ERC
Enterprise Research Centre

RESEARCH PAPER

DEMAND- AND SUPPLY-SIDE FINANCING ISSUES ('FRICTIONS'), GROWTH EXPECTATIONS AND INVESTMENT PLANS: EVIDENCE FROM UK SMALL AND MEDIUM-SIZED ENTERPRISES (SMES)

October 26th 2026

UKRI Economic and Social Research Council

wbs WARWICK BUSINESS SCHOOL THE UNIVERSITY OF WARWICK

About the Enterprise Research Centre

The Enterprise Research Centre (ERC) is an independent research centre based at Warwick Business School focusing on growth, innovation and productivity in small and medium-sized enterprises. The Centre is funded by the Economic and Social Research Council, Department for Business, Innovation, Science and Trade, Innovate UK, the British Business Bank and the Intellectual Property Office.

ERC research informs policy and practice relating to business start-up, growth, innovation, productivity and access to finance.

Further information is available at: www.enterpriseresearch.ac.uk.

Disclaimer

The views expressed in this report are those of the authors and do not necessarily represent those of the funders. Whilst every effort has been made to ensure the accuracy of the information contained in this publication, neither ERC nor any of its partners accept any responsibility for errors or omissions.

.

Suggested Citation

Frasier, S., and Nguyen, T. 2026. *Demand- and supply-side financing issues ('frictions'), growth expectations and investment plans: Evidence from UK small and medium-sized enterprises (SMEs).* ERC Research Report. Enterprise Research Centre, Warwick Business School. Available at: www.enterpriseresearch.ac.uk

Authors	Stuart Fraser, Thao Nguyen
Published	October 2026
ERC Research Paper No	124

Contents

About the Enterprise Research Centre 2
Disclaimer 2
Suggested Citation 2
Executive Summary 6
1. Introduction 8
2. Business-investment decisions 14
3. Model of growth-expectations formation 18
The primary data on forward-looking growth expectations in our analysis are dichotomous: $\boldsymbol{g = 1}$ if the firm believes (ex-ante) it will grow in the year ahead and zero otherwise. In this context, firms' prior beliefs of growth expectations are assumed to follow a beta distribution, $\boldsymbol{Beta\alpha, \beta}$ (see e.g., Fraser and Nguyen, 2025). Over time, firms receive information about actual growth, $\boldsymbol{X}$, which is a Bernoulli distributed random variable. In particular, $\boldsymbol{X}$ can take only two values $\boldsymbol{x \in 0, 1}$ with $\boldsymbol{x = 1}$ if the firm grows and zero otherwise. Firms use information on actual growth to revise growth expectations as shown below. 18
Under rational Bayesian learning, for a firm aged $\boldsymbol{n}$ (with $\boldsymbol{n}$ data points on $\boldsymbol{x}$), the expected value of $\boldsymbol{g}$ is 18
$\boldsymbol{Eng = \alpha + yn\alpha + \beta + n}$, ... 18
where $\boldsymbol{yn = i = 1nxi}$ is the total number of actual growth events up to $\boldsymbol{n}$ (see e.g., Fraser and Nguyen, 2025). Under rational learning, the change in growth expectations is therefore 18
$\boldsymbol{Eng - En - 1g = \alpha + yn\alpha + \beta + n - \alpha + yn - 1\alpha + \beta + n - 1}$ 18
$\boldsymbol{= 1\alpha + \beta + nxn - En - 1g,}$ $\boldsymbol{(1)}$ 18
where $\boldsymbol{xn - En - 1g}$ is the growth surprise. The effect of a growth surprise on the change in growth expectations – the 'learning gain' – therefore diminishes with experience, $\boldsymbol{n}$, as the firm learns its true growth probability. 18
Under confirmation bias, entrepreneurs revise growth expectations on receiving information that confirms their prior beliefs ('confirming information') while ignoring information that disconfirms prior beliefs ('disconfirming information'). Prior studies indicate confirmation bias is stronger for individuals with optimistic beliefs such as entrepreneurs (Carr and Blettner 2010; Hmieleski and Baron, 2009; Shepherd, Williams and Patzelt, 2015; see also discussion of entrepreneurial overoptimism in section 2). This suggests: (i) entrepreneurs are likely to be affected by confirmation bias; and (ii) entrepreneurs are likely to consider growth events ($\boldsymbol{x = 1}$) as confirming information and no-growth events ($\boldsymbol{x = 0}$) as disconfirming information. 18
If entrepreneurs, prone to confirmation bias, revise beliefs only when $\boldsymbol{x = 1}$, while ignoring no-growth events, then the posterior density for growth expectations is 18
$\boldsymbol{fgx1, \ldots, xn \propto hx1, \ldots, xngfg = gyngα - 11 - gβ - 1}$ 18
$\boldsymbol{= gyn + \alpha - 11 - g\beta - 1,}$ 18
where $\boldsymbol{hx1, \ldots, xng}$ is the (binomial) likelihood of $\boldsymbol{g}$ in a situation where firms ignore no-growth events (which is proportional to $\boldsymbol{gyn}$). It follows that, under confirmation bias, the

posterior distribution is $\boldsymbol{Beta\alpha + yn, \beta}$ and hence, in the presence of no-growth events $\boldsymbol{yn < n}$,..... 19

$\boldsymbol{Eng = \alpha + yn\alpha + \beta + yn > \alpha + yn\alpha + \beta + n}$ 19

This result means, if $\boldsymbol{x = 1}$ is confirming information, firms overestimate growth expectations (i.e., the probability of growth) under confirmation bias. Now, if $\boldsymbol{xn = 1}$, $\boldsymbol{Eng - En - 1g = \alpha + yn\alpha + \beta + yn - \alpha + yn - 1\alpha + \beta + yn - 1}$ 19

$\boldsymbol{= 1\alpha + \beta + ynxn - En - 1g, \quad xn = 1.}$ $\boldsymbol{(2)}$ 19

Hence, on receiving confirming information firms revise growth expectations (upwards) similar to the revision under rational learning (see $\boldsymbol{(1)}$). The key difference under confirmation bias is that, in the presence of no-growth events $\boldsymbol{yn < n}$, the learning gain, $\boldsymbol{1/\alpha + \beta + yn}$, exceeds the learning gain under rational learning, $\boldsymbol{1/\alpha + \beta + n}$. 19

Conversely, if the firm receives disconfirming information then $\boldsymbol{Eng - En - 1g = 0}$. This follows as, if firms ignore a disconfirming event, $\boldsymbol{xn = 0}$, then $\boldsymbol{fgx1, \dots, xn = 0 = fgx1, \dots, xn - 1}$ meaning the posterior density is unchanged by the latest growth information. Hence, the learning gain from disconfirming events, which is zero, is less than the learning gain under rational learning. 19

Accordingly, there are two key predictions from the model of growth learning under confirmation bias with overoptimistic beliefs: 19

1. The learning gain (growth-surprise effect) under confirmation bias is asymmetric. In particular, firms revise growth expectations upwards on receiving confirming information but do not revise growth expectations downwards on receiving disconfirming inforation. By contrast, under rational learning, the learning gain is symmetric for positive and negative growth surprises (see $\boldsymbol{(1)}$). 19

2. Confirmation bias begets anchoring bias. This is a consequence of the asymmetric (zero) learning gain from disconfirming information. 19

Using the above results, we can derive an estimable equation for growth expectations under confirmation bias. First, combining $\boldsymbol{(2)}$ with $\boldsymbol{Eng - En - 1g = 0}$ if $\boldsymbol{xn = 0}$, write ... 20

$\boldsymbol{Eng - En - 1g = \gamma xn - En - 1g + 1\alpha + \beta + yn1xn - En - 1g > 0xn - En - 1g,}$ $\boldsymbol{(3)}$ 20

where $\boldsymbol{\gamma = 0}$ and $\boldsymbol{1xn - En - 1g > 0}$ is an indicator variable equal to one for positive growth surprises and zero otherwise. Note that $\boldsymbol{1xn - En - 1g > 0xn - En - 1g = 1xn - En - 1g > 0}$ with binary variables for $\boldsymbol{xn}$ and $\boldsymbol{En - 1g}$ (although we retain the expanded expression as it applies more generally with non-binary variables). 20

Next, write $\boldsymbol{(3)}$ as..... 20

$\boldsymbol{g = En - 1g + \gamma xn - En - 1g + 1\alpha + \beta + yn1xn - En - 1g > 0xn - En - 1g - \varepsilon \coloneqq \Omega - \varepsilon,}$ 20

where $\boldsymbol{\varepsilon}$ is a stochastic error term with $\boldsymbol{En\varepsilon = 0}$ and (non-normal) cumulative distribution function (CDF), $\boldsymbol{F\varepsilon}$. Hence, $\boldsymbol{Probg = 1 = Prob\Omega - \varepsilon > 0 = Prob\varepsilon < \Omega}$. To help estimate this probability, we transform $\boldsymbol{\varepsilon}$ to a standard normal random variable using the transformation $\boldsymbol{J\varepsilon = \Phi - 1F\varepsilon \sim N0, 1,}$ where $\boldsymbol{\Phi - 1}$. is the inverse of the standard normal CDF and $\boldsymbol{J}$. is a monotonically increasing function (see Fraser and Nguyen, 2025). Accordingly, $\boldsymbol{Probg = 1 = ProbJ\varepsilon < J\Omega = \Phi J\Omega}$ which gives the probability that the entrepreneur expects growth in terms of a standard normal probability. 20

The above results imply latent growth expectations, $\boldsymbol{g *}$, may be written as the following equation, ... 20

$\boldsymbol{g *= J\Omega + v,}$ $\boldsymbol{(4)}$ 20

where $\boldsymbol{Probg = 1 = Probg *> 0}$ and $\boldsymbol{v \sim N0, 1}$. Contained in $\boldsymbol{\Omega}$, $\boldsymbol{En - 1g}$ is proxied by the observed (dichotomous) growth expectation in the previous period. The growth surprise,

$xn - En - 1g$, is proxied by the difference between actual growth in the current period (xn equal to zero or one) and the growth expectation in the previous period (equal to zero or one). 20

Equation (4) provides an estimable form for growth expectations which allows testing of rational Bayesian learning versus confirmation bias. The effects of previous growth expectations and growth surprises, obtained by estimating (4), are identified up to a positive (firm-varying) constant $J\Omega := dJ/d\Omega$ i.e., the transformation to normality affects the magnitude but not the sign of the effects. Under confirmation bias (with overoptimistic beliefs), the coefficient on $xn - En - 1g$, which is the learning gain for negative growth surprises, is zero while the coefficient on $1xn - En - 1g > 0xn - En - 1g$, which is the learning gain for positive growth surprises, is positive. Conversely, under rational learning, the coefficient on $xn - En - 1g$ is positive and equal to the (rational) learning gain, while the coefficient on $1xn - En - 1g > 0xn - En - 1g$ is zero as the learning gain is symmetric for positive and negative growth surprises. 20

We extend equation (4) by considering the effects of funding states $Z = NN, DB, RB, RA$ on growth expectations and controlling for firm characteristics, X, (which also includes a constant) in the following equation 21

$g *= J\Omega + Z\delta + X\theta + v.$ (5) 21

The effects of funding states, δ, are measured relative to the omitted FF state in which the firm applies for and receives external funding. 21

The effects of funding states on growth expectations reflect unobserved heterogeneity (motivation/ambition) and/or scarring effects of negative funding experiences. In particular, scarring effects in this context occur where negative funding experiences (such as rejection and discouragement) have an adverse effect on confidence resulting in lower growth expectations (see Fraser and Nguyen, 2025; Cowling and Sclip, 2023 for the effects of negative funding experiences on subsequent borrowing decisions). Among NN firms, lower growth ambition would lead to lower growth expectations. 21

4. Methodology 22

5. Data 23

6. Results 24

6.1. Impacts of growth expectation and funding states on investment plans 30

6.2. Impacts of learning, cognitive bias and funding states on growth expectation 35

6.3. The total impacts of funding states, growth expectation, and learning on investment plans 35

6.4. Heterogeneity across firm characteristics 40

7. Conclusion 42

References 44

Appendix 52

Executive Summary

UK business investment has been low for decades relative to other G7 economies. Low investment in fixed capital, skills and innovation matter as they lead to reduced labour productivity growth and lower living standards. Among factors blamed for low investment by SMEs, issues with finance supply (e.g., cost of borrowing) and finance demand (e.g., risk/control/debt aversion) as well as low-growth ambition and expectations have received considerable attention from policymakers. In this context, we examine how SME investment plans are driven by the growth ambition and growth expectations of their owners ('entrepreneurs') and a lack of financial resources.

Firstly, we study how entrepreneurs form growth expectations and how this impacts investment plans. We consider six types of investment plan, encompassing plans for fixed capital, R&D, (product and process) innovation and (leadership and workforce) skills investment. While we anticipate investment-plan likelihoods are increasing in growth expectations (and decreasing in uncertainty about growth), cognitive bias (such as confirmation bias) may cause entrepreneurs to systematically underestimate or overestimate actual growth causing too little or too much investment relative to rational growth expectations. This is important in view of prior studies showing cognitive bias among entrepreneurs in general but a lack of specific evidence regarding the rationality of entrepreneurial investment plans.

To frame the analysis of growth expectations, we present a model of how entrepreneurs learn about growth under rationality and show how cognitive bias affects learning. Under rational Bayesian learning, an entrepreneur's revision of growth expectations depends on new information about growth contained in the 'growth surprise' (i.e., the difference between their actual growth and prior growth expectations) and responds symmetrically to positive and negative growth surprises. However, confirmation bias causes an asymmetric response to positive and negative growth surprises, resulting in biased growth expectations. This bias (if present), which could involve either positivity or negativity bias, leads to suboptimal investment planning involving overinvestment or underinvestment respectively.

Secondly, we test the direct effects of demand and supply-side financing issues ('frictions') on investment plans holding growth expectations constant and indirect effects through growth expectations. Holding growth expectations constant, discouraged and rejected borrowers may experience higher investment costs (due to higher supply-side information costs) directly lowering their likelihood of investment plans relative to otherwise similar 'fully funded' firms which applied for external finance and received the full amount requested. Similarly, controlling for growth expectations, firms with no external-finance needs are less likely to have investment plans (relative to 'fully funded' firms) if their lack of need is a result of experiencing higher investment costs due to owners' debt/control aversion. (By contrast, if the lack of need is because these firms are able to self-finance optimally as opposed to debt/control aversion then, other things equal, they would not be less likely to have investment plans.) In addition, scarring funding experiences among rejected and discouraged borrowers and lower growth ambition among firms with no external-finance needs may have a negative effect on growth expectations and thus reduce investment-plan propensities indirectly via growth expectations.

We use the UK Longitudinal Small Business Survey (LSBS) 2015-2023 to address the following research questions: (i) what are the effects of entrepreneurs' growth expectations on investment plans (including: are growth expectations rational?)?; and (ii) what are the direct and indirect effects of financing issues on investment plans?

Regarding (i), we find firms that expect to grow are 18.2, 12.2, 21.1, 20.3, 11.9 and 16.3 percentage points more likely to have capital, R&D, product-innovation, process-innovation, leadership-skills, and workforce-skills investment plans respectively than otherwise similar firms which do not expect to grow. These are economically (and statistically) significant increases compared to firms that do not expect to grow, which have probabilities of 19.5, 13.3, 21.3, 19.5, 15.4 and 32.9 percent for the respective investment plans. In terms of rationality,

growth expectations (and investment plans) symmetrically adjust downwards following a negative growth surprise and upwards following a positive surprise consistent with rational growth expectations.

Regarding (ii), controlling for growth expectations and firm/industry effects, states of financial rejection and discouragement directly reduce the likelihood of some types of capital-, innovation- and skills-investment plans (consistent with higher information costs). For discouraged borrowers, relative to 'fully funded' firms, the direct reductions in the likelihood of investment plans in fixed capital and leadership development are 8.8 and 8.1 percentage points respectively. For rejected borrowers, the direct reductions for capital investment and workforce-skills development are 9.8 and 23.7 percentage points, respectively. However, a state of no-external finance needs directly and indirectly reduces the likelihood of a wider range of capital-, innovation- and skills-investment plans suggesting demand-side issues (debt/control aversion and low-growth ambition) are more pervasive. The total (direct and indirect) reductions in the likelihood of investment plans for firms with no external-finance needs relative to otherwise similar 'fully funded' firms are 18.2, 16.8, 23.6, 14.6, and 14.9 percentage points for capital, product-innovation, process-innovation, leadership-skills and workforce-skills investment plans respectively. These are economically (and statistically) significant reductions relative to the investment-plan probabilities of 'fully funded' firms, which are 35.4 percent (capital), 36.7 percent (product-innovation), 38.5 percent (process-innovation), 27.9 percent (leadership skills) and 45.9 percent (workforce skills) respectively. Risk aversion results in a 9.8 percentage point reduction in the likelihood of R&D investment plans (against an R&D probability for 'fully funded' firms of 15.1 percent) and a 9.3 percentage point reduction in the probability of process-innovation development plans.

Our findings suggest addressing low-growth expectations is important in view of the significant negative impact on investment plans in general but especially on (productivity-enhancing) innovation activities. However, reflecting rational growth expectations, firms require positive signs of actual growth before revising upwards their growth expectations (and increasing the likelihood of investment plans).

Evidence of supply-side financing issues affecting some types of investment plan among discouraged and rejected borrowers provides support for policies aimed at improving the supply of finance in small-business finance markets. However, the predominant issues across all types of investment plan are on the demand side among firms with no external-finance needs (affecting investment plans both directly and indirectly). Moreover, innovation-investment plans are the most severely affected by demand-side financing issues (debt/control aversion and low-growth ambition). Addressing low-growth ambition among firms with no external-finance needs would help raise growth expectations, reduce debt/control aversion and increase investment propensity.

Additional findings indicate the negative direct effects of financial discouragement and rejection on investment plans (holding growth expectations constant) are greater (in magnitude) for women-led businesses, supporting policies aimed specifically at improving female entrepreneurs' access to finance. Our results also suggest growth expectations among ethnic-minority led businesses are scarred by negative financing experiences (i.e., discouragement and rejection), with an absence of similar scarring effects among businesses with White-British owners, supporting initiatives to increase lending by Community Development Finance Institutions. Finally, firms which export products are more likely to plan for investment, supporting policies aimed at encouraging more small firms to export.

1. Introduction

UK business investment has been low for decades relative to other G7 economies (Alayande and Coyle, 2023). Issues of low investment relate to both traditional gross fixed capital formation (GFCF), which includes investment in fixed assets and capitalised intellectual property products (Alayande and Coyle, 2023), as well as intangible investments not captured in GFCF including firm-specific training (Goodridge and Haskel, 2023).[1] In addition, low total factor productivity (TFP) growth since the financial crisis points to a slowdown in innovation leading to slower technological progress (Goodridge and Haskel, 2023).[2] Low investment in (fixed) capital, skills and innovation matter as they lead to reduced labour productivity growth and lower living standards (Goodridge and Haskel, 2023; Pessoa and Van Reenen 2014; Gomez-Salvador et al., 2006).

Among factors blamed for low investment by SMEs, low levels of growth ambition (reducing growth expectations), as well as issues with finance supply (e.g., cost of borrowing) and demand (e.g., risk/control/debt aversion), have received considerable attention from policymakers (HMT/DBT, 2025; British Business Bank, 2025). Policy makers are particularly concerned about the overall large numbers of discouraged borrowers, who have external-financing needs but do not apply for finance due to fear of rejection, and so-called permanent non-borrowers who do not use external finance and have no inclination to use it (HMT/DBT, 2025; British Business Bank, 2025). There are also specific (and longstanding) concerns regarding the financing of innovation investment (e.g., Fraser, Bhaumik and Wright, 2015). These concerns arise as innovation requires resources including financial capital (Audretsch and Belitski, 2020; Roper and Arvanitis, 2012; Hoegl, Gibbert and Mazursky, 2008) but generates intangible assets which are harder to use as loan collateral (Bailey et al., 2022; Mann, 2018).[3]

In this context, we examine how SME owners ('entrepreneurs') form growth expectations and how this impacts on capital-, innovation- and skills-investment plans.[4] In addition, we consider how financing issues ('frictions') affect investment plans both directly and indirectly via growth expectations as well as how these effects vary over different types of investment plan.

Regarding growth expectations, investment propensity is positively correlated with growth expectations as the value of an investment project is increasing in the expected growth of the cashflows generated by the project (Gennaioli, Ma and Shleifer, 2016; McDonald and Siegel, 1986). However, cognitive bias may cause entrepreneurs to systematically underestimate or overestimate actual growth resulting in either too little or too much investment relative to

[1] GFCF includes some forms of capitalised intangible investment (e.g., software and databases and R&D) but not others (e.g., design, financial product innovation and firm-specific training) (Goodridge and Haskel, 2023).

[2] TFP is measured as the residual from an estimated production function and thus includes factors such as unmeasured intangible investments in addition to technological progress. However, using a dataset with a broader range of intangible investments than captured in GFCF, Goodridge and Haskel (2023) find that slower TFP growth accounts for the majority (78%) of the slowdown in labour productivity growth since the financial crisis which supports a slowdown occurring at the technological/knowledge frontier. Overall, a slowdown in 'innovation', comprising intangible investments and TFP growth, accounts for 88% of the slowdown in UK labour productivity growth (Goodridge and Haskel, 2023).

[3] While debt finance may be available in some circumstance to finance innovation – for example, strong creditor rights may facilitate the pledging of patents as collateral (Mann, 2018) – in general, venture capital is a more suitable source of finance for innovation investment (Lerner and Nanda, 2020; Hall, 2005).

