur provided another answer in the period before and zero if she does not change her growth expectations.
Negative	Dummy variable that equals one if the entrepreneur changes her <i>Development Expectation</i> to any other expectation item when the entrepreneur answered “Develop the company” in the period before and zero if she does not change her growth expectations.
Revision Hiring	Dummy variable that equals one when the entrepreneur changes her <i>Hiring Expectation</i> between two successive periods of the survey and zero otherwise. The variable is computed between periods 1 and 3 and 3 and 5.
Positive	Dummy variable that equals one if the entrepreneur changes her <i>Hiring Expectation</i> to “hire” when the entrepreneur answered “no” in the period before and zero if she does not change her growth expectations.
Negative	Dummy variable that equals one if the entrepreneur changes her <i>Hiring Expectation</i> to “no” when the entrepreneur answered “hire” in the period before and zero if she does not change her growth expectations.
<u>Expectation Errors (Sources: SINE, DADS):</u>	
Optimistic Development Error	Dummy variable that corresponds to the difference between the variable <i>Development Expectation</i> and its subsequent realizations. Realization is a dummy variable that equals one if the firm sales <i>do not</i> reach a higher sales bucket in the following year, while the entrepreneur expects to “Develop the company”, and zero otherwise. The variable equals zero if Realization = Expectation.
Pessimistic Development Error	Dummy variable that corresponds to the difference between the variable <i>Development Expectation</i> and its subsequent realizations. Realization is a dummy variable that equals one if the firm sales <i>does</i> reach a higher sales bucket in the following year, while the entrepreneur <i>does not</i> expect to “Develop the company”, and zero otherwise. The variable equals zero if Realization = Expectation.
Optimistic Hiring Error	Dummy variable that corresponds to the difference between <i>Hiring Expectation</i> and subsequent realizations. Realization is a dummy variable that equals one if the firm employment size does not increase by at least 1 employee (or 2 depending on the threshold) in the following year, while the entrepreneur expects to “hire”, and zero otherwise. The variable equals zero if Realization = Expectation.

Continued on next page

Variable	Description
Pessimistic Hiring Error	Dummy variable that corresponds to the difference between <i>Hiring Expectation</i> and subsequent realizations. Realization is a dummy variable that equals one if the firm employment size <i>increases</i> by at least 1 employee (or 2 depending on the threshold) in the following year, while the entrepreneur <i>does not</i> expect to “hire”, and zero otherwise. The variable equals zero if Realization = Expectation.
Entrepreneurs’ Characteristics (Source: SINE)	
Female	Dummy variable that equals one if the start-up is led by a female entrepreneur and zero if it is led by a male entrepreneur.
Age	Dummy variables that equals one if the entrepreneur is one of the following age categories at creation: 24 or younger, 25-34, 35-44, 45-54, 55 or older.
French	Dummy variable that equals one if the entrepreneur is a French citizen and zero otherwise.
Bachelor’s	Dummy variable that equals one if the entrepreneur’s highest diploma is a three-year bachelor’s degree (License) and zero otherwise.
Master’s/PhD	Dummy variable that equals one if the entrepreneur has at least a five-year master’s degree, including engineering, JD, MD, and PhD degrees (Master, Grande école, Doctorat), and zero otherwise.
Expert	Dummy variable that equals one if the entrepreneur has at least three years of prior work experience in the sector in which the start-up is incorporated and zero otherwise.
Serial	Dummy variable that equals one if the entrepreneur has already founded a start-up and zero otherwise.
Start-up	Dummy variable that equals one if the entrepreneur starts a new company and zero if she purchases, inherits or leases an already existing company.
High-growth oriented	Dummy variable that stems from the question, “What is your main objective?” and equals one if the entrepreneur answers, “to develop the company” but zero if she answers, “mainly to create my own job”.
Motivation items stem from the question, “What are your three main motivations? ”:	
New idea	Dummy variable that equals one if the entrepreneur ticks the box, “a new idea for a product, service, or market” and zero otherwise.
Taste	Dummy variable that equals one if the entrepreneur ticks the box, “taste for entrepreneurship or new challenges” and zero otherwise.
Opportunity	Dummy variable that equals one if the entrepreneur ticks the box, “an opportunity to create a start-up” and zero otherwise.
Independence	Dummy variable that equals one if the entrepreneur ticks the box, “desire to be independent” and zero otherwise.
Founding Team:	
Alone	Dummy variable that equals one if the entrepreneur indicates having started the company on her own and zero otherwise.
Spouse	Dummy variable that equals one if the entrepreneur indicates having started the company with her spouse and zero otherwise.
Siblings	Dummy variable that equals one if the entrepreneur indicates having started the company with a sibling, a relative or a friend and zero otherwise.
Associates	Dummy variable that equals one if the entrepreneur indicates having started the company with a professional partner or an associate and zero otherwise.
Micro and Macro Signals (Source: DADS, Tax files, Insee.fr)	
Δ Employment size $_{t,t-1}$	Change in the firm’s employment size between years t and t-1.
Δ Sales $_{t,t-1}$	Change in the firm’s sales bucket between years t and t-1.
Δ GDP $_{t,t-1}$	Change in the French GDP between years t and t-1.
Δ Inflation $_{t,t-1}$	Change in the French inflation rate between years t and t-1.
Δ Business climate $_{t,t-1}$	Change in the French business climate index between years t and t-1.
Δ Unemployment $_{t,t-1}$	Change in the French unemployment rate between years t and t-1.