[4] As such, we are using a practical (economist's) definition of entrepreneurship based on business ownership (see Parker, 2018, chapter 1). In particular, there is no prerequisite for innovation or growth ambition to be 'truly entrepreneurial' (see e.g., Bosma and Schutjens, 2009).

rational growth expectations. In particular, cognitive bias may cause entrepreneurs to forgo projects with positive net-present value (NPV) (pointing to negativity bias) or undertake projects with negative NPV (pointing to positivity bias) reducing firm value in either case relative to rational expectations. While prior studies in behavioural corporate finance have examined the effects of cognitive bias on Chief Financial Officer (CFO) and Chief Executive Officer (CEO) investment decisions (Alati et al., 2024; Gennaioli, Ma and Shleifer, 2016; Malmendier and Tate, 2015), less is known in the context of entrepreneurial decision making. This is a significant shortcoming as issues of cognitive bias may be particularly acute for entrepreneurs making investment decisions under informational overload, uncertainty, high emotions and time pressures (see Fraser, 2019, and related references therein).

A primary aim of this paper is therefore to test whether entrepreneurial growth expectations and investment plans are rational. To achieve this aim, we present a model of how entrepreneurs learn about growth. Under Bayesian learning, firms update growth expectations as new information about actual growth is received. In particular, if learning is rational then an entrepreneur's revision of growth expectations: (i) depends on the 'growth surprise', which is the difference between their actual growth and prior growth expectations, capturing new information; and (ii) responds symmetrically to positive and negative growth surprises (e.g., Evans and Honkapohja, 2012). However, cognitive issues in the form of confirmation bias (Pouget, Sauvagnat and Villeneuve, 2017; Charness and Dave, 2017) may affect learning by causing entrepreneurs to respond asymmetrically to positive and negative growth surprises depending on whether they contain information confirming or disconfirming prior beliefs (Fraser and Nguyen, 2025). Moreover, we show confirmation bias begets anchoring bias (Baker and Wurgler, 2013; Tversky and Kahneman, 1974) in situations where growth expectations are irresponsive to new information which disconfirms prior beliefs. In this case, growth expectations become irrationally anchored to prior beliefs.

Regarding financing frictions, the direct effects of (supply-side) financing constraints on investment, controlling for investment opportunities, have been well studied in the literature (e.g., Fazzari, Hubbard and Petersen, 1988; Carpenter and Petersen, 2002; see also surveys of the financing-constraints literature in Fraser, 2019 and Kerr and Nanda, 2011). The underlying cause of financing constraints is an information-cost wedge between internal and external finance due to asymmetric information in finance markets (Myers and Majluf, 1984; see also Fraser, 2019). In particular, discouraged borrowers are creditworthy firms that do not apply for loans as, due to asymmetric information, screening is costly and their applications may be rejected (Kon and Storey, 2003).[5] While there is limited evidence on the effects of discouragement on investment, evidence supporting the creditworthiness of discouraged borrowers is reported in Fraser and Nguyen (2025) (see also, Ferrando and Mulier, 2022) suggesting they may be underinvesting in viable projects (as opposed to not investing in unviable projects). Information costs may also give rise to the rejection of finance applicants with viable investment plans but who lack collateral and/or a track record (e.g., Fraser, 2019).[6]

[5] While discouragement depends on the entrepreneur's perceived rather than actual probability of loan rejection (Fraser and Nguyen, 2025), the roots of discouraged borrowing lie in the problem of asymmetric information in credit markets (Kon and Storey, 2003), which makes it fundamentally a supply-side financing issue.

[6] Under asymmetric information, banks may be unable to distinguish firms that are good risks, with a high probability of repayment, from bad risks even after screening loan applicants for creditworthiness (Stiglitz and Weiss, 1981). This residual imperfect information may lead to a credit-rationing equilibrium in which rejected applicants, who appear identical to approved applicants, would not obtain a loan even if they offered to pay a higher interest rate (Stiglitz and Weiss, 1981). The optimal bank policy in this case is not to raise the interest rate to clear the market as so doing would increase the average risk of the loan portfolio and lower expected bank profits due to an adverse-selection effect (Stiglitz and Weiss,

The cost wedge between internal and external finance may also be explained by demand-side cognition costs, including control aversion (González et al., 2013; Romano, Tanewski and Smyrnios, 2001; Berggren, Olofsson and Silver, 2000; Mishra and McConaughy, 1999; Cressy, 1995), risk aversion (Paaso, Pursiainen and Torstila, 2024; González et al., 2013; Fama and Jensen, 1983), and debt aversion (Paaso, Pursiainen and Torstila, 2024; Nguyen et al., 2021). In particular, firms professing no need for external finance may be forgoing otherwise viable investment opportunities due to cognition costs rather than having sufficient internal finance for optimal investment (Cole and Sokolyk, 2016).

States of discouragement, rejection and no external-finance needs may also affect growth expectations and thus indirectly affect investment. In particular, growth expectations may be negatively affected by scarring funding experiences among rejected and discouraged borrowers (Fraser and Nguyen, 2025; Cowling, Liu and Calabrese, 2022). In addition, lower growth ambition or entrepreneurial ability among firms with no external-finance needs (Cosh, Cumming and Hughes, 2009; Parker and van Praag, 2006; Åstbro and Bernhardt, 2003, 2005) may result in lower growth expectations compared to otherwise similar externally financed firms. However, lower growth ambition and expectations among firms with no external-finance needs are not inevitable as they may be just as ambitious as externally financed firms and simply have enough internal finance to support optimal investment and growth (Cole and Sokolyk, 2016).

We use the UK Longitudinal Small Business Survey (LSBS) 2015-2023 to address the following research questions: (i) what are the effects of entrepreneurs' growth expectations on investment plans (including: are growth expectations rational)?; and (ii) what are the direct and indirect effects of financing issues on investment plans? LSBS is an annual panel dataset comprising a large representative sample of privately held small firms in the UK. This sample is appropriate for studying cognitive frictions and financing issues, which are more likely to affect privately held small firms (Paaso, Pursiainen and Torstila, 2024; Cole and Sokolyk, 2016). To estimate the direct and indirect effects of financing issues on investment plans, firms are categorised into one of five mutually exclusive self-reported funding states: discouraged borrowers (DB), rejected borrowers (RB), firms with a self-reported no-need for external finance (NN), firms that did not apply for external finance due to risk aversion (RA), and fully funded (FF) firms which applied for external finance and received the full amount requested. This is similar to the funding-state categorisation of firms used in Cole and Sokolyk (2016) and Beyhagi et al. (2020) but with an extra category to help disentangle risk aversion from control and debt aversion (e.g., Paaso, Pursiainen and Torstila, 2024; González et al., 2013). In the broader context of the slowdown in UK business investment, our analysis covers six types of investment plan, encompassing plans for capital, R&D, (product and process) innovation and (leadership and workforce) skills investment.

We find growth expectations are overall on a declining trend since 2015 and are correlated with UK GDP growth rates. Similar to Gennaioli, Ma and Shleifer (2016) we also find growth expectations positively affect investment plans. Firms that expect to grow are 18.2, 12.2, 21.1, 20.3, 11.9 and 16.3 percentage points (pp) more likely to have capital, R&D, product-innovation, process-innovation, leadership-skills, and workforce-skills investment plans respectively than firms that do not expect to grow. These are economically (and statistically) significant increases compared to firms that do not expect to grow, which have probabilities of 19.5, 13.3, 21.3, 19.5, 15.4 and 32.9 percent for the respective investment plans. However, by contrast to Gennaioli, Ma and Shleifer (2016) but similar to Alati et al., 2024, our findings

1981). Moreover, even if banks are perfectly informed about ex-ante risk, raising the interest rate to clear the market may not be the bank's optimal policy if it induces riskier borrower behaviour ex post (an incentive/moral-hazard effect) (e.g., Watson, 1984; Williamson, 1987).

are consistent with rational learning, in such a way that growth expectations (and investment plans) symmetrically adjust downwards following a negative growth surprise and upwards following a positive surprise.

Regarding the direct effects of funding states on investment plans, controlling for growth expectations and firm/industry effects, we find DB and RB firms are less likely to have some types of investment plans than otherwise similar FF firms. In particular, these investment plans relate to capital investment (DB and RB), leadership skills (DB) and workforce skills (RB). This is consistent with higher information costs among DB and RB firms which negatively affect investment propensity. Moreover, there are negative direct effects for NN firms across a wider range of plans covering capital investment, product and process innovation, leadership and workforce skills and negative effects for RA firms on R&D and process-innovation investment. Overall, this indicates higher cognition costs (due to debt/control aversion and risk aversion) impact adversely across a broader range of investment plans. [7]

Regarding the indirect effects of funding states on investment plans, overall, only NN firms have lower growth expectations than otherwise similar FF firms. This is consistent with lower growth ambition among NN firms (supported by the absence of growth-expectation effects for NN firms when we control for growth ambition). Lower growth expectations indirectly reduce NN-firm investment-plan likelihoods across all types of investment plan. The total (direct plus indirect) reductions in the likelihood of investment plans for NN firms relative to otherwise similar FF firms are 18.2, 16.8, 23.6, 14.6, and 14.9 pp for capital, product-innovation, process-innovation, leadership-skills and workforce-skills investment plans respectively. These are economically (and statistically) significant reductions relative to the investment-plan probabilities of fully funded firms, which are 35.4, 36.7, 38.5, 27.9 and 45.9 percent for capital, product-innovation, process-innovation, leadership-skills and workforce-skills investment plans respectively. Risk aversion results in a 9.8 pp reduction in the likelihood of R&D investment plans (against an R&D probability for fully funded firms of 15.1 percent) and a 9.3 pp reduction in the probability of process-innovation development plans. While there is no evidence that previous negative financing experiences scar growth expectations among DB and/or RB firms in general, there is evidence of scarring among ethnic-minority-led businesses.

Our paper makes contributions to several strands of research. Principally, we contribute to studies analysing whether expectations affect firm behaviour and, if they do, whether expectations are rational (Gennaioli, Ma and Shleifer, 2016; Alati et al., 2024; Barrero, 2022). In particular, by developing a model of how entrepreneurs learn about growth we are able to test not only whether growth expectations affect investment plans but also to test for cognitive (confirmation and anchoring) bias in how entrepreneurs form growth expectations (with our results supporting rational growth expectations). We extend previous studies which focus mainly on the expectations of CFOs or CEOs in large firms by examining growth expectations and investment plans in the context of SMEs. This is important not only because SMEs constitute the overwhelming majority of the business population but also as prior studies suggest entrepreneurs are particularly prone to cognitive bias. In this regard, our findings in support of rationality run contrary to prevailing views about entrepreneurial cognition. Relatedly, by testing for rational investment plans, this paper contributes to the wider literature on the role of entrepreneurial and managerial cognition in investment decisions (e.g., Fraser

[7] In terms of testing financing constraints, controlling for growth expectations plays a similar role to that of controlling for investment opportunities (in larger firms) using Tobin's *q* i.e., the identification of supply-side financing constraints/investment costs (e.g., Carpenter and Petersen, 2002). However, controlling for growth expectations also helps us disentangle growth ambition (which drives growth expectations) from demand-side financing constraints/investment costs (due to debt/control aversion).

and Nguyen, 2025; Fraser, Bhaumik and Wright, 2015; Malmendier and Tate, 2015; Baker and Wurgler, 2013).

This paper also contributes to the large literature on the determinants of investment (e.g., Gennaioli, Ma and Shleifer, 2016; Nunes, Mendes and Serrasqueiro, 2012; Bernanke, 1983) and, in particular, the effects of financing constraints on investment (Fraser, 2019; Kerr and Nanda, 2011; Carpenter and Petersen, 2002; Fazzari, Hubbard and Petersen, 1988). In this respect our contribution is threefold. First, we test not only the effects of (supply-side) financing constraints on investment, relating to discouraged and rejected borrowers, but also the effects of no-financing needs. This allows us to test if firms with no-financing needs are underinvesting due to demand-side cognition costs (relating to control/debt aversion with the effects of risk aversion considered separately). We are unaware of prior testing of the effects of no-financing needs in the investment/financing-constraints literature. Indeed, in this literature, firms with no-financing needs are assumed to have sufficient internal finance such that their investment plans are unconstrained (Beck et al., 2018; Cole and Sokolyk, 2016). Second, showing the effects of no-financing needs on growth expectations aids our understanding of whether lower growth ambition among no-need firms (e.g., Cosh, Cumming and Hughes, 2009) presents a further obstacle (over and above control/debt aversion) to investment plans. Third, we test whether negative financing experiences (discouragement and rejection) scar not only subsequent borrowing decisions (as in Fraser and Nguyen, 2025; Cowling, Liu and Calabrese, 2022) but also growth expectations. In this regard, we find evidence of scarring effects on growth expectations among ethnic-minority led businesses if not businesses overall (consistent with e.g., Fraser, 2009; Blanchflower, Levine and Zimmerman, 2003).

Finally, by considering different types of investment plan (relating, principally, to fixed capital, innovation and skills) we contribute to the literature regarding low levels of business investment and productivity growth in the UK (Goodridge and Haskel, 2023; Alayande and Coyle, 2023; Pessoa and Van Reenen 2014). In this respect, our findings provide complementary insights into the precursors of business investment and the types of tangible and intangible investment which are particularly affected by growth expectations and/or financing issues. Our findings indicate innovation-investment plans are particularly sensitive to growth expectations and therefore the most affected by the lower growth expectations observed over (at least) the last decade. This is consistent with the significant slowdown in innovation (contributing largely to the slowdown in UK labour productivity growth since the financial crisis) reported in Goodridge and Haskel (2023). Regarding financing issues, our findings highlight problems on the supply side, relating to higher information costs among discouraged and rejected borrowers, negatively affect capital-, innovation- and skills-investment plans. This is consistent with Pessoa and Van Reenen (2014) who argue that low productivity growth in the UK following the financial crisis is partly due to a higher effective cost of capital for SMEs which increased capital shallowing (i.e., a fall in the capital-labour ratio). However, a key contribution of our study is to show problems on the demand side, relating to debt/control aversion and low-growth ambition among firms with no external-finance needs, are the main issue for investment plans in terms of both the prevalence and magnitude of impacts. Moreover, while demand-side financing issues significantly reduce the likelihood of all types of investment plan, innovation-investment plans are the most severely affected. Again, this is consistent with, and helps explain, the slowdown in innovation reported in Goodridge and Haskel (2023).

The remainder of this paper is structured as follows. Section 2 provides an overview of the literature on business-investment decisions. Section 3 presents a model of how entrepreneurs learn about growth and form growth expectations in cases of rationality and irrationality. Section 4 sets out the empirical methodology, section 5 describes the data, and section 6

presents the results of the empirical analysis. Section 7 concludes the paper with a discussion of policy implications. Additional results are presented in an appendix at the end of the paper.

2. Business-investment decisions

In this section, we begin with an overview of previous findings regarding the effects of (exogenous) firm characteristics and external factors on investment decisions in reduced form. We then look at theoretical explanations for investment decisions and previous findings from structural analyses regarding the effects of uncertainty and expectations (including cognitive bias).

The literature highlights a myriad of firm characteristics which affect business-investment decisions. These firm characteristics include: size, with larger firms more likely to invest (e.g., de Guevara, Maudos and Salvador, 2021); sector, reflecting sectoral differences in investment opportunities (relating to product demand), the degree of competition (relating to the need to invest to maintain competitiveness), and the cost of capital (as well as the availability of other resources required for investment) (e.g., Mann, 2024)[8]; firm age, reflecting factors such as experience, growth stage and information asymmetry (e.g., Mann, 2024); ownership structure, affecting resource availability and incentives to invest in the business (e.g., Golubova, 2024; Mann, 2024); human capital and managerial capabilities (Mann, 2024; Lai, Lin and Lin, 2015); financial capital, reflecting the availability of internal funds for investment (see section 1); exporting, reflecting increased investment opportunities due to demand for products from home and abroad (e.g., Peters et al., 2022); and business-owners' gender and ethnicity as well as age (Belenzon, Shamshur and Zarutskie, 2019).[9]

Regarding the role of gender, it is well documented that female entrepreneurs invest less capital than males in their businesses both at start up and for later-stage investment (Malmström et al., 2024; Kanze et al., 2018; Coleman and Robb, 2009). Female entrepreneurs are also more likely to rely on personal finance (including personal credit cards and bank loans) for investment and less likely to use business loans and venture capital (Howell and Nanda, 2024; British Business Bank, 2019; Coleman and Robb, 2009). This gender gap in investment is due to a complex and interrelated range of reasons including gender norms and socialisation affecting not only the incidence and types of entrepreneurship undertaken by female entrepreneurs (Hohl et al., 2021; Greene, Han and Marlow, 2013; Marlow and McAdam, 2012) but also underlying gender discrimination by finance providers (Malmström et al., 2024; Kanze et al., 2018; Carter et al., 2007).[10]

While ethnic-minority-led businesses are more ambitious and more willing to use finance to help business growth and development than White-led businesses, they experience greater difficulties accessing finance than White-led businesses (British Business Bank, 2025). These difficulties are reflected in higher incidences of financial rejection and discouragement as well as higher loan margins among ethnic-minority-led business (British Business Bank, 2025; Asiedu, Freeman and Nti-Addae, 2012; Fraser, 2009; Blanchflower, Levine and Zimmerman, 2003). The disparity between high-growth ambition and relatively poor access to finance is particularly acute for Black-led businesses (British Business Bank, 2025; Asiedu, Freeman and Nti-Addae, 2012; Fraser, 2009). Reasons for poorer access to finance among ethnic-minority-led businesses include higher information barriers/costs (British Business Bank,

[8] For example, Riley, Rincon-Aznar and Samek (2018) find worse productivity and investment outcomes in sectors more susceptible to slowing global demand.

[9] Belenzon, Shamshur and Zarutskie (2019) find investment is decreasing in owner's age. In particular, investment is 45 percent lower in firms with an owner-CEO aged over 59 years old compared to firms with an owner-CEO aged below 34 years old.

[10] Notwithstanding the various reasons underlying gender gaps in investment:
"Whatever the cause, the fact that women use dramatically smaller amounts of start-up capital and rely on personal rather than external sources has implications for their ability to develop new products and services, grow their firms, hire employees, and survive periods of adversity." (Coleman and Robb, 2009, p. 409)

2025; Fraser, 2009), poorer credit ratings (British Business Bank, 2025; Fraser, 2009), lower availability of collateral (Fraser, 2009), and ethnic discrimination (Blanchflower, Levine and Zimmerman, 2003).

In terms of external factors, agglomeration externalities, based on production linkages and flows of skills and innovative ideas between firms, generate increasing returns promoting investment in regions in which the potential for agglomeration benefits are higher (Becker and Martin, 2023; Rice and Venables, 2023; see also Mann, 2024, and the literature referenced therein). In this respect, regional infrastructure (such as transport linkages and availability of high-speed broadband) plays a key role in engendering agglomeration externalities and increasing regional investment by facilitating flows of people, products and ideas into and within a region (Rincon-Aznar et al., 2021; Northern Powerhouse Partnership, 2017). Overall, government policy including targeted support for R&D and green investment as well as monetary and fiscal policy impact investment decisions (Golubova, 2024; Mann, 2024). However, policy variability in the UK (e.g., the multiple changes to capital allowances over the last four decades) has engendered an environment of policy uncertainty unfavourable for investment (Mann, 2024; Coyle, 2023).

Several theories have been proposed to explain how firms make investment decisions (e.g., Farooq et al., 2022; Gennaioli, Ma and Shleifer, 2016; Dixit and Pindyck, 1994; McDonald and Siegel, 1986). In the neoclassical theory of investment (Jorgenson, 1963), firms choose the optimal capital stock which maximises the present value of cashflows. Accordingly, firms invest (or disinvest) as the optimal capital stock changes over time. However, in Jorgenson's model there is no role for expectations as there is no uncertainty and firms have perfect foresight of future cashflows (see also Dixit and Pindyck, chapter 5).[11] In Tobin's *q* theory of investment (Tobin, 1969), firms invest when the market value of the firm's existing assets, which incorporates the market's expectations of the present value of the firm's cash flows, exceeds the replacement cost of assets (i.e., cost of investment).[12]

However, Tobin's *q* theory (and Jorgenson's model) assume investment is reversible. Yet most investments are partially or completely irreversible as some or all of the cost of investment is sunk and thus irrecoverable if the investment decision is reversed (Dixit and Pindyck, 1994). This is problematic as, under uncertainty, the ability to delay an irreversible investment confers a valuable real option on the firm, which it gives up on investing (McDonald and Siegel, 1986; see also Trigeorgis and Reuer, 2017, for a survey of the real-options literature). Accordingly, under uncertainty, firms should make an (irreversible) investment only when the expected present value of future cash flows from investment exceeds the (direct) cost of investment plus the option value of delaying investment (representing the opportunity cost of investment) (Dixit and Pindyck, 1994; McDonald and Siegel, 1986).

Supporting real-option theory, previous studies report a significant wedge between hurdle rates for investment (i.e., return-on-investment thresholds) and the weighted average cost of capital (WACC). For example, hurdle rates average 12 per cent for UK businesses while WACC, representing the direct costs of investment, averages 6.5 per cent (Melolinna, Miller and Tatomir, 2018). A theoretical explanation for the wedge between hurdle rates and WACC is that it represents the real-option value of delaying irreversible investment under uncertainty

[11] In Jorgenson's model, firms should invest until the marginal product of capital (the per-period value of an incremental unit of capital) equals the user cost of capital (the per-period cost of an incremental unit of capital). This is equivalent to the textbook rule of investing when the NPV of investment (with perfect foresight) is greater than zero (see Dixit and Pindyck, 1994, chapter 1).

[12] In this case *q*, the ratio between the market value and replacement cost ('book value') of assets, exceeds unity. If *q* exceeds unity the market values the firm's assets above book value and so investing in new projects creates value (assuming markets are efficient). Conversely, if *q* is less than one the firm should sell assets (or not replace assets as they depreciate in value) rather than invest in new projects.

(Bloom 2014; Bloom, Bond and Van Reenen, 2007; Dixit and Pindyck, 1994).[13] Moreover, the wedge is larger for small firms consistent with higher uncertainty (see Jagannathan et al., 2016, for similar findings in the US).[14]

In addition, several studies have looked directly at the effects of uncertainty on investment decisions (Alati et al., 2024; Altig et al., 2022; Bloom et al., 2022; Bloom, Van Reenen and Williams, 2019; Bloom, Bond and Van Reenen, 2007). Bloom et al. (2022), using a survey of US manufacturing firms, report that a two standard deviation increase in firm-level uncertainty is associated with a six per cent reduction in investment. In the UK, uncertainty caused by Brexit led to an 11 per cent reduction in business investment in the three years following the vote to leave the EU in June 2016 (Bloom et al., 2019).

Regarding the effects of expectations on investment decisions, besides studies using model-based predictions or market-based indices of expectations (Danso et al., 2019, Gulen et al., 2024), several recent studies have used business survey data to capture managers' ex-ante growth expectations (Alati et al., 2024, Gennaioli, Ma and Shleifer, 2016). Gennaioli, Ma and Shleifer (2016) show, using a survey of CFOs in the US, that planned investment growth is positively related to expected earnings growth, even after controlling for investment opportunities, using equity- and bond-market measures of Tobin's *q*, indicating CFO growth expectations contain information about investment plans which is not contained in market information. They also show that growth expectation errors (i.e., growth surprises) display a systematic and recurring pattern with excessive pessimism about growth in bad times (when past earnings are low) and excessive optimism in good times. This suggests that CFO growth expectations are inconsistent with the rational expectations hypothesis (as the difference between actual and expected earnings growth is predictable) (see also Barrero, 2022).

For UK businesses, Alati et al. (2024) find business-investment plans adjust downwards following a negative sales-growth surprise (and upwards following a positive surprise). This finding is consistent with businesses being discouraged from investment due to disappointing realised returns relative to expectations (see also Bank of England, 2017). In addition, consistent with firm learning, Alati et al. (2024) find evidence that the relationship between sales-growth surprises and investment is due to firms adjusting investment as they learn about demand from income shocks contained in growth surprises. However, Alati et al. (2024), who use sales-growth surprises primarily as an instrumental variable to identify the effect of sales on investment, conflate the relationship between sales-growth surprises and investment plans implied by a learning model (as, in a learning model, growth expectations mediate the relationship between growth surprises and investment plans). Also, by contrast to Gennaioli, Ma and Shleifer (2016), Alati et al. (2024) do not find a predictable pattern in sales-growth surprises which is indicative of rational expectations.

Looking in more detail at the effects of irrational expectations on investment, overoptimism may lead to overinvestment if it results in entrepreneurs overestimating their firms' chances of success and/or growth prospects (e.g., Malmendier and Tate, 2005; de Meza and Southey,

[13]Other findings indicate market power increases the wedge between hurdle rates and WACC while competitive pressures lower the wedge as businesses investment is spurred by the need to maintain competitiveness (Mann, 2024; Gormsen and Huber, 2023). This finding is consistent with a real option to delay investment whose value is increasing in uncertainty but decreasing in competition (Bloom, 2014).

[14]Regarding WACC specifically, Sharpe and Suarez (2021) find, somewhat surprisingly, that CFO investment plans are insensitive to changes in the interest rate (which underpins WACC). However, this insensitivity is explained by firms building up cash-holdings prior to investment (which is consistent with external-financing constraints as discussed in section 1). Regarding hurdle rates specifically, in the UK they appear to be less variable than WACC (Melolinna, Miller and Tatomir, 2018). One explanation for the stickiness of hurdle rates may be anchoring bias which would lead to inefficient investment decisions (Baker and Wurgler, 2013).

1996; see also the review of studies relating to entrepreneurial overoptimism in investment/borrowing decisions in Fraser, 2019).[15] Overoptimistic entrepreneurs invest in higher risk projects, which is unfavourable from a financiers' point of view (Gervais, Heaton and Odean, 2011, Puri and Robinson, 2007). On the other hand, optimistic individuals exert more effort in carrying out projects resulting in higher productivity (Gervais, Heaton and Odean, 2011, Puri and Robinson, 2007). Accordingly, entrepreneurial optimism may also send an opposing positive signal to financiers. Supporting this latter view, Dai, Ivanov and Cole (2017) found evidence from US small business that entrepreneurial optimism leads to improved chances of loan approval and better interest rates. However, supporting co-existing opposing effects of entrepreneurial optimism on financing prospects, Cole, Cowling and Liu (2022) find there is an inverted U-shaped relationship between optimism and loan application decisions and an inverted U-shaped relationship between optimism and loan-approval probabilities. This suggests there is a 'sweet spot' of optimism that maximises the chances of loan approval and this sweet spot is recognised by entrepreneurs as reflected in their loan-application decisions.

However, as noted previously, entrepreneurial expectations may also be affected by negativity or pessimism bias (e.g., Gennaioli, Ma and Shleifer, 2016). Moreover, Fraser and Greene (2006) show entrepreneurial optimism decreases with experience, which may engender negativity bias in expectations among older firms in particular (Fraser and Nguyen, 2025).[16]
In the following section, we consider a specific cognitive mechanism leading to overinvestment due to overoptimistic growth expectations (reflecting the general focus on entrepreneurial overoptimism in the literature). However, as shown, our model of growth-expectations formation is also capable of generating and testing underinvestment due to overly pessimistic growth expectations.

[15] The prevalence of overoptimism was recognised by Adam Smith in the 18th century: "The chance of gain is by every man more or less overvalued, and the chance of loss is by most men undervalued." (Smith, 1937, p.107). More recent studies have shown while overoptimism is systematic in the general population (Tversky and Kahneman, 1974; Taylor, 1989), entrepreneurs are particularly prone to overoptimism (e.g., Hmieleski and Baron, 2009; Puri and Robinson, 2007; Fraser and Greene, 2006; Arabsheibani et al., 2000).

[16] Fraser and Nguyen (2025) show, in the context of entrepreneurial learning about the probability of loan rejection, that increasing pessimism among older firms causes confirmation bias involving an over-weighting of rejection experiences. This results in an increasing effect of previous rejection experiences on the probability of borrower discouragement among older firms (whereas, absent pessimism, the effect of rejection would decrease monotonically with firm age due to rational learning).

3. Model of growth-expectations formation

The primary data on forward-looking growth expectations in our analysis are dichotomous: $\boldsymbol{g = 1}$ if the firm believes (ex-ante) it will grow in the year ahead and zero otherwise. In this context, firms' prior beliefs of growth expectations are assumed to follow a beta distribution, $\boldsymbol{Beta(\alpha, \beta)}$ (see e.g., Fraser and Nguyen, 2025). Over time, firms receive information about actual growth, $\boldsymbol{X}$, which is a Bernoulli distributed random variable. In particular, $\boldsymbol{X}$ can take only two values $\boldsymbol{x \in \{0, 1\}}$ with $\boldsymbol{x = 1}$ if the firm grows and zero otherwise. Firms use information on actual growth to revise growth expectations as shown below.

Under rational Bayesian learning, for a firm aged $\boldsymbol{n}$ (with $\boldsymbol{n}$ data points on $\boldsymbol{x}$), the expected value of $\boldsymbol{g}$ is

$$\boldsymbol{E_n(g) = \frac{\alpha + y_n}{\alpha + \beta + n}},$$

where $\boldsymbol{y_n = \sum_{i=1}^{n} x_i}$ is the total number of actual growth events up to $\boldsymbol{n}$ (see e.g., Fraser and Nguyen, 2025). Under rational learning, the change in growth expectations is therefore

$$\boldsymbol{E_n(g) - E_{n-1}(g) = \frac{\alpha + y_n}{\alpha + \beta + n} - \frac{\alpha + y_{n-1}}{\alpha + \beta + n - 1}}$$

$$\boldsymbol{= \frac{1}{\alpha + \beta + n}[x_n - E_{n-1}(g)]}, \qquad \boldsymbol{(1)}$$

where $\boldsymbol{x_n - E_{n-1}(g)}$ is the growth surprise. The effect of a growth surprise on the change in growth expectations – the 'learning gain' – therefore diminishes with experience, $\boldsymbol{n}$, as the firm learns its true growth probability.

Under confirmation bias, entrepreneurs revise growth expectations on receiving information that confirms their prior beliefs ('confirming information') while ignoring information that disconfirms prior beliefs ('disconfirming information'). Prior studies indicate confirmation bias is stronger for individuals with optimistic beliefs such as entrepreneurs (Carr and Blettner 2010; Hmieleski and Baron, 2009; Shepherd, Williams and Patzelt, 2015; see also discussion of entrepreneurial overoptimism in section 2).[17] This suggests: (i) entrepreneurs are likely to be affected by confirmation bias; and (ii) entrepreneurs are likely to consider growth events ($\boldsymbol{x = 1}$) as confirming information and no-growth events ($\boldsymbol{x = 0}$) as disconfirming information.

If entrepreneurs, prone to confirmation bias, revise beliefs only when $\boldsymbol{x = 1}$, while ignoring no-growth events, then the posterior density for growth expectations is

$$\boldsymbol{f(g|x_1, \ldots, x_n) \propto h(x_1, \ldots, x_n|g) f(g)}$$

$$\boldsymbol{= g^{y_n} g^{\alpha - 1}(1 - g)^{\beta - 1}}$$

$$\boldsymbol{= g^{y_n + \alpha - 1}(1 - g)^{\beta - 1}},$$

[17] By contrast, Fraser and Nguyen (2025), in the context of loan rejection-probability expectations, argue confirmation bias affects entrepreneurs scarred by previous negative credit experiences. Accordingly, in Fraser and Nguyen (2025), loan-rejection events represent confirming information.

where $\boldsymbol{h(x_1, \dots, x_n|g)}$ is the (binomial) likelihood of $\boldsymbol{g}$ in a situation where firms ignore no-growth events (which is proportional to $\boldsymbol{g^{y_n}}$).[18] It follows that, under confirmation bias, the posterior distribution is $\boldsymbol{Beta(\alpha + y_n, \beta)}$ and hence, in the presence of no-growth events $\boldsymbol{(y_n < n)}$,

$$\boldsymbol{E_n[g] = \frac{\alpha + y_n}{\alpha + \beta + y_n} > \frac{\alpha + y_n}{\alpha + \beta + n}}.$$

This result means, if $\boldsymbol{x = 1}$ is confirming information, firms overestimate growth expectations (i.e., the probability of growth) under confirmation bias. Now, if $\boldsymbol{x_n = 1}$,

$$\boldsymbol{E_n(g) - E_{n-1}(g) = \frac{\alpha + y_n}{\alpha + \beta + y_n} - \frac{\alpha + y_n - 1}{\alpha + \beta + y_n - 1}}$$

$$\boldsymbol{= \frac{1}{\alpha + \beta + y_n}[x_n - E_{n-1}(g)], \quad x_n = 1.} \qquad \boldsymbol{(2)}$$

Hence, on receiving confirming information firms revise growth expectations (upwards) similar to the revision under rational learning (see $\boldsymbol{(1)}$). The key difference under confirmation bias is that, in the presence of no-growth events $\boldsymbol{(y_n < n)}$, the learning gain, $\boldsymbol{1/(\alpha + \beta + y_n)}$, exceeds the learning gain under rational learning, $\boldsymbol{1/(\alpha + \beta + n)}$.[19]

Conversely, if the firm receives disconfirming information then $\boldsymbol{E_n[g] - E_{n-1}[g] = 0}$. This follows as, if firms ignore a disconfirming event, $\boldsymbol{x_n = 0}$, then $\boldsymbol{f(g|x_1, \dots, x_n = 0) = f(g|x_1, \dots, x_{n-1})}$ meaning the posterior density is unchanged by the latest growth information. Hence, the learning gain from disconfirming events, which is zero, is less than the learning gain under rational learning.[20]

Accordingly, there are two key predictions from the model of growth learning under confirmation bias with overoptimistic beliefs:

1. The learning gain (growth-surprise effect) under confirmation bias is asymmetric. In particular, firms revise growth expectations upwards on receiving confirming information but do not revise growth expectations downwards on receiving disconfirming information. By contrast, under rational learning, the learning gain is symmetric for positive and negative growth surprises (see $\boldsymbol{(1)}$).

2. Confirmation bias begets anchoring bias. This is a consequence of the asymmetric (zero) learning gain from disconfirming information.[21]

[18] In Fraser and Nguyen (2025), confirmation bias involves a parameter associated with overweighting of confirming information and underweighting of disconfirming information in the likelihood function. An advantage of the different approach to modelling confirmation bias in this paper is that it avoids identification issues associated with estimating a confirmation-bias parameter.

[19] In essence, this result is a consequence of firms accruing experience at a slower rate under confirmation bias (i.e., only on receiving confirming information) than under rational learning.

[20] Analogously, under pessimism bias, if firms revise beliefs only when $x = 0$, while ignoring growth events, then the posterior density for growth expectations is proportional to $g^{\alpha-1}(1-g)^{n-y_n+\beta-1}$. In this case, the posterior mean of growth expectations is $\alpha/(\alpha + \beta + n - y_n)$ which, in the presence of growth events $(y_n > 0)$, underestimates growth expectations relative to rational Bayesian learning. Under pessimism bias, the learning gain from confirming events $(x = 0)$, $1/(\alpha + \beta + n - y_n)$, exceeds the learning gain under rational learning while the learning gain from disconfirming events $(x = 1)$ is zero (further details of the analysis of pessimism bias are available on request).

[21] Under confirmation bias with excessively pessimistic beliefs, the key predictions are:

Using the above results, we can derive an estimable equation for growth expectations under confirmation bias. First, combining $(\mathbf{2})$ with $\boldsymbol{E_n[g] - E_{n-1}[g] = 0}$ if $\boldsymbol{x_n = 0}$, write

$$\boldsymbol{E_n(g) - E_{n-1}(g) = \gamma[x_n - E_{n-1}(g)] + \frac{1}{\alpha + \beta + y_n} 1_{x_n - E_{n-1}(g) > 0}[x_n - E_{n-1}(g)],} \qquad (\mathbf{3})$$

where $\boldsymbol{\gamma = 0}$ and $\boldsymbol{1_{x_n - E_{n-1}(g) > 0}}$ is an indicator variable equal to one for positive growth surprises and zero otherwise. Note that $\boldsymbol{1_{x_n - E_{n-1}(g) > 0}[x_n - E_{n-1}(g)] = 1_{x_n - E_{n-1}(g) > 0}}$ with binary variables for $\boldsymbol{x_n}$ and $\boldsymbol{E_{n-1}(g)}$ (although we retain the expanded expression as it applies more generally with non-binary variables).

Next, write $(\mathbf{3})$ as

$$\boldsymbol{g = E_{n-1}(g) + \gamma[x_n - E_{n-1}(g)] + \frac{1}{\alpha + \beta + y_n} 1_{x_n - E_{n-1}(g) > 0}[x_n - E_{n-1}(g)] - \varepsilon \coloneqq \Omega - \varepsilon,}$$

where $\boldsymbol{\varepsilon}$ is a stochastic error term with $\boldsymbol{E_n(\varepsilon) = 0}$ and (non-normal) cumulative distribution function (CDF), $\boldsymbol{F(\varepsilon)}$. Hence, $\boldsymbol{Prob(g = 1) = Prob(\Omega - \varepsilon > 0) = Prob(\varepsilon < \Omega)}$. To help estimate this probability, we transform $\boldsymbol{\varepsilon}$ to a standard normal random variable using the transformation $\boldsymbol{J(\varepsilon) = \Phi^{-1}[F(\varepsilon)] \sim N(0, 1)}$, where $\boldsymbol{\Phi^{-1}(.)}$ is the inverse of the standard normal CDF and $\boldsymbol{J(.)}$ is a monotonically increasing function (see Fraser and Nguyen, 2025). Accordingly, $\boldsymbol{Prob(g = 1) = Prob[J(\varepsilon) < J(\Omega)] = \Phi[J(\Omega)]}$ which gives the probability that the entrepreneur expects growth in terms of a standard normal probability.

The above results imply latent growth expectations, $\boldsymbol{g^*}$, may be written as the following equation,

$$\boldsymbol{g^* = J(\Omega) + v,} \qquad (\mathbf{4})$$

where $\boldsymbol{Prob(g = 1) = Prob(g^* > 0)}$ and $\boldsymbol{v \sim N(0, 1)}$. Contained in $\boldsymbol{\Omega}$, $\boldsymbol{E_{n-1}(g)}$ is proxied by the observed (dichotomous) growth expectation in the previous period. The growth surprise, $\boldsymbol{x_n - E_{n-1}(g)}$, is proxied by the difference between actual growth in the current period ($\boldsymbol{x_n}$ equal to zero or one) and the growth expectation in the previous period (equal to zero or one).

Equation $(\mathbf{4})$ provides an estimable form for growth expectations which allows testing of rational Bayesian learning versus confirmation bias. The effects of previous growth expectations and growth surprises, obtained by estimating $(\mathbf{4})$, are identified up to a positive (firm-varying) constant $\boldsymbol{J_\Omega \coloneqq dJ/d\Omega}$ i.e., the transformation to normality affects the magnitude but not the sign of the effects.[22] Under confirmation bias (with overoptimistic beliefs), the coefficient on $\boldsymbol{x_n - E_{n-1}(g)}$, which is the learning gain for negative growth surprises, is zero while the coefficient on $\boldsymbol{1_{x_n - E_{n-1}(g) > 0}[x_n - E_{n-1}(g)]}$, which is the learning gain for positive growth surprises, is positive. Conversely, under rational learning, the coefficient on $\boldsymbol{x_n - E_{n-1}(g)}$ is positive and equal to the (rational) learning gain, while the coefficient on

1. The learning gain under confirmation bias is asymmetric with firms revising growth expectations downwards on receiving confirming information ($x = 0$) but not revising growth expectations upwards on receiving disconfirming information ($x = 1$).
2. Confirmation bias begets anchoring bias due to the asymmetric (zero) learning gain from disconfirming information.

[22] Specifically, the average marginal effects are identified. These average effects are calculated by the average of the partial derivatives of $\Phi[J(\Omega_i)]$ where i indexes firms.

$\mathbf{1}_{x_n - E_{n-1}(g)>0}[x_n - E_{n-1}(g)]$ is zero as the learning gain is symmetric for positive and negative growth surprises.[23]

We extend equation (4) by considering the effects of funding states $\boldsymbol{Z} = (\boldsymbol{NN}, \boldsymbol{DB}, \boldsymbol{RB}, \boldsymbol{RA})$ on growth expectations and controlling for firm characteristics, $\boldsymbol{X}$, (which also includes a constant) in the following equation

$$g^* = J(\Omega) + Z\delta + X\theta + v. \quad (5)$$

The effects of funding states, $\boldsymbol{\delta}$, are measured relative to the omitted $\boldsymbol{FF}$ state in which the firm applies for and receives external funding.

The effects of funding states on growth expectations reflect unobserved heterogeneity (motivation/ambition) and/or scarring effects of negative funding experiences. In particular, scarring effects in this context occur where negative funding experiences (such as rejection and discouragement) have an adverse effect on confidence resulting in lower growth expectations (see Fraser and Nguyen, 2025; Cowling and Sclip, 2023 for the effects of negative funding experiences on subsequent borrowing decisions). Among $\boldsymbol{NN}$ firms, lower growth ambition would lead to lower growth expectations.

[23] In general, write the total effect of growth surprises on growth expectations as

$$\lambda_0\left(1 - 1_{x_n - E_{n-1}(g)>0}\right)[x_n - E_{n-1}(g)] + \lambda_1 1_{x_n - E_{n-1}(g)>0}[x_n - E_{n-1}(g)],$$

where λ_0 and λ_1 are the effects of negative and positive growth surprises respectively. Hence:

1. Under rationality, the total effect of growth surprises is $\lambda_0[x_n - E_{n-1}(g)]$ as $\lambda_0 = \lambda_1 = 1/(\alpha + \beta + n)$ (i.e., firms' expectations respond symmetrically to negative and positive growth surprises).
2. Under confirmation (optimism) bias firms' expectations respond more to positive than negative growth surprises ($\lambda_1 > \lambda_0$), so that the total effect of growth surprises is $\lambda_0[x_n - E_{n-1}(g)] + (\lambda_1 - \lambda_0)1_{x_n - E_{n-1}(g)>0}[x_n - E_{n-1}(g)]$. In particular, if firms completely ignore no-growth events in revising expectations, $\lambda_0 = 0$ and $\lambda_1 = 1/(\alpha + \beta + y_n)$ as in equation (3).
3. Under confirmation (pessimism) bias firms' expectations respond more to negative than positive growth surprises ($\lambda_1 < \lambda_0$), so that the total effect of growth surprises is $\lambda_0[x_n - E_{n-1}(g)] + (\lambda_1 - \lambda_0)1_{x_n - E_{n-1}(g)>0}[x_n - E_{n-1}(g)]$ (i.e., as 2. but with $\lambda_1 - \lambda_0 < 0$). In particular, if firms completely ignore growth events in revising expectations, $\lambda_1 = 0$ and $\lambda_0 = 1/(\alpha + \beta + n - y_n)$ is the learning gain. In terms of (3), pessimism bias implies a positive coefficient on $x_n - E_{n-1}(g)$ and a negative coefficient (of equal magnitude) on $1_{x_n - E_{n-1}(g)>0}[x_n - E_{n-1}(g)]$.

4. Methodology

The discussion in section 2 motivates estimating investment plans, I, as primarily a function of growth expectations, g, and uncertainty, σ. In addition, investment costs are increasing in information and cognition costs (see introduction). Accordingly, funding states are also included in the investment-plan equation to capture the effects of information/cognition costs on investment plans (relative to firms that applied for and obtained external finance).[24] Previous investment plans, I_{-1} are included to control for potential state dependence and/or unobserved heterogeneity. A recent experience of investment plans may make it less likely to have current investment plans (e.g., Alati et al., 2024). Conversely, previous investment plans may capture unobserved heterogeneity (e.g., unobserved investment opportunities) which affects (positively) both previous and current investment plans (see Aristei and Angori, 2022; Heckman, 1991 for the distinction between heterogeneity and state dependence). The investment-plan equation also includes controls for firm characteristics, X, as discussed in section 2 (along with a constant term).

Latent investment plans, I^*, are therefore given by the following equation

$$I^* = \alpha_1 g + \alpha_2 \sigma + \alpha_3 I_{-1} + Z\lambda + X\xi + u, \qquad (6)$$

where $u \sim N(0,1)$. Based on the discussion in section 2, our priors for the key effects are $\alpha_1 > 0$, $\alpha_2 < 0$ and $\lambda_i < 0$ (where λ_i, the effects of funding states relative to externally funded firms, are the elements of the column vector λ).
A single-equation estimator of (6) is subject to simultaneous equation bias as g is an endogenous variable (see section 3). Therefore, to address simultaneous equation bias, equations (6) and (5) are estimated jointly using a bivariate probit estimator (e.g., Greene, 2019).[25] This estimator uses the assumption

$$\begin{pmatrix} u \\ v \end{pmatrix} \sim BN\left[0, \begin{pmatrix} 1 & \square \\ \rho_{uv} & 1 \end{pmatrix}\right].$$

To test the direct and indirect effects of funding states on investment plans, we estimate the marginal effects of funding states on investment plans. These effects encompass the direct effects of funding states on investment plans holding growth expectations constant, obtained from equation (6), the indirect effects of funding states on investment plans through growth expectations, obtained from equations (5) and (6), and the total (direct plus indirect) effects.

[24] While we have no data on firms' cost of capital, previous studies show investment is insensitive to interest rates which affect the cost of capital (Sharpe and Suarez, 2021).
[25] In linear models, exclusion restrictions are required to identify the effects of endogenous explanatory variables (e.g., Greene, 2019). However, exclusion restrictions are not required to identify multiple equation probit models with endogenous dummy regressors (Wilde, 2000). In particular, exclusion restrictions are not required if there is sufficient variation in the data, which is ensured by the assumption that each equation contains at least one varying exogenous regressor (Wilde, 2000). This assumption applies to our model thus supporting the identification of the effects of growth expectations in equation (6).

5. Data

This study uses the UK Longitudinal Small Business Survey (LSBS) 2015-2023, a large-scale annual business survey of owners and managers in the UK, commissioned by the Department of Business and Trade. This data set provides longitudinal coverage over a range of firm characteristics, including business-investment plans, growth expectations, financial access, and firm performance. In each survey, a subset of firms from the previous year is interviewed and topped up with a fresh sample of firms to mitigate sample attrition. Due to oversampling of larger businesses, we use longitudinal weights to obtain unbiased and representative results for the UK SME population.

Firms are asked in each survey about their forward-looking investment plans in the next three years. This includes plans for capital investment (e.g., in machinery and buildings) ('*plan_capital*), R&D investment ('*plan_rnd*'), introducing new products or services ('*plan_prod*), introducing new working practices ('plan_proc'), developing leadership capability ('*plan_leader*'), and developing employees' skills ('*plan_skills*'). Before 2018, all firms in the sample were asked about their investment plans. However, from 2018, only a randomised sub-sample of a third of the whole sample are asked about investment plans.

Firms are also asked about their growth performance in the current year and their growth expectation for the next year. Accordingly, LSBS allows us to track a business's ex-ante expected growth and ex-post realised growth and accordingly capture the '*expectation error*'. In particular, '*growth expectation*' and '*growth*' take the values of 1 if growth is expected/realised and 0 otherwise. An ordinal variable '*error'* is given by the difference between ex-post realised growth for year *t* and ex-ante expected growth for year t formed in year $t-1$, which takes values in the range $[-1, 1]$. A binary variable '*uncertainty'* is measured as the absolute value of '*error*'.

To capture funding states, we use firms' answers to a number of questions. Firms are asked if they applied for external finance in the last 12 months, and if their application was accepted or rejected. Firms are also asked if they had a need for finance, and if they applied or not, and if not, whether it was due to being afraid of rejection, the process of applying taking too long or not wanting to take additional risk. Accordingly, a categorical variable 'funding' is defined as taking a value of 0 if a firm's finance application(s) is/are accepted (*FF*), 1 if a firm's application(s) is/are rejected (RB), 2 if a firm did not apply for finance because they thought they would be rejected or the process would take too long (DB), 3 if a firm did not apply because they did not want to take additional risk (RA), and 4 if a firm did not have a need for external finance (NN).

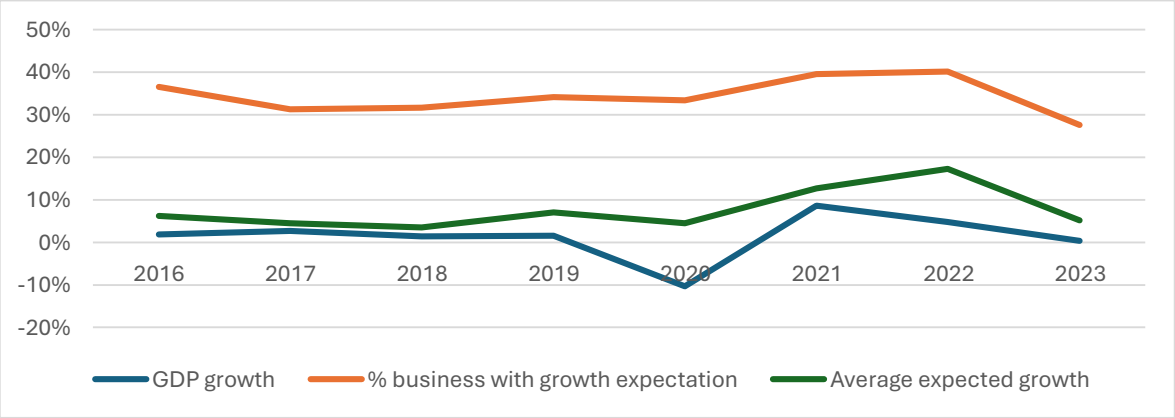
The model also includes a range of control variables for firm and owner characteristics as discussed in section 2. These include controls for industry, size, age, legal status, exporting status, a London location, an urban location, women-led businesses, and ethnic-minority-led businesses. Variable definitions, along with descriptive statistics, are provided in Table 1.

6. Results

Growth expectation and investment plans

In Figure 1, we begin by showing the cyclicality of business growth expectation by plotting the proportion of businesses expecting (in year $t-1$) growth in year t, the average expected growth in year t (formed in year $t-1$), and UK annual GDP growth rates[26] in year t over the period of 2016-2023.[27] The proportion of firms expecting growth, which ranges between 28 percent and 40 percent, fell from 38 percent in 2016 to 28 percent in 2023. Overall, there are moderate correlations between '*growth expectation*' /*'expected growth'* (from our data) and GDP growth (from ONS data). The correlation coefficients are 0.45 ('*growth expectation*'-GDP growth) and 0.57 ('*expected growth*'-GDP growth) (see Table 1), but they are not statistically significant (probably due to the small number of observations).

Figure 1: Growth expectation and UK GDP growth



This graph plots the proportion of business with growth expectation for year t formed at year t-1, the average expected growth for year t formed at year t-1, and UK GDP growth at year t over the period of 2016-2023.

Table 1: Correlation between growth expectation and GDP growth

	Growth-expectation	Expected growth	GDP growth
Growth-expectation	1.000		
Expected growth	0.825**	1.000	
GDP growth	0.446	0.569	1.000

To illustrate the correlation between growth expectation and investment plans from our sample, Figures 2A-2C plot the proportions of firms expecting growth over the next 12 months and firms having investment plans over the next 3 years, and Table 2 shows the correlation coefficients. The correlation coefficients are significant and range between 0.19 and 0.27. Figure 2A shows that capital investment is positively correlated with growth expectation over the period of 2015-2023. R&D investment also correlates with growth expectation although

[26] Gross Domestic Product: Year on Year growth: CVM SA % - Office for National Statistics
[27] The first year of LSBS is 2015 and therefore the first ex-ante growth expectation in year 2015 relates to expectations for growth in 2015-16.

the proportion of firms having R&D investment plans gradually increased over the period. Figure 2B shows that plans for developing new products or introducing new processes also seem to track growth expectations, with the correlation coefficient between 0.22 and 0.27. Investment in leadership and employee skills shows correlation with growth expectation (Figure 2C), with the correlation coefficient around 0.20.

Figure 2A: Growth expectation and capital investment and R&D investment plans

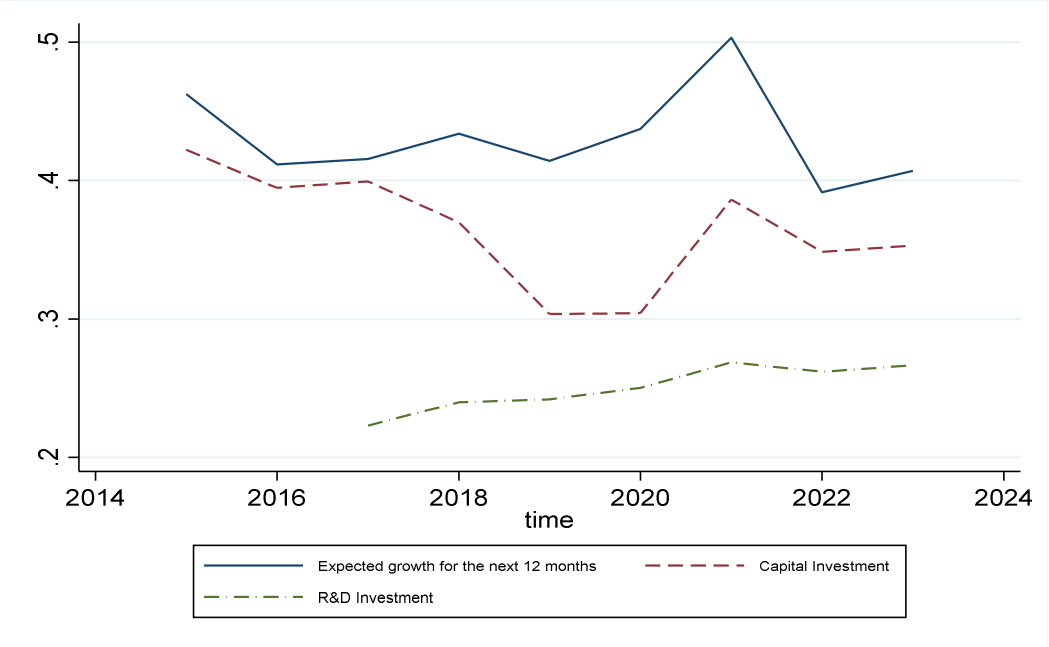


Figure 2B: Growth expectation and plans for new products or processes

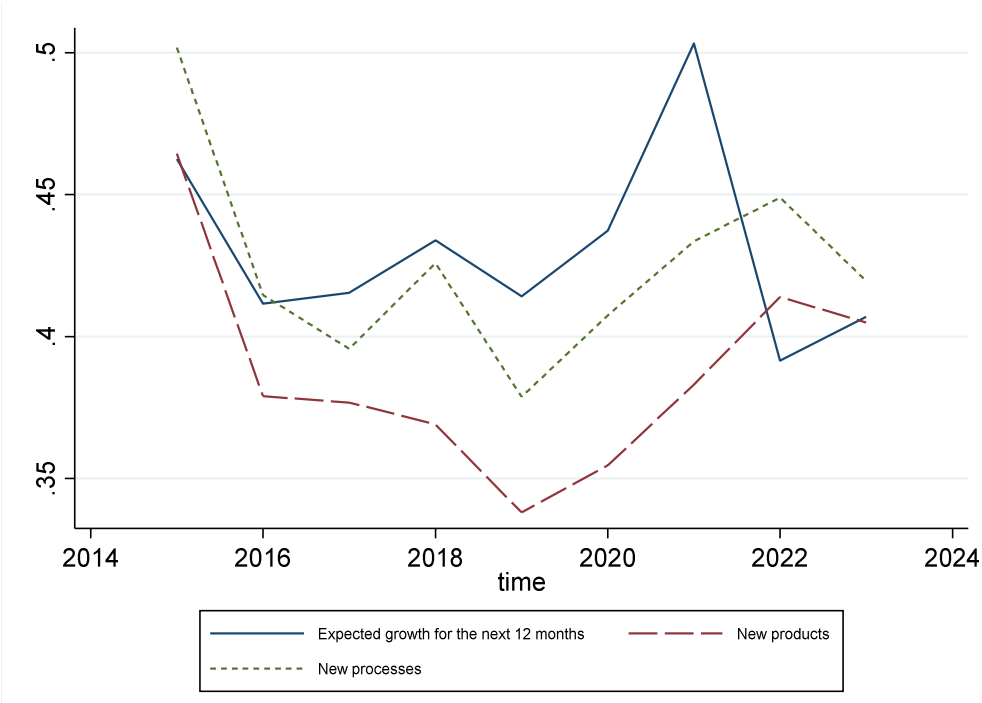
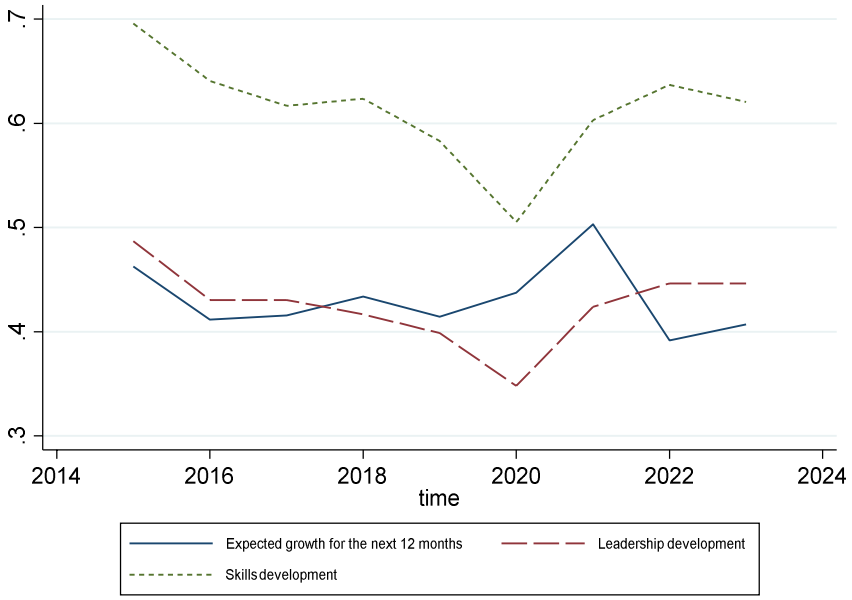


Figure 2C: Growth expectation and plans for skills investment



This graph plots growth expectation for the next 12 months and capital investment plans and R&D investment plans in Panel A, innovation investment plans in Panel B (including new products and new processes), and skills investment in Panel C (including leadership development and employee skills development).

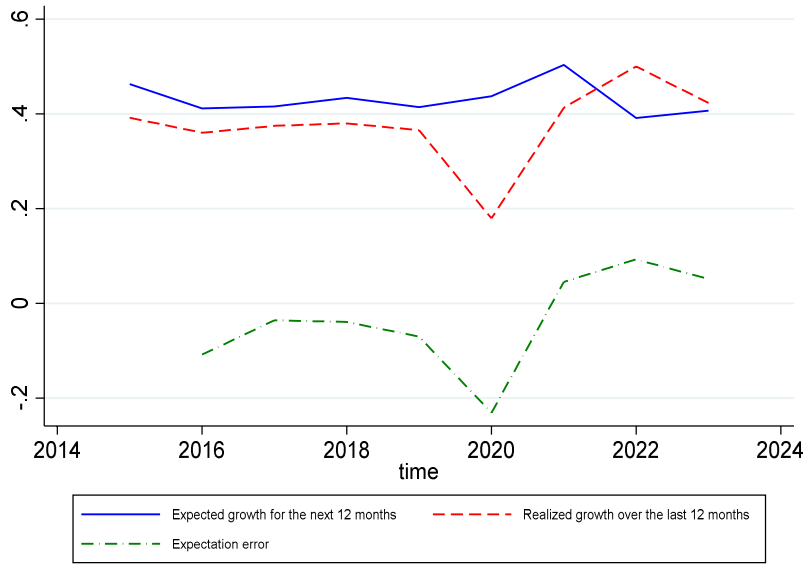
Table 2: Correlation between growth expectation and investment plans

	Growth-expect	Plan_ capital	Plan_ rnd	Plan_ prod	Plan_ proc	Plan_ leader	Plan_ skills
Growth-expect	1.000						
Plan_capital	0.187***	1.000					
Plan_rnd	0.208***	0.276***	1.000				
Plan_prod	0.272***	0.288***	0.417***	1.000			
Plan_proc	0.228***	0.302***	0.318***	0.406***	1.000		
Plan_leader	0.220***	0.278***	0.277***	0.319***	0.396***	1.000	
Plan_skills	0.223***	0.306***	0.275***	0.347***	0.417***	0.511***	1.000

Growth expectation and growth outcome

The correlation between growth expectation for the next 12 months and means of growth outcome over the last 12 months for the period from 2015 to 2023 are shown in Figure 3 and Table 3. It shows a learning effect between realised growth and expected growth, where growth expectation for the next 12 months tracks past growth performance. There is also a significant correlation of 0.238 between growth expectation and realised growth.

Figure 3: Growth expectation, growth outcome and expectation error over 2015-2023



This graph shows the correlation between means of growth outcome at time t (dash line), means of growth expectation formed at time t for time t+1 (solid line), and means of expectation error at time t (dash-dot line). Expectation error is calculated as the difference between ex-post growth outcome at time t and ex-ante growth expectation formed at time t-1 for time t. The y-axis shows the proportion of firms. Frequency is yearly.

Table 3: Correlations between growth expectation, realised growth and expectation error

	Growth-expectation	Realised growth	Expectation error
Growth-expectation	1.000		
Realised growth	0.238***	1.000	
Expectation error	-0.143***	0.594***	1.000

Table 4 shows the population-weighted summary statistics of other variables used in this study. Overall, a quarter of SMEs planned to have capital investment. Around 16 percent of SMEs planned for R&D investment. Around a quarter of SMEs planned to introduce new products or processes. Around 18 percent of SMEs planned to develop leadership capabilities, and 34 percent of SMEs planned for employee skills development.

About a third of SMEs expected growth in the next 12 months. While 18 percent of SMEs overestimated their growth (resulting in a negative growth surprise), 15 percent of SMEs underestimated growth (and therefore experienced a positive growth surprise).

In terms of funding states, 89 percent of SMEs mentioned they did not need external finance ('no-need'). Meanwhile, around 5 percent of SMEs applied for any finance and were approved, while 2.4 percent were rejected. Around 2 percent of SMEs stated that fear of rejection and/or a long application process were the main reasons stopping them from applying even though they had a financial need. About 2 percent of SMEs stated risk-aversion as the main reason for not applying despite having a financial need.

Table 4: Variable description and summary statistics

Variable	Description	N	Mean	Std. dev.	Min	Max
plan_capital	=1 if having an investment plan on fixed capital in the next 3 years; =0 otherwise	15,019	0.237	0.425	0	1
plan_rnd[28]	=1 if having an investment plan on R&D activities in the next 3 years; =0 otherwise	9,807	0.158	0.364	0	1
plan_prod	=1 if having a plan to introduce new products or services in the next 3; =0 otherwise years	15,019	0.279	0.449	0	1
plan_proc	=1 if having a plan to introduce new working practices in the next 3; =0 otherwise years	15,019	0.254	0.435	0	1
plan_leader	=1 if having a plan to develop leadership capability in the next 3 years; =0 otherwise	15,019	0.176	0.381	0	1
plan_skills	=1 if having a plan to develop skills of employees in the next 3 years; =0 otherwise	15,019	0.341	0.474	0	1
growthexp	=1 if expecting to increase growth for the next 12 months; =0 otherwise	15,019	0.318	0.466	0	1
Error	Ordinal variable in [-1, 1] when realized growth and expected growth take the values of 1 if growth and 0 otherwise	15,019	-0.033	0.579	-1	1
Positive	Dummy variable if error is positive	15,019	0.151	0.358	0	1
Uncertainty	=absolute value of error	15,019	0.336	0.472	0	1
Funding states						
Accepted finance (FF)	funding =1 if business applied for external finance and got accepted	15,019	0.049	0.215	0	1
Discouraged borrowers (DB)	funding =2 if business was discouraged borrower (i.e., had a need for finance but did not apply for it because it thought it could be rejected)	15,019	0.021	0.144	0	1
Rejected borrowers (RB)	funding =3 if business applied and got rejected	15,019	0.024	0.152	0	1

[28] Only available from 2018.

Risk-averse borrowers (RA)	funding =4 if business had a need for external finance but did not apply since it did not want to increase risk level	15,019	0.021	0.143	0	1
No-need business (NN)	funding =5 if business was did not need external finance	15,019	0.886	0.318	0	1
Sector						
C - Manufacturing	sector =2 if business is in sector C- Manufacturing	15,019	0.661	0.473	0	1
J - Information/ Communication	sector =3 if in sector J - Information/ Communication	15,019	0.053	0.224	0	1
KL - Financial/ Real Estate	sector =4 if in sector KL - Financial/ Real Estate	15,019	0.071	0.256	0	1
M - Professional/ Scientific	sector =5 if in sector MN - Professional/ Scientific/Administrative services	15,019	0.042	0.200	0	1
R - Arts/ Entertainment	sector =6 if R – Art/Entertainment	15,019	0.133	0.340	0	1
Others	Sector=1 if other sectors	15,019	0.040	0.196	0	1
Legal status						
Sole proprietorship	legal=1 if business is sole proprietor	15,019	0.433	0.496	0	1
Company	legal =2 if a company	15,019	0.474	0.499	0	1
Partnership	legal =3 if a partnership	15,019	0.079	0.269	0	1
Other	legal =4 if other legal forms	15,019	0.014	0.118	0	1
Business age						
0-3 years old	age=1 if business is up to 3 years old	15,019	0.036	0.186	0	1
4-5 years	age=2 if business is 4 - 5 years old	15,019	0.063	0.242	0	1
6-10 years	age=3 if business is 6 – 10 years old	15,019	0.194	0.396	0	1
11-20 years	age=4 if business is 11 - 20 years old	15,019	0.258	0.438	0	1
20+ years	age=5 if business is more than 20 years old	15,019	0.449	0.497	0	1
Business size						
no employee	size=1 if business did not have any employee	15,019	0.754	0.431	0	1
micro 1-4	size=2 if 1 – 4 employees	15,019	0.159	0.365	0	1
micro 5-9	size=2 if 5 – 9 employees	15,019	0.046	0.209	0	1
small 10-49	size=2 if 10 – 49 employees	15,019	0.036	0.186	0	1
medium 50+	size=2 if 50+ employees	15,019	0.006	0.074	0	1

Export	=1 if business exported products	15,019	0.154	0.361	0	1
London-based	=1 if business is based in London	15,019	0.103	0.304	0	1
Urban	=1 if business is based in an urban area	15,019	0.699	0.459	0	1
Wled	=1 if business is led by women	15,019	0.189	0.392	0	1
Mled	=1 if business is led by ethnic-minority	15,019	0.038	0.192	0	1

Just over 66 percent of SMEs are in manufacturing sectors, 5.3 percent in information or communication sectors, 7.1 percent in financial services or real estate sectors, 4.2 percent in professional services, scientific, or administration services, and 13.3 percent in arts and entertainment sectors. 43 percent of SMEs are sole proprietorships, 47 percent are companies, 8 percent are partnerships, and 1.4 percent are in other legal forms. Mature businesses, established for more than 20 years, account for 45 percent of SMEs, and firms established for between 6 and 20 years account for another 45 percent of SMEs. Start-ups account for 3.6 percent and firms aged between 4 and 5 years account for 6.3 percent of SMEs. A vast majority – three quarters – of businesses are self-employed, micro businesses (1-9 employees) account for 20 percent of SMEs, small businesses account for 3.6 percent while medium-sized firms account for less than 1 percent of SMEs. About 15 percent of SMEs exported their products or services overseas. 10 percent of SMEs are based in London with 70 percent based in urban locations. Around 20 percent of SMEs are led by women, and 4 percent are led by an individual from an ethnic-minority group.

6.1. Impacts of growth expectation and funding states on investment plans

Table 5, panel A presents the impacts of growth expectations, uncertainty and funding states on plans for investment in capital, innovation and skills. It shows that growth expectations drive investment plans across all types of tangible and intangible capital. The effects are strongest for product and process innovation, suggesting a relationship between growth and innovation. Surprisingly, uncertainty, measured as the absolute value of the expectation error, does not have a significant (negative) impact on investment plans.

Funding states, as expected, have negative direct impacts on investment plans. The statistical significance of one-period lags of funding-state variables, holding growth expectations constant, suggests information costs impact negatively on future investment propensity. In particular, the DB state reduces the propensity for investment plans in fixed capital and leadership capability development by 8.8 pp and 8.1 pp respectively. The RB state reduces the likelihood of planning for investment in fixed capital and workforce skills by 9.8 pp and 23.7 pp respectively.

Meanwhile, risk-averse entrepreneurs are less likely to invest in R&D and new processes, while firms with no external-finance needs are less likely to have investment plans for capital investment, product and process innovation, and skills development. In particular, holding growth expectation constant, RA associates with a 9.8 pp and 9.3 pp lower propensity for R&D investment and process-innovation investment plans respectively, and NN entrepreneurs also associate with lower propensities of investment plans in fixed capital (16.7 pp), product innovation (15.0 pp), process innovation (21.9 pp), leadership development (13.3 pp), and

employees' skills (13.5 pp). This shows the negative direct effects of demand-side constraints, including debt/control aversion and risk aversion, on innovation-investment propensity.

Table 5: Bivariate probit model of investment plans and growth expectation

	Plan_capital	Plan_R&D	Plan_prod	Plan_proc	Plan_leader	Plan_skills
	b/se	b/se	b/se	b/se	b/se	b/se
Panel A: Investment plans						
Growthexp	0.638***	0.642*	0.754***	0.698***	0.538***	0.557***
	(0.134)	(0.334)	(0.129)	(0.125)	(0.131)	(0.139)
Uncertainty	0.067	0.046	0.094*	0.111**	0.020	0.074
	(0.054)	(0.117)	(0.055)	(0.053)	(0.057)	(0.055)
DB_t	0.073	-0.113	0.030	-0.116	0.158	-0.058
	(0.184)	(0.448)	(0.189)	(0.202)	(0.212)	(0.221)
RB_t	0.133	0.816**	0.220	0.004	-0.113	-0.225
	(0.181)	(0.366)	(0.189)	(0.186)	(0.178)	(0.192)
RA_t	-0.022	0.516	-0.076	0.010	-0.389**	0.222
	(0.179)	(0.396)	(0.201)	(0.187)	(0.182)	(0.206)
NN_t	-0.186*	0.187	-0.104	-0.156	-0.185*	-0.126
	(0.111)	(0.190)	(0.105)	(0.105)	(0.110)	(0.113)
DB_{t-1}	-0.335**	0.387	-0.151	-0.196	-0.403**	0.024
	(0.158)	(0.419)	(0.175)	(0.174)	(0.184)	(0.183)
RB_{t-1}	-0.379**	-0.190	-0.221	-0.160	-0.136	-0.317*
	(0.166)	(0.307)	(0.159)	(0.155)	(0.158)	(0.167)
RA_{t-1}	0.231	-0.722*	-0.267	-0.339**	0.103	0.016
	(0.175)	(0.380)	(0.181)	(0.161)	(0.218)	(0.183)
NN_{t-1}	-0.206**	-0.049	-0.236**	-0.309***	-0.207**	-0.177*
	(0.089)	(0.160)	(0.110)	(0.093)	(0.095)	(0.099)
C Manufacturing	0.257**	0.229	0.411***	0.166	-0.120	-0.034
	(0.104)	(0.182)	(0.110)	(0.115)	(0.114)	(0.113)
J Information	0.143	0.413**	0.455***	0.106	0.144	0.344***
	(0.088)	(0.185)	(0.088)	(0.085)	(0.091)	(0.085)
KL Finance/Real estate	-0.139	-0.200	-0.084	-0.098	-0.145	-0.003
	(0.098)	(0.186)	(0.099)	(0.095)	(0.097)	(0.089)
MN Professional/Admin	0.001	0.070	0.035	-0.042	0.199**	-0.021
	(0.090)	(0.179)	(0.082)	(0.083)	(0.092)	(0.083)
R Arts/Entertainment	0.153	0.305	0.199	0.294**	0.178	0.011
	(0.154)	(0.245)	(0.152)	(0.140)	(0.164)	(0.146)
Company	-0.015	-0.063	0.078	0.146**	0.288***	0.231***
	(0.062)	(0.147)	(0.065)	(0.063)	(0.073)	(0.061)
Partnership	0.164*	-0.119	-0.108	0.151*	0.188**	0.176**
	(0.085)	(0.227)	(0.093)	(0.083)	(0.094)	(0.083)
Other legal status	-0.117	-0.510	-0.121	0.228	0.543**	0.069
	(0.238)	(0.425)	(0.235)	(0.221)	(0.247)	(0.208)
no employee	-0.619***	-0.575***	-0.113	-0.443***	-1.169***	-1.088***

	(0.073)	(0.173)	(0.073)	(0.073)	(0.083)	(0.081)
micro 1-4	-0.512***	-0.326**	0.064	-0.281***	-0.810***	-0.579***
	(0.064)	(0.156)	(0.064)	(0.063)	(0.074)	(0.073)
micro 5-9	-0.389***	-0.221	0.084	-0.223***	-0.535***	-0.479***
	(0.064)	(0.161)	(0.065)	(0.063)	(0.073)	(0.074)
small 10-49	-0.203***	-0.277**	0.093*	-0.042	-0.292***	-0.146**
	(0.053)	(0.135)	(0.053)	(0.052)	(0.063)	(0.064)
4-5 years	-0.179	0.701**	0.191	0.066	0.083	0.177
	(0.154)	(0.354)	(0.154)	(0.170)	(0.166)	(0.172)
6-10 years	-0.093	0.611**	0.085	0.050	-0.089	0.204
	(0.141)	(0.277)	(0.137)	(0.159)	(0.146)	(0.159)
11-20 years	-0.185	0.530**	0.110	0.110	-0.143	0.155
	(0.141)	(0.269)	(0.137)	(0.159)	(0.145)	(0.161)
20+ years	-0.138	0.402	0.042	0.043	-0.147	0.082
	(0.136)	(0.278)	(0.133)	(0.156)	(0.141)	(0.158)
Export	-0.090	0.250*	0.324***	0.075	0.031	0.164***
	(0.057)	(0.130)	(0.059)	(0.061)	(0.060)	(0.061)
London	0.142*	0.116	-0.050	0.020	0.128	0.003
	(0.085)	(0.164)	(0.085)	(0.083)	(0.080)	(0.083)
Rural	0.112**	0.048	-0.007	0.030	-0.060	0.008
	(0.055)	(0.131)	(0.058)	(0.054)	(0.059)	(0.054)
Women	-0.222***	-0.260	0.086	0.128*	-0.038	0.085
	(0.073)	(0.172)	(0.070)	(0.068)	(0.071)	(0.067)
Ethnic	0.022	0.396*	0.179	0.307**	0.097	-0.082
	(0.133)	(0.219)	(0.121)	(0.124)	(0.128)	(0.129)
plan_capital$_{t-1}$	0.964***					
	(0.052)					
plan_R&D$_{t-1}$		1.573***				
		(0.120)				
plan_prodinn$_{t-1}$			1.126***			
			(0.054)			
plan_ prodinn$_{t-1}$				0.944***		
				(0.052)		
plan_leader$_{t-1}$					1.046***	
					(0.055)	
plan_skills$_{t-1}$						1.056***
						(0.053)
2016	0.329**		-0.182	-0.143	0.586***	0.917***
	(0.164)		(0.156)	(0.148)	(0.099)	(0.092)
2017	0.377**		-0.042	-0.051	0.752***	1.094***
	(0.165)		(0.158)	(0.151)	(0.103)	(0.095)
2018	0.442**	0.447***	0.056	0.146	0.802***	1.191***
	(0.180)	(0.169)	(0.173)	(0.166)	(0.134)	(0.120)
2019	-0.003	0.285	-0.245	-0.144	0.410***	0.765***
	(0.188)	(0.177)	(0.183)	(0.180)	(0.148)	(0.147)
2021	0.033	0.083	-0.188	-0.075	0.146	0.248**
	(0.219)	(0.204)	(0.204)	(0.202)	(0.134)	(0.126)
2022	0.547**	0.285	0.001	0.134	0.098	0.272**
	(0.229)	(0.234)	(0.216)	(0.213)	(0.136)	(0.133)
2023	0.036	0.104	-0.348	-0.377*	0.213	0.342***

	(0.245)	(0.323)	(0.238)	(0.216)	(0.131)	(0.123)
Constant	-0.555**	-2.117***	-1.126***	-0.624**	-0.739***	-1.091***
	(0.272)	(0.499)	(0.262)	(0.268)	(0.247)	(0.258)
Panel B: Growth expectation						
Growthexp$_{t-1}$	1.285***	1.279***	1.277***	1.284***	1.281***	1.284***
	(0.058)	(0.058)	(0.058)	(0.058)	(0.058)	(0.058)
Expectation error	0.378***	0.367***	0.365***	0.378***	0.372***	0.380***
	(0.063)	(0.063)	(0.063)	(0.063)	(0.064)	(0.064)
Positive error	0.022	0.022	0.015	0.018	0.021	0.020
	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)
DB$_t$	0.137	0.133	0.137	0.135	0.134	0.138
	(0.171)	(0.171)	(0.171)	(0.172)	(0.172)	(0.171)
RB$_t$	-0.049	-0.052	-0.055	-0.057	-0.053	-0.050
	(0.156)	(0.156)	(0.155)	(0.156)	(0.156)	(0.156)
RA$_t$	0.259	0.253	0.258	0.254	0.255	0.254
	(0.168)	(0.168)	(0.169)	(0.169)	(0.169)	(0.169)
NN$_t$	-0.221**	-0.225**	-0.224**	-0.224**	-0.224**	-0.224**
	(0.102)	(0.101)	(0.102)	(0.102)	(0.102)	(0.102)
DB$_{t-1}$	0.222	0.221	0.223	0.217	0.220	0.221
	(0.151)	(0.151)	(0.151)	(0.150)	(0.151)	(0.150)
RB $_{t-1}$	0.104	0.105	0.108	0.109	0.105	0.106
	(0.150)	(0.151)	(0.151)	(0.149)	(0.150)	(0.149)
RA $_{t-1}$	-0.004	-0.003	0.006	0.002	-0.004	0.001
	(0.146)	(0.145)	(0.144)	(0.145)	(0.146)	(0.145)
NN $_{t-1}$	0.009	0.009	0.010	0.006	0.009	0.010
	(0.078)	(0.078)	(0.079)	(0.078)	(0.078)	(0.078)
C Manufacturing	0.005	0.005	-0.002	0.002	0.005	0.003
	(0.082)	(0.082)	(0.083)	(0.082)	(0.082)	(0.082)
J Information	0.098	0.098	0.098	0.099	0.096	0.099
	(0.076)	(0.076)	(0.076)	(0.076)	(0.076)	(0.076)
KL Finance/Real estate	-0.019	-0.017	-0.017	-0.021	-0.018	-0.017
	(0.082)	(0.082)	(0.082)	(0.082)	(0.082)	(0.082)
MN Professional/Admin	0.037	0.039	0.043	0.041	0.038	0.039
	(0.071)	(0.071)	(0.071)	(0.071)	(0.071)	(0.071)
R Arts/Entertainment	0.052	0.054	0.058	0.060	0.055	0.055
	(0.126)	(0.126)	(0.126)	(0.126)	(0.126)	(0.126)
Company	0.097*	0.099*	0.096*	0.098*	0.098*	0.097*
	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)
Partnership	0.064	0.066	0.063	0.067	0.066	0.066
	(0.076)	(0.076)	(0.077)	(0.076)	(0.076)	(0.076)
Other	0.069	0.077	0.067	0.069	0.077	0.074
	(0.229)	(0.228)	(0.227)	(0.228)	(0.228)	(0.227)
no employee	-0.486***	-0.487***	-0.489***	-0.489***	-0.487***	-0.488***
	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)
micro 1-4	-0.389***	-0.390***	-0.392***	-0.391***	-0.390***	-0.390***
	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)

micro 5-9	-0.233***	-0.235***	-0.235***	-0.238***	-0.234***	-0.234***
	(0.052)	(0.052)	(0.052)	(0.052)	(0.052)	(0.052)
small 10-49	-0.164***	-0.164***	-0.166***	-0.167***	-0.164***	-0.165***
	(0.043)	(0.043)	(0.044)	(0.044)	(0.043)	(0.043)
4-5 years old	0.003	-0.000	-0.001	0.003	0.000	0.000
	(0.140)	(0.140)	(0.140)	(0.140)	(0.140)	(0.140)
6-10 years	-0.339***	-0.340***	-0.343***	-0.337***	-0.339***	-0.340***
	(0.121)	(0.121)	(0.120)	(0.120)	(0.120)	(0.121)
11-20 years	-0.419***	-0.421***	-0.423***	-0.420***	-0.420***	-0.421***
	(0.118)	(0.118)	(0.117)	(0.118)	(0.118)	(0.119)
20+ years	-0.529***	-0.533***	-0.535***	-0.531***	-0.531***	-0.533***
	(0.115)	(0.115)	(0.114)	(0.115)	(0.115)	(0.116)
Export	0.075	0.076	0.078	0.074	0.076	0.074
	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)
London	0.098	0.095	0.097	0.098	0.096	0.097
	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)
Rural	-0.025	-0.025	-0.026	-0.027	-0.025	-0.025
	(0.047)	(0.048)	(0.048)	(0.047)	(0.048)	(0.047)
Women	0.027	0.029	0.029	0.030	0.029	0.028
	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)
Ethnic	-0.067	-0.069	-0.070	-0.077	-0.069	-0.070
	(0.108)	(0.108)	(0.108)	(0.109)	(0.108)	(0.108)
2016	-0.353***	-0.351***	-0.349***	-0.352***	-0.351***	-0.352***
	(0.086)	(0.086)	(0.086)	(0.086)	(0.086)	(0.086)
2017	-0.217**	-0.212**	-0.210**	-0.215**	-0.213**	-0.216**
	(0.089)	(0.089)	(0.090)	(0.089)	(0.089)	(0.089)
2018	-0.372***	-0.372***	-0.368***	-0.370***	-0.372***	-0.371***
	(0.118)	(0.117)	(0.117)	(0.117)	(0.117)	(0.117)
2019	-0.211**	-0.209**	-0.207*	-0.209**	-0.210**	-0.211**
	(0.105)	(0.105)	(0.105)	(0.105)	(0.105)	(0.105)
2021	-0.358***	-0.355***	-0.353***	-0.358***	-0.356***	-0.358***
	(0.116)	(0.117)	(0.117)	(0.117)	(0.117)	(0.117)
2022	-0.518***	-0.514***	-0.510***	-0.517***	-0.515***	-0.518***
	(0.136)	(0.136)	(0.136)	(0.136)	(0.136)	(0.136)
2023	-0.464***	-0.462***	-0.457***	-0.464***	-0.463***	-0.464***
	(0.121)	(0.121)	(0.121)	(0.121)	(0.121)	(0.121)
Constant	0.244	0.249	0.252	0.252	0.247	0.250
	(0.176)	(0.176)	(0.176)	(0.177)	(0.176)	(0.177)
N. of obs.	15,019	15,019	15,019	15,019	15,019	15,019

*This table presents results from the bivariate probit model of (1) investment plans and (2) growth expectation. For (1), growth expectation, uncertainty, current and lagged funding states, sectors, size, age, legal status, location, women- and ethnic-minority-led businesses, lagged investment plans and time dummies are included. For (2), lagged values of growth expectation, current and lagged funding states, sectors, size, age, legal status, location, women- and ethnic-minority-led businesses and time dummies are included. For both equations, the base category for sectors, size, age, legal status, location, time are Other sectors, medium size (having at least 50 employees), startup (0-3 years), proprietorship, non-London based location, urban-based location, and 2020, respectively. *, ** and *** represent significance at 10%, 5% and 1% respectively.*

There are also some sectoral differences in investment plans. Businesses in manufacturing sectors have a higher propensity for investment in fixed capital and new products, while businesses in information and communication sectors are more likely to invest in R&D, product

innovation and employee skills. Businesses in professional and scientific services and administration services are more likely to invest in leadership development, and those in arts and entertainment sectors are more likely to invest in new processes. Business size affects investment-plan propensities, with smaller firms less likely to have investment plans for both tangible and intangible capital. Meanwhile, in most cases, there is no relationship between business age and investment propensity. However, somewhat surprisingly, start-ups are less likely to have R&D investment plans than more established firms.

Rural firms are more likely to have tangible, but not intangible, capital-investment plans. Women-led businesses are less likely to have capital-investment plans, while ethnic-minority-led business are more likely to have process-innovation investment plans. Businesses that exported products are more likely to have product-innovation and skills-investment plans.

6.2. Impacts of learning, cognitive bias and funding states on growth expectation

Table 5, panel B presents the impacts of learning and funding states on growth-expectation formation.

The results show businesses learn from past experiences when forming their growth expectations in the next period as 'expectation error' has positive effects on growth expectation. This suggests that businesses incorporate information contained in 'growth surprise' in revising growth expectations such that a positive surprise (when actual growth exceeds expected growth) leads to an upward revision in growth expectations and a negative surprise leads to a downward revision. The statistical insignificance of 'positive error' indicates that firms update their expectations symmetrically. Accordingly, information from both positive and negative surprises are incorporated equally when revising growth expectations supporting rational learning about growth.

Negative financing experiences do not, in general, scar firms' growth expectations as both current and one-period lags of DB and RB states do not have significant impacts on growth expectations among all SMEs. RA businesses are also not less likely to expect growth. However, businesses with no external-finance needs are less likely to expect growth, which is consistent with lower growth ambition (as when we control for growth ambition, the effects of no external-finance needs on growth expectation turn insignificant, as shown in Table A.1 in the Appendix).

Smaller businesses, with fewer than 50 employees, are less likely to expect growth than larger businesses, while more established businesses are less likely to expect growth than start-ups.

6.3. The total impacts of funding states, growth expectation, and learning on investment plans

Table 6 presents the direct effects of growth expectations on investment propensity (Column (1)), the indirect effects of learning on investment through growth expectations (Column (2)), and the direct, indirect and total effects of funding state on investment propensity (Columns (1)-(3)). Panel A shows results for capital investment, panel B for R&D investment, panel C for product innovation, panel D for process innovation, panel E for leadership development, and panel F for employee-skills development.

Growth expectations have significant impacts on investment plans across all types of tangible and intangible capital. Growth expectations have strongest impacts on innovation-investment plans while impacting least on skills investment. Compared to those not expecting growth,

businesses expecting growth are 18.2 pp more likely to have capital investment, 12.2 pp more for R&D investment, 21.1 pp more for product innovation, 20.3 pp more for process innovation, 11.9 pp more for leadership development, and 16.3 pp more for skills development. These are statistically and economically significant increases relative to the respective investment-plan probabilities for firms that do not expect to grow, which are 19.5, 13.3, 21.3, 19.5, 15.4 and 32.9 percent.

Discouraged borrowing and rejection have negative *direct* effects on investment propensity (holding growth expectations constant) indicative of higher investment/information costs. For instance, Panel A shows that, holding growth expectations constant, businesses that are discouraged in the year before are 8.8 pp less likely to plan for capital investment in the next three years. Having financing applications rejected also directly reduces capital-investment plans by about 9.8 pp. Looking at demand-side financing issues, risk-aversion *directly* reduces investment propensity for R&D activities and process innovation by 9.8 pp and 9.3 pp respectively, but not other types of investment. Perceiving no financial need in the current and previous period also associates with directly lower investment propensities. Holding growth expectations constant and combining negative effects of current and previous period, compared to firms with external finance, firms with no external-finance need in the previous year are 16.7 pp less likely to invest in fixed capital, 15 pp less likely for product-innovation plans, 21.9 pp less likely for process innovation, 13.3 pp less likely for leadership development, and 13.5 pp less likely for employee skills development. This supports the negative effects of demand-side investment/cognition costs (i.e., debt/control aversion among NN firms and risk aversion among RA firms) on investment planning. These are (statistically and economically) significant reductions compared to investment-plan probabilities for fully funded firms of 35.4 percent (capital), 15.1 percent (R&D), 36.7 percent (product-innovation), 38.5 percent (process-innovation), 27.9 percent (leadership skills) and 45.9 percent (workforce skills).

Table 6 also shows the indirect investment-propensity effects of funding states through growth expectations. These indirect effects reduce investment propensities among firms with no external-finance needs (relative to firms with external finance) in the range 1.4-1.9 pp across all types of investment plan. This indicates that, in addition to direct demand-side investment-cost effects due to debt/control aversion, investment propensities among firms with no external-finance needs are further reduced by low-growth ambition. The total reductions (encompassing both debt/control aversion and low-growth ambition) in the likelihood of investment plans for firms with no external-finance needs relative to otherwise similar externally financed firms are 18.2, 16.8, 23.6, 14.6, and 14.9 pp for capital, product-innovation, process-innovation, leadership-skills and workforce-skills investment plans respectively. Again, these are statistically and economically significant reductions relative to the investment-plan probabilities of fully funded firms.

Interestingly, there is also evidence of positive indirect investment-propensity effects among DB firms. This is consistent with high-growth ambition among DB firms (and the previously noted absence of scarring effects of negative financing experiences on growth expectations). The results do not support irrationality in growth expectations and investment plans. The significant indirect effects of 'expectation error', and insignificant indirect effects of 'positive error', show investment plans adjust rationally to new information about growth.

Table 6: Direct effects of funding states and growth expectation on investment plans and indirect effects of funding states and learning on investment plans through growth expectation

	Direct effects	**Indirect effects**	**Total effects**
Panel A: Capital investment			
Growthexp	0.182***		

	(0.041)		
Expectation error		0.027***	
		(0.007)	
Positive error		0.002	
		(0.006)	
DB_t	-0.077	0.029*	-0.048
	(0.062)	(0.015)	(0.061)
RB_t	-0.072	0.004	-0.068
	(0.063)	(0.014)	(0.061)
RA_t	0.066	0.020	0.086
	(0.076)	(0.014)	(0.076)
NN_t	-0.111***	-0.016**	-0.127***
	(0.037)	(0.007)	(0.036)
DB_{t-1}	-0.088**	0.017	-0.072*
	(0.040)	(0.011)	(0.039)
RB_{t-1}	-0.098**	0.008	-0.091**
	(0.041)	(0.010)	(0.040)
RA_{t-1}	0.069	-.0003	0.069
	(0.054)	(0.010)	(0.054)
NN_{t-1}	-0.056**	0.0006	-0.055**
	(0.025)	(0.005)	(0.025)
$DB_t + DB_{t-1}$	-0.165*	-0.262	-0.119
	(0.091)	(0.220)	(0.089)
$RB_t + RB_{t-1}$	0.170*	-0.245	-0.158*
	(0.093)	(0.220)	(0.089)
$RA_t + RA_{t-1}$	0.135	0.020	0.155
	(0.118)	(0.022)	(0.118)
$NN_t + NN_{t-1}$	-0.167***	-0.015	-0.182***
	(0.053)	(0.011)	(0.053)
Panel B: R&D investment			
Growthexp	0.122*		
	(0.070)		
Expectation error		0.027**	
		(0.013)	
Positive error		0.002	
		(0.003)	
DB_t	0.047	0.029*	0.075
	(0.111)	(0.015)	(0.110)
RB_t	-0.121	0.004	0.125
	(0.091)	(0.009)	(0.091)
RA_t	-0.029	0.020*	-0.009
	(0.069)	(0.012)	(0.070)
NN_t	0.022	-0.016**	0.006
	(0.035)	(0.008)	(0.035)
DB_{t-1}	0.079	0.017*	0.095
	(0.094)	(0.009)	(0.093)
RB_{t-1}	-0.031	0.008	-0.023
	(0.049)	(0.007)	(0.049)
RA_{t-1}	-0.098**	0.0001	-0.098**
	(0.044)	(0.005)	(0.044)
NN_{t-1}	-0.008	0.0007	-0.008
	(0.028)	(0.002)	(0.028)
$DB_t + DB_{t-1}$	0.125	0.045**	0.171

	(0.185)	(0.023)	(0.185)
$RB_t + RB_{t-1}$	0.090	0.012	0.102
	(0.123)	(0.015)	(0.122)
$RA_t + RA_{t-1}$	-0.127	0.020	-0.107
	(0.102)	(0.015)	(0.103)
$NN_t + NN_{t-1}$	0.014	-0.015*	-0.002
	(0.056)	(0.009)	(0.055)
Panel C: Product innovation			
Growthexp	0.211***		
	(0.039)		
Expectation error		0.031***	
		(0.006)	
Positive error		0.001	
		(0.006)	
DB_t	-0.033	0.033**	0.0004
	(0.060)	(0.017)	(0.064)
RB_t	-0.00002	0.005	0.005
	(0.061)	(0.016)	(0.063)
RA_t	-0.090	0.024	-0.066
	(0.066)	(0.016)	(0.068)
NN_t	-0.089**	-0.019**	-0.108***
	(0.035)	(0.008)	(0.036)
DB_{t-1}	-0.040	0.019	-0.020
	(0.045)	(0.012)	(0.047)
RB_{t-1}	-0.057	0.009	-0.048
	(0.041)	(0.012)	(0.042)
RA_{t-1}	-0.068	0.0005	-0.068
	(0.046)	(0.011)	(0.047)
NN_{t-1}	-0.061**	0.0008	-0.060*
	(0.030)	(0.006)	(0.031)
$DB_t + DB_{t-1}$	-0.073	0.053**	-0.020
	(0.094)	(0.026)	(0.100)
$RB_t + RB_{t-1}$	-0.057	0.014	-0.043
	(0.090)	(0.026)	(0.093)
$RA_t + RA_{t-1}$	-0.158	0.025	-0.133
	(0.102)	(0.025)	(0.104)
$NN_t + NN_{t-1}$	-0.150***	-0.178	-0.168***
	(0.058)	(0.013)	(0.060)
Panel D: Process innovation			
Growthexp	0.203***		
	(0.040)		
Expectation error		0.030***	
		(0.007)	
Positive error		0.001	
		(0.006)	
DB_t	-0.092	0.030*	-0.061
	(0.066)	(0.016)	(0.065)
RB_t	-0.047	0.004	-0.043
	(0.065)	(0.015)	(0.065)
RA_t	-0.097	0.022	-0.075
	(0.065)	(0.015)	(0.067)
NN_t	-0.133***	-0.018**	-0.150***
	(0.038)	(0.008)	(0.037)

DB_{t-1}	-0.056	0.018	-0.038
	(0.048)	(0.012)	(0.048)
RB_{t-1}	-0.046	0.009	-0.037
	(0.044)	(0.011)	(0.047)
RA_{t-1}	-0.093**	0.0001	-0.093**
	(0.043)	(0.010)	(0.045)
NN_{t-1}	-0.086***	0.0004	-0.085***
	(0.027)	(0.006)	(0.027)
$DB_t + DB_{t-1}$	-0.148	0.048**	-0.100
	(0.101)	(0.024)	(0.099)
$RB_t + RB_{t-1}$	-0.093	0.013	-0.080
	(0.095)	(0.024)	(0.099)
$RA_t + RA_{t-1}$	-0.190**	0.022	-0.167*
	(0.096)	(0.024)	(0.100)
$NN_t + NN_{t-1}$	-0.219***	-0.017	-0.236***
	(0.058)	(0.012)	(0.056)
Panel E: Leadership capability development			
Growthexp	0.119***		
	(0.031)		
Expectation error		0.023***	
		(0.007)	
Positive error		0.001	
		(0.005)	
DB_t	-0.058	0.024*	-0.034
	(0.052)	(0.013)	(0.053)
RB_t	-0.059	0.003	-0.055
	(0.049)	(0.012)	(0.049)
RA_t	-0.067	0.017	-0.050
	(0.058)	(0.012)	(0.057)
NN_t	-0.089***	-0.014**	-0.102***
	(0.030)	(0.006)	(0.030)
DB_{t-1}	-0.081**	0.014	-0.067*
	(0.034)	(0.009)	(0.036)
RB_{t-1}	-0.030	0.007	-0.023
	(0.034)	(0.009)	(0.036)
RA_{t-1}	0.024	-0.0002	0.024
	(0.052)	(0.008)	(0.052)
NN_{t-1}	-0.044**	0.0006	-0.044*
	(0.022)	(0.004)	(0.023)
$DB_t + DB_{t-1}$	-0.139*	0.040*	-0.101
	(0.075)	(0.021)	(0.077)
$RB_t + RB_{t-1}$	-0.089	-0.010	-0.079
	(0.074)	(0.019)	(0.076)
$RA_t + RA_{t-1}$	-0.424	0.018	-0.026
	(0.102)	(0.019)	(0.101)
$NN_t + NN_{t-1}$	-0.133***	-0.013	-0.146***
	(0.045)	(0.010)	(0.046)
Panel F: Skills development			
Growthexp	0.163***		
	(0.042)		
Expectation error		0.024***	
		(0.007)	
Positive error		0.001	

		(0.005)	
DB_t	-0.010	0.025*	0.015
	(0.076)	(0.014)	(0.076)
RB_t	-0.149**	0.004	-0.146**
	(0.063)	(0.012)	(0.062)
RA_t	0.069	0.018	0.087
	(0.076)	(0.013)	(0.076)
NN_t	-0.086**	-0.014**	-0.100***
	(0.039)	(0.007)	(0.038)
DB_{t-1}	0.007	0.015	0.021
	(0.052)	(0.010)	(0.052)
RB_{t-1}	-0.087*	0.007	-0.081*
	(0.045)	(0.009)	(0.047)
RA_{t-1}	0.004	0.00006	0.005
	(0.052)	(0.008)	(0.053)
NN_{t-1}	-0.050*	0.0006	-0.049*
	(0.028)	(0.004)	(0.028)
$DB_t + DB_{t-1}$	-0.003	0.040*	0.037
	(0.114)	(0.021)	(0.112)
$RB_t + RB_{t-1}$	-0.237**	0.010	-0.226**
	(0.097)	(0.020)	(0.097)
$RA_t + RA_{t-1}$	0.074	0.018	0.092
	(0.116)	(0.019)	(0.117)
$NN_t + NN_{t-1}$	-0.135**	-0.013	-0.149***
	(0.060)	(0.010)	(0.059)

This table presents the marginal effects of growth expectation, expectation error, and funding states on investment plans across six different plans. Column (1) presents the direct effect, column (2) presents the indirect effects, and column (3) presents the total effects. For growth expectation, there is only a direct effect on investment plan. For expectation error, there is only an indirect effect on investment plans. Funding states have both direct and indirect effects on investment plans through growth expectation, and total effects (the sum of the direct and indirect effects) are shown in column (3). Panels A-F are for capital investment, R&D investment, product innovation, process innovation, leadership development and employee skills development respectively.

6.4. Heterogeneity across firm characteristics

We now turn to examining heterogeneity in the impacts of funding states on investment plans and growth expectation across a number of firm characteristics. These include the gender and ethnicity of the business owner(s) and the sector in which the firm operates. The results from this analysis are presented in Tables A.2-A.4 in the Appendix.

The results in Table A.2 show women-led businesses that are financially discouraged or rejected are significantly *less* likely to invest in fixed capital, R&D, process innovation, and leadership capabilities holding growth expectations constant (Panel A: Investment plans), but *not* less likely to expect growth than otherwise similar men-led businesses (Panel B: Growth expectation). This finding supports supply-driven financing constraints as an explanation for lower investment propensities among women-led businesses while also highlighting female entrepreneurs' growth expectations are not scarred by negative financing experiences.

By contrast, as shown in Table A.3 (Panel B: Growth expectation), DB and RB firms led by ethnic-minority owners are less likely to expect growth than those led by White-British owners. This suggests there are scarring effects of negative financing experiences on ethnic-minority owners' growth expectations. However, holding growth expectations constant, DB firms led by ethnic-minority owners are *more* likely to have investment plans for R&D, process innovation

and leadership development than otherwise similar businesses led by White-British owners (see Table A.3 (Panel A: Investment plans)). This suggests financing constraints (associated with financial discouragement) act as a spur to innovation (and leadership development) among ethnic-minority-led firms.[29] Similarly, holding growth expectations constant, NN firms led by ethnic minorities are more likely to have investment plans in R&D activities than otherwise similar firms with White-British owners (see Table A.3 (Panel A: Investment plans)). This suggests, at least in respect of R&D investment, ethnic-minority-led firms are less affected by issues of debt/control aversion than their non-minority counterparts.

Overall, the findings in Table A.3 are aligned with the literature on ethnic-minority/migrant entrepreneurship which suggests businesses led by ethnic-minority owners manage to grow their businesses despite facing disadvantages. In particular, our findings indicate ethnic-minority-led businesses support growth by investing in riskier R&D and innovation activities as well as developing their leadership capabilities (showing resilience by continuing to develop their businesses even under financing constraints).

Regarding sectors, in Table A.4 (Panel A: Investment plans) there is strong evidence of enabling (positive) effects of financing constraints on capital-investment plans (among RB firms in Information/Financial sectors), on R&D investment plans (among DB firms in Information/Financial and Professional/Arts sectors), on process-innovation investment plans (among DB firms in the Manufacturing sector) and on employee-skills investment plans (among RB firms in the Manufacturing sector) relative to firms in 'Other sectors'. However, there is a negative financing-constraint effect on leadership-capability investment plans among RB firms in Professional/Arts sectors. In addition, risk aversion has negative effects on R&D and leadership-capability investment plans among firms in Manufacturing and Professional/Arts sectors respectively. The results in Table A.4 Panel A also show NN firms in the Manufacturing sector are more likely than 'Other sectors' to have process-innovation and leadership-capability investment plans (suggesting firms in the Manufacturing sector are less affected by debt/control aversion).

The results in Table A.4 (Panel B: Growth expectations) provide some evidence ($p < 0.10$) of scarring negative effects on growth expectations among DB firms in the Manufacturing sector. There is also some evidence ($p < 0.10$) that risk-averse firms in Professional/Arts sectors have higher growth expectations than firms in 'Other sectors'. However, there is no evidence of sectoral variation in growth ambition among NN firms.

Overall, the sectoral results suggest capital-, innovation- and skills-investment plans in some sectors (in particular, Manufacturing and Information/Financial sectors) are more resilient to supply-side financing constraints. In addition, firms in the Manufacturing sector seem to be less affected by demand-side financing constraints (relating to debt/control aversion if not risk aversion).

[29] Prior studies in the organisational-slack literature have investigated whether financing constraints inhibit or enable innovation and firm performance (e.g., Nohria and Gulati, 1996; Hoegl, Gibbert and Mazursky, 2008; Vanacker, Collewaert and Paeleman, 2013). In particular, contrary to the implications of financing constraints in the economics/finance literature, unmet financing need may increase entrepreneurial efficiency by improving discipline in the selection, support, and termination of investment projects (Nohria and Gulati, 1996; 1997), reducing entrepreneurial over-optimism and complacency (Kim, Kim and Lee, 2008), and increasing entrepreneurial ingenuity (Baker and Nelson, 2005). Our results for DB firms are therefore consistent with financing constraints having an enabling impact on innovation (and leadership-capability development) among ethnic-minority-led firms.

7. Conclusion

In this paper, we test the effects of SME-owner ('entrepreneurial') growth expectations on investment plans and the rationality of growth expectations. To frame the analysis of growth expectations, we present a model of how entrepreneurs learn about growth under rationality and show how cognitive (confirmation and anchoring) bias affects learning. Tests of the model with UK LSBS data show entrepreneurs' growth expectations are positively related to investment plans and support rational learning about growth. Accordingly, entrepreneurs neither systematically underestimate or overestimate growth and investment plans are therefore based on rational growth expectations. While this is perhaps a surprising result for entrepreneurial growth expectations (in view of prior studies in the entrepreneurship literature supporting cognitive bias), our finding is consistent with previous UK evidence supporting rational growth expectations in larger firms (Alati et al., 2024). Moreover, our evidence of rational growth expectations provides an interesting contrast with evidence of irrational expectations about the probability of loan rejection (see Fraser and Nguyen, 2025). This contrast may be due to entrepreneurs being better informed about the growth of their firm than the loan-approval processes of banks. Meanwhile, the apparent absence of negative effects of uncertainty on investment plans in our results may reflect inadequate measures of uncertainty.

We also test the direct and indirect effects of demand- and supply-side financing issues on investment plans. In this regard, while there is evidence supply-side issues among discouraged and rejected borrowers directly and negatively affect some types of investment plan (indicative of higher investment/information costs), the predominant issues across all types of investment plan are on the demand side. In particular, a lack of external-finance needs reduces the likelihood of investment plans both directly controlling for growth expectations (indicative of higher investment costs due to debt/control aversion) and indirectly via growth expectations (indicative of lower growth ambition). Moreover, innovation-investment plans are the most severely affected by demand-side financing issues.

In terms of policy implications, addressing low growth expectations is important in view of the significant negative impact on investment plans. This relates especially to innovation-investment plans which are the most sensitive to growth expectations (and the most important for labour productivity growth based on previous evidence in Goodridge and Haskel, 2023). If growth expectations were at their highest (2020/21) level, compared to actual propensities (in parenthesis), investment-plan propensities would be 26.1 (23.7) percent for capital investment, 17.5 (15.8) percent for R&D investment, 29.0 (27.9) percent for product innovation, 26.7 (25.4) percent for process innovation, 19.7 (17.6) percent for leadership development, and 39.2 (34.1) percent for workforce-skills development. Our results supporting rational growth expectations suggest firms would need to see positive signs of actual growth before revising upwards their growth expectations (and increasing the likelihood of investment plans). However, addressing underlying low-growth ambition, particularly in relation to the majority of firms with no external-finance needs, would also be beneficial for growth expectations thereby indirectly increasing the likelihood of investment plans. Moreover, increasing growth ambition may help reduce debt/control aversion (González et al., 2013; Berggren, Olofsson and Silver, 2000) which would provide a further direct increase in the likelihood of investment plans.[30]

[30] Regarding the paucity of growth ambition among small firms, it is well documented that a minority of new firms are disproportionately responsible for job growth with the overwhelming majority of new firms contributing nothing to job growth (e.g., Guzman and Stern. 2020; Bosma and Schutjens, 2009). While providing a 'toolkit' of policies to engender greater growth ambition is beyond the scope of this paper, prior studies indicate a wide range of factors affect growth ambition. These factors include personal characteristics (encompassing fear of failure, experience and entrepreneurial self-efficacy), motivation for entrepreneurship (opportunity versus necessity), scalability of business models, economic and

Our result showing the direct negative impacts of financial discouragement and rejection on investment plans (holding growth expectations constant) provides some support for policies, such as the Growth Guarantee Scheme and Start Up Loans, aimed at improving the supply of finance to SMEs in general. Moreover, our finding that these negative impacts are greater (in magnitude) for women-led businesses than otherwise comparable men-led businesses offers some support for policies, such as the Investing in Women Code, aimed specifically at improving female entrepreneurs' access to finance (Investing in Women Code, 2025). However, assessing whether discouraged and rejected borrowers are forgoing viable investment plans (and therefore merit assistance) would require further analysis of the impact of discouragement and rejection on subsequent firm performance (Fraser, 2019; Fraser, Bhaumik and Wright, 2015). Among financially discouraged ethnic-minority-led firms there is even evidence that financing constraints enable (rather than inhibit) innovation and leadership development. In addition, R&D investments among ethnic-minority-led firms are less affected by debt/control aversion than otherwise similar firms with White-British owners. Despite this apparent resilience of investment plans to (supply and demand-side) financing constraints, we find growth expectations among ethnic-minority led businesses are scarred by negative financing experiences (discouragement and rejection). In this respect, recent initiatives supporting increased lending by Community Development Finance Institutions, which provide assistance to a diverse range of business owners, may be important in helping reduce scarring experiences among ethnic-minority-led firms (British Business Bank, 2025). Finally, our finding that exporting firms are more likely to have innovation and skills-investment plans suggests recent policies undertaken by UK Export Finance to encourage more small firms to export may help increase investment and growth going forward (DBT, 2025).

An important direction for future research would be to extend the analysis to include the impacts of growth expectations and investment plans on subsequent firm performance (including labour productivity growth and profitability). Future LSBS surveys should also consider eliciting entrepreneurs' subjective probability distributions about their firms' future sales (and employment), similar to the approach used by the Atlanta Fed/Chicago Booth/Stanford Survey of Business Uncertainty (see Barrero, 2022; Altig et al., 2020). In addition, surveying firms' evaluation of environmental uncertainty as an obstacle to future development of the business would be beneficial. Overall, this would provide more robust measures of growth expectations and uncertainty leading to a better understanding of their role in entrepreneurial decision making and firm performance.

capital-market conditions (resulting in procyclical growth ambitions), a strong entrepreneurial ecosystem (such as those found in Silicon Valley and Boston), and perceptions of barriers and constraints (see Guzman and Stern, 2020; Wallin, Still and Henttonen, 2016; Verheul and Van Mil, 2011). Relatedly, for a toolkit of policies to promote innovation, which include debt and equity-market interventions targeting small/young firms, see Bloom, Van Reenen and Williams (2019).

References

Alati, A., Tischer, J., Froemel, M. and Ozturk, O., 2024. Firms' Sales Expectations and Marginal Propensity to Invest. Staff Working Paper No. 1087, Bank of England.

Alayande, A. and Coyle, D., 2023. Investment in the UK: Longer term trends. *Cambridge, UK: Bennett Institute for Public Policy, University of Cambridge*.

Altig, D., Barrero, J. M., Bloom, N., Davis, S. J., Meyer, B., and Parker, N., 2022. Surveying business uncertainty. *Journal of Econometrics*, 231(1), pp. 282-303.

Arabsheibani, G., D. De Meza, J. Maloney, and Pearson, B., 2000. And a vision appeared unto them of a great profit: Evidence of self-deception among the self-employed. *Economics Letters*, 67(1), pp 35–41.

Aristei, D. and Angori, G., 2022. Heterogeneity and state dependence in firms' access to bank credit. *Small Business Economics*, *59*(1), pp.47-78.

Asiedu, E., Freeman, J.A. and Nti-Addae, A., 2012. Access to credit by small businesses: How relevant are race, ethnicity, and gender?. *American Economic Review*, 102(3), pp.532-537.

Åstebro, T. and Bernhardt, I., 2003. Start-up financing, owner characteristics, and survival. *Journal of Economics and Business*, 55(4), pp.303-319.

Åstbro, T. and Bernhardt, I., 2005. The winner's curse of human capital. *Small Business Economics*, 24(1), pp.63-78.

Audretsch, D.B. and Belitski, M., 2020. The role of R&D and knowledge spillovers in innovation and productivity. *European Economic Review*, *123*, p.103391.

Baker, M., and Wurgler, J., 2013. Behavioral corporate finance: An updated survey. In Handbook of the Economics of Finance (Vol. 2, pp. 357-424). Elsevier.

Baker, T. and Nelson, R.E., 2005. Creating something from nothing: Resource construction through entrepreneurial bricolage. *Administrative science quarterly*, 50(3), pp.329-366.

Bailey, A.J., Cesa-Bianchi, A., Garofalo, M., Harrison, R., McLaren, N., Piton, S. and Sajedi, R., 2022. Structural change, global R* and the missing-investment puzzle. Staff Working Paper No. 997, Bank of England, October 2022, Available at SSRN 4180693.

Bank of England, 2017. The financial system and productive investment: New survey evidence. *Quarterly Bulletin*, 2017 Q1.

Barrero, J.M., 2022. The micro and macro of managerial beliefs. *Journal of Financial Economics*, 143(2), pp.640-667.

Beck, T., Degryse, H., De Haas, R. and Van Horen, N., 2018. When arm's length is too far: Relationship banking over the credit cycle. *Journal of Financial Economics*, 127(1), pp.174-196.

Becker, M., and Martin, J., 2023. New insights on regional capital investment in the UK, 1997 to 2019 (No. 016). The Productivity Institute.

Belenzon, S., Shamshur, A. and Zarutskie, R., 2019. CEO's age and the performance of closely held firms. *Strategic Management Journal*, *40*(6), pp.917-944.

Berggren, B., Olofsson, C., and Silver, L., 2000. Control aversion and the search for external financing in Swedish SME's. *Small Business Economics*, 15(3), pp.233-242.

Bernanke, B.S., 1983. The determinants of investment: Another look. *The American Economic Review*, 73(2), pp.71-75.

Beyhaghi, M., Firoozi, F., Jalilvand, A. and Samarbakhsh, L., 2020. Components of credit rationing. *Journal of Financial Stability*, 50, p.100762.

Blanchflower, D.G., Levine, P.B. and Zimmerman, D.J., 2003. Discrimination in the small-business credit market. *Review of Economics and Statistics*, 85(4), pp.930-943.

Bloom, N., 2014. Fluctuations in uncertainty. *Journal of Economic Perspectives*, 28(2), pp.153-176.

Bloom, N., Bond, S. and Van Reenen, J., 2007. Uncertainty and investment dynamics. *The Review of Economic Studies*, 74(2), pp. 391–415.

Bloom, N., Bunn, P., Chen, S., Mizen, P., Smietanka, P. and Thwaites, G., 2019. The impact of Brexit on UK firms (No. w26218). National Bureau of Economic Research.

Bloom, N., Davis, S.J., Foster, L.S., Ohlmacher, S.W. and Saporta-Eksten, I., 2022. Investment and subjective uncertainty (No. w30654). National Bureau of Economic Research.

Bloom, N., Van Reenen, J. and Williams, H., 2019. A toolkit of policies to promote innovation. *Journal of Economic Perspectives*, 33(3), pp.163-184.

Bosma, N. and Schutjens, V., 2009. Determinants of early-stage entrepreneurial activity in European regions: distinguishing low and high ambition entrepreneurship. In Entrepreneurship and Growth in Local, Regional and National Economies. Edward Elgar Publishing.

British Business Bank, 2019. UK VC & Female founders: https://www.british-business-bank.co.uk/wp-content/uploads/2019/01/UK_VC_and_Female_Founders_Report_British_Business_Bank.pdf

British Business Bank, 2025. Small Business Finance Markets 2024/25.

Carpenter, R.E., and Petersen, B.C., 2002. Is the growth of small firms constrained by internal finance? *Review of Economics and Statistics*, 84(2), pp.298-309.

Carr, J.C. and Blettner, D.P., 2010. Cognitive control bias and decision-making in context: Implications for entrepreneurial founders of small firms. *Frontiers of Entrepreneurship Research*, 30(6), p.2.

Carter, S., Shaw, E., Lam, W. and Wilson, F., 2007. Gender, entrepreneurship, and bank lending: The criteria and processes used by bank loan officers in assessing applications. *Entrepreneurship Theory and Practice*, 31(3), pp.427-444.

Charness, G. and Dave, C., 2017. Confirmation bias with motivated beliefs. *Games and Economic Behavior*, 104, pp.1-23.

Cole, R.A., Cowling, M. and Liu, W., 2022. Entrepreneurial overconfidence and SME financing decisions. SSRN 3812718.

Cole, R.A., and Sokolyk, T., 2016. Who needs credit and who gets credit? Evidence from the surveys of small business finances. *Journal of Financial Stability*, 24, pp.40-60.

Coleman, S. and Robb, A., 2009. A comparison of new firm financing by gender: evidence from the Kauffman Firm Survey data. *Small Business Economics*, 33, pp.397-411.

Cosh, A., Cumming, D. and Hughes, A., 2009. Outside entrepreneurial capital. *The Economic Journal*, 119(540), pp.1494-1533.

Cowling, M., Liu, W. and Calabrese, R., 2022. Has previous loan rejection scarred firms from applying for loans during Covid-19? *Small Business Economics*, 59, pp.1-24.

Cowling, M. and Sclip, A., 2023. Dynamic discouraged borrowers. *British Journal of Management*, 34(4), pp.1774-1790.

Coyle, D., 2023. Long-term perspectives and large-scale investments. Available at: https://www.productivity.ac.uk/news/diane-coyle-at-the-treasury-committee-long-term-perspectives-and-large-scaleinvestments/

Cressy, R., 1995. Business borrowing and control: A theory of entrepreneurial types. *Small Business Economics*, 7(4), 291-300.

Danso, A., Lartey, T., Amankwah-Amoah, J., Adomako, S., Lu, Q. and Uddin, M., 2019. Market sentiment and firm investment decision-making. *International Review of Financial Analysis*, *66*, p.101369.

Dai, N., Ivanov, V. and Cole, R.A., 2017. Entrepreneurial optimism, credit availability, and cost of financing: Evidence from US small businesses. *Journal of Corporate Finance*, 44, pp. 289-307.

DBT, 2025. The UK's Trade Strategy, June 2025.

de Guevara, J.F., Maudos, J. and Salvador, C., 2021. Effects of the degree of financial constraint and excessive indebtedness on firms' investment decisions. *Journal of International Money and Finance*, 110, p.102288.

de Meza, D., Southey, C., 1996. The borrower's curse: optimism, finance and entrepreneurship. *The Economic Journal*, pp. 375-386.

Dixit, A.K. and Pindyck, R.S., 1994. *Investment under Uncertainty*. Princeton University Press.

Evans, G.W. and Honkapohja, S., 2012. Learning and expectations in macroeconomics. In *Learning and Expectations in Macroeconomics*. Princeton University Press.

Fama, E.F. and Jensen, M.C., 1983. Separation of ownership and control. *The Journal of Law and Economics*, 26(2), pp.301-325.

Farooq, U., Tabash, M.I., Al-Naimi, A.A. and Drachal, K., 2022. Corporate investment decision: a review of literature. *Journal of Risk and Financial Management*, 15(12), p. 611.

Fazzari, S., Hubbard, R.G., and Petersen, B.C., (1988). Financing constraints and corporate investment, NBER Working Paper No. 2387

Ferrando, A. and Mulier, K., 2022. The real effects of credit constraints: Evidence from discouraged borrowers. *Journal of Corporate Finance*, 73, pp.102-171.

Fraser, S., 2009. Is there ethnic discrimination in the UK market for small business credit?. *International Small Business Journal*, 27(5), pp.583-607.

Fraser, S., 2019. Entrepreneurial borrowing: do entrepreneurs seek and receive enough credit? *Foundations and Trends in Entrepreneurship*, 15(5-6), pp.431-663.

Fraser, S., Bhaumik, S.K., and Wright, M., 2015. What do we know about entrepreneurial finance and its relationship with growth?. *International Small Business Journal*, 33(1), pp.70-88.

Fraser, S. and Greene, F.J., 2006. The effects of experience on entrepreneurial optimism and uncertainty. *Economica*. 73(290), pp. 169–192.

Fraser, S. and Nguyen, T. (2025). The Effects of Business Experience on Discouraged Borrowing and Efficiency in the Credit Market. *Br. J. Manag.* https://doi.org/10.1111/1467-8551.12933

Gennaioli, N., Ma, Y. and Shleifer, A., 2016. Expectations and investment. *NBER Macroeconomics Annual*, 30(1), pp.379-431.

Gervais, S., Heaton, J.B. and Odean, T., 2011. Overconfidence, compensation contracts, and capital budgeting. *The Journal of Finance*, 66(5), pp.1735-1777.

Golubova, E., 2024, What do we know about factors that affect business investment decisions. Enterprise Research Centre SOTA Review No. 62.

Gomez-Salvador, Ramon; Musso, Alberto; Stocker, Marc; Turunen, Jarkko, 2006. Labour productivity developments in the euro area, ECB Occasional Paper, No. 53, European Central Bank (ECB), Frankfurt a. M.

González, M., Guzmán, A., Pombo, C. and Trujillo, M.A., 2013. Family firms and debt: Risk aversion versus risk of losing control. *Journal of Business Research*, 66(11), pp.2308-2320.

Goodridge, P. and Haskel, J., 2023. Accounting for the slowdown in UK innovation and productivity. *Economica*, 90(359), pp.780-812.

Gormsen, N. J., & Huber, K., 2023. Corporate discount rates (No. w31329). National Bureau of Economic Research.

Greene, F. J., Han, L., and Marlow, S., 2013. Like mother, like daughter? Analyzing maternal influences upon women's entrepreneurial propensity. *Entrepreneurship Theory and Practice*. 37(4): 687–711.

Greene, W. H., 2019. *Econometric Analysis.* 8th Edition, Pearson Education Limited, London.

Gulen, H., Ion, M., Jens, C.E. and Rossi, S., 2024. Credit cycles, expectations, and corporate investment. *The Review of Financial Studies*, *37*(11), pp.3335-3385.

Guzman, J. and Stern, S., 2020. The state of American entrepreneurship: New estimates of the quantity and quality of entrepreneurship for 32 US States, 1988–2014. *American Economic Journal: Economic Policy*, 12(4), pp.212-243.

Hall, B.H., 2005. The financing of innovation. The Handbook of Technology and Innovation Management, pp.409-430.

Heckman, J.J., 1991. Identifying the hand of past: Distinguishing state dependence from heterogeneity. *The American Economic Review*, 81(2), pp.75-79.

Hmieleski, K.M. and Baron, R.A., 2009. Entrepreneurs' optimism and new venture performance: A social cognitive perspective. *Academy of Management Journal*, 52(3), pp.473-488.

HMT/DBT, 2025. HMT and DBT Call for Evidence: Small Business Access to Finance: https://www.gov.uk/government/calls-for-evidence/small-business-access-to-finance/small-business-access-to-finance

Hoegl, M., Gibbert, M. and Mazursky, D., 2008. Financial constraints in innovation projects: When is less more?. *Research Policy*, 37(8), pp.1382-1391.

Hohl, L., Bican, P.M., Guderian, C.C. and Riar, F.J., 2021. Gender diversity effects in investment decisions. *The Journal of Entrepreneurship*, 30(1), pp.134-152.

Howell, S.T. and Nanda, R., 2024. Networking frictions in venture capital, and the gender gap in entrepreneurship. *Journal of Financial and Quantitative Analysis*, 59(6), pp.2733-2761.

Investing in Women Code, 2025. Annual Report 2025: https://www.british-business-bank.co.uk/about/governance/diversity-equity-and-inclusion/investing-in-women-code

Jagannathan, R., Matsa, D. A., Meier, I., and Tarhan, V., 2016. Why do firms use high discount rates?. *Journal of Financial Economics*, 120(3), pp. 445-463.

Jorgenson, D.W., 1963. Capital theory and investment behavior. *The American Economic Review*, 53(2), pp.247-259.

Kanze, D., Huang, L., Conley, M.A. and Higgins, E.T., 2018. We ask men to win and women not to lose: Closing the gender gap in startup funding. *Academy of Management Journal*, 61(2), pp.586-614.

Kerr, W.R. and Nanda, R., 2011. Financing constraints and entrepreneurship. *Handbook of Research on Innovation and Entrepreneurship. Cheltenham: Elgar*, pp.88-103.

Kim, H., Kim, H. and Lee, P.M., 2008. Ownership structure and the relationship between financial slack and R&D investments: Evidence from Korean firms. *Organization Science*, 19(3), pp.404-418.

Kon, Y. and Storey, D.J., 2003. A theory of discouraged borrowers. *Small Business Economics*, *21*, pp.37-49.

Lai, Y.-L., Lin, F.-J., and Lin, Y.-H., 2015. Factors affecting firm's R&D investment decisions. *Journal of Business Research*, 68(4), pp. 840-844. doi:10.1016/j.jbusres.2014.11.038

Lerner, J. and Nanda, R., 2020. Venture capital's role in financing innovation: What we know and how much we still need to learn. *Journal of Economic Perspectives*, 34(3), pp.237-261.

Malmendier, U. and Tate, G., 2005. CEO overconfidence and corporate investment. *The Journal of Finance*. 60(6), pp. 2661–2700.

Malmendier, U. and Tate, G., 2015. Behavioral CEOs: The role of managerial overconfidence. *Journal of Economic Perspectives*, 29(4), pp.37-60.

Malmström, M., Burkhard, B., Sirén, C., Shepherd, D. and Wincent, J., 2024. A meta-analysis of the impact of entrepreneurs' gender on their access to bank finance. *Journal of Business Ethics*, 192(4), pp. 803-820.

Mann, C.L., 2024. UK Business Investment: Economists, Managers, Financiers. An Integrated Framework to Analyse the Past and Underpin Prospects. Productivity Insights Paper No. 036, The Productivity Institute.

Mann, W., 2018. Creditor rights and innovation: Evidence from patent collateral. *Journal of Financial Economics*, 130(1), pp.25-47.

Marlow, S. and McAdam, M., 2012. Analyzing the influence of gender upon high-technology venturing within the context of business incubation. *Entrepreneurship Theory and Practice*. 36(4), pp. 655–676.

McDonald, Robert, and Daniel Siegel. "The value of waiting to invest." *The Quarterly Journal of Economics* 101.4 (1986): 707-727.

Melolinna, M., Miller, H. and Tatomir, S., 2018. Business investment, cost of capital and uncertainty in the United Kingdom—evidence from firm-level analysis. Staff Working Paper No. 717, Bank of England.

Mishra, C.S., and McConaughy, D.L., 1999. Founding family control and capital structure: The risk of loss of control and the aversion to debt. *Entrepreneurship: Theory and Practice*, 23(4), pp.53-53.

Myers, S.C. and Majluf, N.S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2), pp.187-221.

Nguyen, H.T., Nguyen, H.M., Troege, M. and Nguyen, A.T., 2021. Debt aversion, education, and credit self-rationing in SMEs. *Small Business Economics*, *57*(3), pp.1125-1143.

Nohria, N. and Gulati, R., 1996. Is slack good or bad for innovation?. *Academy of Management Journal*, 39(5), pp.1245-1264.

Nohria, N. and Gulati, R., 1997. What is the optimum amount of organizational slack?: A study of the relationship between slack and innovation in multinational firms. *European Management Journal*, 15(6), pp.603-611.

Northern Powerhouse Partnership, 2017. Powerhouse 2050: The North's route map for productivity: https://www.northernpowerhousepartnership.co.uk/publications/powerhouse-2050-the-norths-route-map-for-productivity-pdf-report/

Nunes, P.M., Mendes, S. and Serrasqueiro, Z., 2012. SMEs' investment determinants: empirical evidence using quantile approach. *Journal of Business Economics and Management*, 13(5), pp.866-894.

Paaso, Mikael and Pursiainen, Vesa and Torstila, Sami, 2024. Entrepreneur Debt Aversion and Financing Decisions: Evidence from COVID-19 Support Programs (December 16, 2024). Proceedings of Paris December 2021 Finance Meeting EUROFIDAI - ESSEC, Available at SSRN: https://ssrn.com/abstract=3615299 or http://dx.doi.org/10.2139/ssrn.3615299

Parker, S.C., 2018. The Economics of Entrepreneurship. Cambridge University Press.

Parker, S.C. and Van Praag, C.M., 2006. Schooling, capital constraints, and entrepreneurial performance: The endogenous triangle. *Journal of Business & Economic Statistics*, 24(4), pp.416-431.

Pessoa, J.P. and Van Reenen, J., 2014. The UK productivity and jobs puzzle: does the answer lie in wage flexibility?. *The Economic Journal*, 124(576), pp.433-452.

Peters, B. and Roberts, M.J., 2022. Firm R&D investment and export market exposure. *Research Policy*, *51*(10), p.104601.

Pouget, S., Sauvagnat, J. and Villeneuve, S., 2017. A mind is a terrible thing to change: confirmatory bias in financial markets. *The Review of Financial Studies*, 30(6), pp.2066-2109.

Puri, M. and Robinson, D.T., 2007. Optimism and economic choice. *Journal of Financial Economics*, 86(1), pp.71-99.

Rice, P., and Venables, A., 2023. Tradability, Productivity, and Regional Disparities: theory and UK evidence. Centre for Economic Policy Research.

Riley, R., Rincon-Aznar, A., and Samek, L., 2018. Below the aggregate: a sectoral account of the UK productivity puzzle. ESCoE Discussion Papers, 6.

Rincon-Aznar, A., Marioni, L. D. S., Venturini, F., and Robinson, C., 2021. Investigating factors driving Scotland's productivity gap with international countries. Draft Report to the Scottish Government.

Romano, C.A., Tanewski, G.A. and Smyrnios, K.X., 2001. Capital structure decision making: A model for family business. *Journal of Business Venturing*, 16(3), pp.285-310.

Roper, S. and Arvanitis, S., 2012. From knowledge to added value: A comparative, panel-data analysis of the innovation value chain in Irish and Swiss manufacturing firms. *Research Policy*, 41(6), pp.1093-1106.

Sharpe, S.A. and Suarez, G.A., 2021. Why isn't business investment more sensitive to interest rates? evidence from surveys. *Management Science*, 67(2), pp.720-741.

Shepherd, D.A., Williams, T.A. and Patzelt, H., 2015. Thinking about entrepreneurial decision making: Review and research agenda. *Journal of Management*, 41(1), pp.11-46.

Smith, A., 1937. The Wealth of Nations. Modern Library, New York (1st publ. 1776).

Stiglitz, J.E., and Weiss, A., 1981. Credit rationing in markets with imperfect information. *The American Economic Review*, 71(3), pp.393-410.

Taylor, S. E., 1989. Positive Illusions: Creative Self-deception and the Healthy Mind. Basic Books.

Tobin, J., 1969. A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking*, 1(1), pp.15-29.

Trigeorgis, L. and Reuer, J.J., 2017. Real options theory in strategic management. *Strategic Management Journal*, 38(1), pp.42-63.

Tversky, A., and Kahneman, D., 1974. Judgement under uncertainty: Heuristics and biases. *Science*, 185 (4187), pp.1124-1131.

Vanacker, T., Collewaert, V. and Paeleman, I., 2013. The relationship between slack resources and the performance of entrepreneurial firms: The role of venture capital and angel investors. *Journal of Management Studies*, 50(6), pp.1070-1096.

Verheul, I. and Van Mil, L., 2011. What determines the growth ambition of Dutch early-stage entrepreneurs?. *International Journal of Entrepreneurial Venturing*, 3(2), pp.183-207.

Wallin, A., Still, K. and Henttonen, K., 2016. Entrepreneurial growth ambitions: The case of Finnish technology startups. *Technology Innovation Management Review*, 6(10), pp.5-16.

Watson, H., 1984. Credit markets and borrower effort. *Southern Economic Journal*, pp.802-813.

Wilde, J., 2000. Identification of multiple equation probit models with endogenous dummy regressors. *Economics Letters,* 69(3), pp.309-312.

Williamson, S.D., 1987. Costly monitoring, loan contracts, and equilibrium credit rationing. *The Quarterly Journal of Economics*, 102(1), pp.135-145.

Appendix

Table A1: Effects of growth ambition

	Capital	R&D	Product inno	Process inno	Leadership skills	Employee skills
	b/se	b/se	b/se	b/se	b/se	b/se
Panel A: Investment plans						
growthexp	0.932***	0.807***	1.245***	0.928***	0.991***	0.952***
	(0.085)	(0.247)	(0.073)	(0.084)	(0.084)	(0.094)
Uncertainty	0.048	0.034	0.055	0.098*	-0.003	0.041
	(0.052)	(0.114)	(0.052)	(0.052)	(0.055)	(0.053)
DB_t	0.097	-0.096	0.043	-0.099	0.174	-0.028
	(0.185)	(0.452)	(0.179)	(0.200)	(0.206)	(0.212)
RB_t	0.160	0.829**	0.252	0.026	-0.073	-0.190
	(0.179)	(0.367)	(0.180)	(0.185)	(0.177)	(0.192)
RA_t	-0.036	0.496	-0.114	0.011	-0.404**	0.194
	(0.177)	(0.395)	(0.191)	(0.186)	(0.186)	(0.202)
NN_t	-0.133	0.211	-0.030	-0.113	-0.111	-0.059
	(0.109)	(0.189)	(0.100)	(0.103)	(0.108)	(0.113)
DB_{t-1}	-0.352**	0.392	-0.177	-0.207	-0.423**	-0.014
	(0.159)	(0.417)	(0.164)	(0.172)	(0.176)	(0.180)
RB_{t-1}	-0.384**	-0.187	-0.236	-0.175	-0.167	-0.328**
	(0.166)	(0.308)	(0.154)	(0.149)	(0.152)	(0.160)
RA_{t-1}	0.216	-0.734*	-0.254	-0.343**	0.081	0.010
	(0.173)	(0.380)	(0.169)	(0.158)	(0.217)	(0.178)
NN_{t-1}	-0.194**	-0.043	-0.214**	-0.299***	-0.200**	-0.164*
	(0.087)	(0.161)	(0.101)	(0.091)	(0.092)	(0.096)
Panel B: Growth expectation						
$Growthexp_{t-1}$	0.982***	1.007***	0.903***	0.988***	0.973***	0.972***
	(0.065)	(0.065)	(0.066)	(0.065)	(0.066)	(0.065)
Ambition 1-9%	0.718***	0.698***	0.755***	0.711***	0.731***	0.705***
	(0.075)	(0.078)	(0.074)	(0.076)	(0.078)	(0.075)
Ambition 10-24%	0.839***	0.813***	0.904***	0.833***	0.856***	0.871***
	(0.059)	(0.061)	(0.060)	(0.060)	(0.061)	(0.060)
Ambition 25%	1.346***	1.318***	1.395***	1.345***	1.358***	1.346***
	(0.062)	(0.064)	(0.060)	(0.063)	(0.062)	(0.062)
Error	0.255***	0.248***	0.193***	0.256***	0.257***	0.268***
	(0.068)	(0.069)	(0.068)	(0.068)	(0.068)	(0.067)
Positive	0.053	0.046	0.040	0.043	0.048	0.045
	(0.098)	(0.098)	(0.098)	(0.098)	(0.099)	(0.098)
DB_t	-0.052	-0.035	-0.049	-0.039	-0.039	0.000
	(0.184)	(0.183)	(0.182)	(0.186)	(0.188)	(0.185)
RB_t	-0.101	-0.107	-0.107	-0.110	-0.102	-0.089
	(0.163)	(0.164)	(0.163)	(0.163)	(0.165)	(0.164)
RA_t	0.276	0.260	0.272	0.266	0.271	0.268
	(0.170)	(0.173)	(0.174)	(0.174)	(0.174)	(0.171)
NN_t	-0.154	-0.156	-0.146	-0.155	-0.148	-0.150
	(0.107)	(0.107)	(0.106)	(0.107)	(0.107)	(0.107)

DB_{t-1}	0.149	0.143	0.136	0.144	0.127	0.148
	(0.153)	(0.155)	(0.154)	(0.154)	(0.154)	(0.155)
RB_{t-1}	0.147	0.134	0.156	0.139	0.135	0.150
	(0.145)	(0.149)	(0.147)	(0.145)	(0.145)	(0.143)
RA_{t-1}	-0.104	-0.095	-0.063	-0.092	-0.099	-0.065
	(0.151)	(0.148)	(0.143)	(0.148)	(0.150)	(0.147)
NN_{t-1}	0.111	0.109	0.114	0.106	0.108	0.119
	0.080	0.080	0.080	0.080	0.080	0.080

Table A2: Effects of funding states for women-led businesses

	Capital investment	R&D investment	Product innovation	Process innovation	Leadership skill	Employee skill
	b/se	b/se	b/se	b/se	b/se	b/se
Panel A: Investment plans						
growthexp	0.636***	0.675**	0.755***	0.691***	0.532***	0.553***
	(0.134)	(0.333)	(0.128)	(0.126)	(0.131)	(0.139)
Uncertainty	0.072	0.040	0.089	0.116**	0.025	0.075
	(0.054)	(0.118)	(0.055)	(0.053)	(0.057)	(0.055)
DB_t	0.187	-0.047	-0.056	-0.055	0.202	-0.083
	(0.198)	(0.496)	(0.193)	(0.214)	(0.236)	(0.230)
RB_t	0.118	0.957**	0.107	0.031	0.038	-0.189
	(0.187)	(0.401)	(0.182)	(0.173)	(0.192)	(0.195)
RA_t	0.052	0.786*	0.044	-0.008	-0.283	0.364*
	(0.187)	(0.437)	(0.201)	(0.207)	(0.199)	(0.214)
NN_t	-0.154	0.242	-0.069	-0.181	-0.191	-0.184
	(0.106)	(0.198)	(0.106)	(0.114)	(0.122)	(0.120)
DB_{t-1}	-0.287*	0.371	-0.048	-0.147	-0.434**	0.062
	(0.170)	(0.427)	(0.169)	(0.191)	(0.205)	(0.196)
RB_{t-1}	-0.238	-0.060	-0.064	-0.032	-0.097	-0.232
	(0.179)	(0.329)	(0.163)	(0.168)	(0.175)	(0.185)
RA_{t-1}	0.382**	-0.326	-0.135	-0.283	0.043	-0.077
	(0.185)	(0.323)	(0.166)	(0.173)	(0.253)	(0.203)
NN_{t-1}	-0.185**	-0.134	-0.214*	-0.247***	-0.233**	-0.109
	(0.088)	(0.171)	(0.112)	(0.095)	(0.104)	(0.108)
Women-led	0.142	-0.021	0.304	0.324	-0.131	0.075
	(0.402)	(0.504)	(0.388)	(0.318)	(0.278)	(0.364)
DB_t # women	-0.938*	-0.650	0.435	-0.390	-0.257	0.172
	(0.522)	(1.105)	(0.632)	(0.529)	(0.501)	(0.701)
RB_t # women	-0.022	-1.600**	0.392	-0.125	-0.789*	-0.082
	(0.555)	(0.750)	(0.547)	(0.606)	(0.403)	(0.561)
RA_t # women	-0.359	-1.318	-0.531	0.152	-0.805*	-0.727
	(0.540)	(0.923)	(0.582)	(0.485)	(0.425)	(0.511)
NN_t # women	-0.207	-0.661	-0.162	0.142	0.021	0.329
	(0.410)	(0.453)	(0.359)	(0.285)	(0.254)	(0.342)
DB_{t-1} # women	-0.190	-	-0.445	-0.222	0.198	-0.207
	(0.429)	-	(0.532)	(0.455)	(0.449)	(0.480)
RB_{t-1} # women	-1.081**	-0.261	-0.729	-0.749*	-0.453	-0.524
	(0.439)	(0.791)	(0.538)	(0.389)	(0.364)	(0.406)
RA_{t-1} # women	-0.858*	-0.962	-0.438	-0.324	0.309	0.568
	(0.447)	(0.952)	(0.548)	(0.449)	(0.504)	(0.434)
NN_{t-1} # women	-0.124	0.543	-0.055	-0.329	0.130	-0.312
	(0.273)	(0.491)	(0.323)	(0.268)	(0.245)	(0.261)
Panel B: Growth expectation						
$growthexp_{t-11}$	1.288***	1.282***	1.280***	1.286***	1.284***	1.287***
	(0.058)	(0.058)	(0.058)	(0.058)	(0.058)	(0.058)
Expectation error	0.379***	0.368***	0.366***	0.379***	0.373***	0.380***

	(0.063)	(0.063)	(0.063)	(0.063)	(0.064)	(0.064)
Positive error	0.022	0.022	0.015	0.018	0.021	0.020
	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)
DB_t	0.099	0.098	0.102	0.098	0.097	0.100
	(0.196)	(0.196)	(0.196)	(0.197)	(0.197)	(0.196)
RB_t	-0.018	-0.018	-0.019	-0.019	-0.018	-0.015
	(0.172)	(0.172)	(0.171)	(0.172)	(0.172)	(0.172)
RA_t	0.207	0.201	0.204	0.202	0.202	0.199
	(0.191)	(0.191)	(0.191)	(0.192)	(0.192)	(0.191)
NN_t	-0.183	-0.186*	-0.186*	-0.186	-0.185	-0.186*
	(0.113)	(0.113)	(0.113)	(0.113)	(0.113)	(0.113)
DB_{t-1}	0.302*	0.303*	0.304*	0.296*	0.302*	0.304*
	(0.171)	(0.170)	(0.170)	(0.170)	(0.171)	(0.169)
RB_{t-1}	0.075	0.075	0.076	0.079	0.076	0.078
	(0.163)	(0.164)	(0.163)	(0.162)	(0.163)	(0.163)
RA_{t-1}	0.104	0.106	0.109	0.111	0.104	0.110
	(0.159)	(0.158)	(0.157)	(0.158)	(0.159)	(0.159)
NN_{t-1}	0.038	0.039	0.039	0.036	0.039	0.040
	(0.087)	(0.088)	(0.089)	(0.087)	(0.088)	(0.087)
Women-led	0.462**	0.468**	0.462**	0.467**	0.467**	0.467**
	(0.234)	(0.230)	(0.233)	(0.232)	(0.231)	(0.232)
DB_t # women	0.088	0.079	0.090	0.093	0.080	0.088
	(0.375)	(0.373)	(0.374)	(0.377)	(0.374)	(0.374)
RB_t # women	-0.306	-0.325	-0.322	-0.334	-0.324	-0.327
	(0.372)	(0.372)	(0.375)	(0.376)	(0.371)	(0.372)
RA_t # women	0.171	0.170	0.176	0.175	0.169	0.183
	(0.352)	(0.349)	(0.350)	(0.350)	(0.350)	(0.350)
NN_t # women	-0.346	-0.346	-0.342	-0.340	-0.347	-0.345
	(0.218)	(0.214)	(0.216)	(0.214)	(0.214)	(0.216)
DB_{t-1} # women	-0.399	-0.408	-0.407	-0.394	-0.400	-0.405
	(0.363)	(0.362)	(0.359)	(0.358)	(0.362)	(0.365)
RB_{t-1} # women	0.276	0.279	0.285	0.278	0.276	0.269
	(0.387)	(0.386)	(0.389)	(0.385)	(0.385)	(0.382)
RA_{t-1} # women	-0.566	-0.565	-0.544	-0.564	-0.555	-0.563
	(0.386)	(0.384)	(0.381)	(0.384)	(0.384)	(0.383)
NN_{t-1} # women	-0.123	-0.126	-0.124	-0.131	-0.124	-0.127
	(0.193)	(0.192)	(0.195)	(0.194)	(0.191)	(0.192)

*This table presents results from the bivariate probit model of investment plans and growth expectation, which is augmented with the interaction terms of 'funding states' and 'wled' to understand the moderating effects of gender on the impacts of 'funding states' on investment plans and growth expectation. *, ** and *** represent significance at 10%, 5% and 1%.*

Table A3: Effects of funding states for ethnic-minority-led businesses

	Capital investment	R&D investment	Product innovation	Process innovation	Leadership skill	Employee skill
	b/se	b/se	b/se	b/se	b/se	b/se
Panel A: Investment plans						
Growthexp	0.633***	0.630*	0.752***	0.703***	0.552***	0.553***
	(0.133)	(0.333)	(0.129)	(0.125)	(0.129)	(0.139)
Uncertainty	0.068	0.038	0.094*	0.110**	0.021	0.073
	(0.054)	(0.117)	(0.055)	(0.053)	(0.057)	(0.055)
DB_t	0.091	-0.277	0.034	-0.239	0.099	-0.039
	(0.194)	(0.462)	(0.199)	(0.194)	(0.213)	(0.233)
RB_t	0.167	0.781**	0.199	-0.034	-0.116	-0.210
	(0.188)	(0.371)	(0.198)	(0.195)	(0.186)	(0.200)
RA_t	0.033	0.487	-0.060	-0.019	-0.327*	0.270
	(0.184)	(0.399)	(0.208)	(0.195)	(0.188)	(0.210)
NN_t	-0.172	0.136	-0.105	-0.171	-0.165	-0.112
	(0.115)	(0.200)	(0.109)	(0.109)	(0.115)	(0.117)
DB_{t-1}	-0.352**	0.412	-0.165	-0.232	-0.497***	0.060
	(0.167)	(0.413)	(0.184)	(0.177)	(0.178)	(0.193)
RB_{t-1}	-0.389**	-0.200	-0.192	-0.101	-0.114	-0.320*
	(0.171)	(0.309)	(0.163)	(0.158)	(0.163)	(0.174)
RA_{t-1}	0.247	-0.886**	-0.256	-0.350**	0.092	0.042
	(0.182)	(0.391)	(0.188)	(0.168)	(0.229)	(0.190)
NN_{t-1}	-0.218**	-0.055	-0.227**	-0.324***	-0.224**	-0.185*
	(0.091)	(0.162)	(0.113)	(0.095)	(0.097)	(0.101)
Ethnic-minority-led	-0.050	-0.745	0.458	-0.623	-0.064	-0.046
	(0.411)	(0.739)	(0.446)	(0.412)	(0.420)	(0.523)
DB_t # Ethnic	-0.363	3.055***	0.000	1.753**	0.648	-0.447
	(0.527)	(1.047)	(0.520)	(0.773)	(0.794)	(0.553)
RB_t # Ethnic	-0.654	-0.134	0.367	0.978**	-0.004	-0.231
	(0.606)	(0.843)	(0.533)	(0.492)	(0.603)	(0.686)
RA_t # Ethnic	-1.117*		-0.244	0.848	-0.980	-0.966
	(0.640)		(0.693)	(0.576)	(0.610)	(0.738)
NN_t # Ethnic	-0.279	1.073**	-0.026	0.468	-0.416	-0.209
	(0.385)	(0.490)	(0.308)	(0.342)	(0.377)	(0.433)
DB_{t-1} # Ethnic	0.451	0.832	0.010	0.985	1.472**	-0.388
	(0.445)	(1.012)	(0.561)	(0.700)	(0.736)	(0.545)
RB_{t-1} # Ethnic	0.457	-0.522	-0.549	-0.865*	-0.074	0.203
	(0.639)	(0.794)	(0.626)	(0.514)	(0.571)	(0.642)
RA_{t-1} # Ethnic	-0.130	0.919	-0.315	0.419	0.496	-0.295
	(0.526)	(0.886)	(0.590)	(0.505)	(0.553)	(0.623)
NN_{t-1} # Ethnic	0.414	0.090	-0.272	0.445	0.503	0.250
	(0.330)	(0.574)	(0.437)	(0.368)	(0.337)	(0.415)
Panel B: Growth expectation						
$growthexp_{t-1}$	1.286***	1.280***	1.279***	1.285***	1.283***	1.285***
	(0.057)	(0.058)	(0.058)	(0.057)	(0.058)	(0.058)
Expectation error	0.379***	0.368***	0.366***	0.379***	0.373***	0.381***
	(0.064)	(0.063)	(0.063)	(0.063)	(0.064)	(0.064)
Positive error	0.024	0.025	0.018	0.021	0.024	0.022

	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)
DB_t	0.186	0.182	0.185	0.186	0.183	0.187
	(0.177)	(0.176)	(0.177)	(0.177)	(0.177)	(0.177)
RB_t	-0.070	-0.073	-0.076	-0.078	-0.073	-0.071
	(0.161)	(0.161)	(0.161)	(0.161)	(0.161)	(0.161)
RA_t	0.190	0.185	0.188	0.187	0.186	0.185
	(0.168)	(0.168)	(0.168)	(0.169)	(0.168)	(0.168)
NN_t	-0.234**	-0.237**	-0.237**	-0.237**	-0.237**	-0.237**
	(0.103)	(0.103)	(0.103)	(0.104)	(0.104)	(0.103)
DB_{t-1}	0.260	0.258	0.260	0.254	0.258	0.258
	(0.159)	(0.158)	(0.158)	(0.158)	(0.158)	(0.158)
RB_{t-1}	0.148	0.151	0.152	0.152	0.150	0.150
	(0.156)	(0.156)	(0.157)	(0.154)	(0.156)	(0.155)
RA_{t-1}	0.006	0.008	0.015	0.011	0.006	0.011
	(0.151)	(0.150)	(0.149)	(0.150)	(0.151)	(0.150)
NN_{t-1}	0.020	0.020	0.021	0.017	0.020	0.020
	(0.080)	(0.080)	(0.081)	(0.080)	(0.080)	(0.079)
Ethnic-minority-led	-0.046	-0.053	-0.070	-0.062	-0.057	-0.062
	(0.516)	(0.516)	(0.514)	(0.515)	(0.518)	(0.519)
DB_t # Ethnic	-0.743	-0.776	-0.763	-0.831	-0.788	-0.774
	(0.582)	(0.587)	(0.583)	(0.589)	(0.589)	(0.586)
RB_t # Ethnic	0.537	0.513	0.535	0.521	0.521	0.516
	(0.621)	(0.625)	(0.620)	(0.623)	(0.628)	(0.619)
RA_t # Ethnic	1.445*	1.438*	1.463*	1.423*	1.446*	1.449*
	(0.766)	(0.772)	(0.768)	(0.779)	(0.775)	(0.773)
NN_t # Ethnic	0.416	0.416	0.418	0.408	0.422	0.416
	(0.501)	(0.504)	(0.503)	(0.505)	(0.506)	(0.506)
DB_{t-1} # Ethnic	-0.805*	-0.805*	-0.781	-0.781	-0.813*	-0.780
	(0.485)	(0.489)	(0.485)	(0.487)	(0.491)	(0.483)
RB_{t-1} # Ethnic	-1.024*	-1.034*	-1.027*	-1.020*	-1.023*	-0.998*
	(0.562)	(0.568)	(0.562)	(0.565)	(0.565)	(0.558)
RA_{t-1} # Ethnic	-0.371	-0.368	-0.343	-0.343	-0.364	-0.351
	(0.600)	(0.601)	(0.591)	(0.592)	(0.600)	(0.594)
NN_{t-1} # Ethnic	-0.400	-0.392	-0.379	-0.383	-0.394	-0.386
	(0.392)	(0.392)	(0.391)	(0.391)	(0.392)	(0.390)

*This table presents results from the bivariate probit model of investment plans and growth expectation, which is augmented with the interaction terms of 'funding states' and 'mled' to understand the moderating effects of ethnicity on the impacts of 'funding states' on investment plans and growth expectation. *, ** and *** represent significance at 10%, 5% and 1%.*

Table A4: Effects of funding states across sectors

	Capital investment	R&D investment	Product innovation	Process innovation	Leadership skill	Employee skill
	b/se	b/se	b/se	b/se	b/se	b/se
Panel A: Investment plans						
growthexp	0.631***	0.666**	0.763***	0.700***	0.548***	0.557***
	0.134	0.336	0.130	0.125	0.131	0.141
Uncertainty	0.064	0.049	0.087	0.106**	0.027	0.076
	0.054	0.119	0.054	0.053	0.057	0.055
DB_t	0.131	-0.701	0.122	-0.154	-0.128	-0.251
	0.233	0.550	0.227	0.234	0.239	0.225
RB_t	0.254	0.118	0.101	-0.213	-0.108	-0.255
	0.236	0.327	0.215	0.205	0.204	0.235
RA_t	-0.003	0.674	0.200	0.038	-0.072	0.218
	0.217	0.533	0.210	0.213	0.180	0.234
NN_t	-0.151	0.223	-0.001	-0.038	-0.069	-0.002
	0.138	0.256	0.122	0.127	0.103	0.128
DB_{t-1}	-0.322*	-0.190	-0.202	-0.200	-0.275	0.075
	0.194	0.413	0.213	0.216	0.227	0.208
RB_{t-1}	-0.444**	0.007	-0.308	-0.116	-0.107	-0.345
	0.215	0.350	0.202	0.187	0.199	0.213
RA_{t-1}	0.166	-0.600	-0.227	-0.435**	-0.005	0.038
	0.222	0.397	0.203	0.181	0.279	0.223
NN_{t-1}	-0.210**	-0.109	-0.297**	-0.374***	-0.153	-0.195*
	0.105	0.209	0.137	0.111	0.115	0.118
C- Manufacturing	0.718*	0.716	0.461	0.047	-0.417*	0.026
	0.394	0.530	0.518	0.319	0.222	0.514
JKL- Information/ Financial sectors	-0.211	0.461	0.514*	0.077	0.404	0.229
	0.319	0.484	0.302	0.317	0.299	0.327
MNR - Professional/ Arts	0.139	-0.387	0.024	0.263	1.105***	0.374
	0.359	0.416	0.359	0.364	0.428	0.385
DB_t # C	0.288	-	-0.369	1.223**	0.935	1.400*
	0.535	-	0.730	0.590	0.678	0.810
DB_t # JKL	-0.128	2.328**	-0.448	-0.416	-0.084	0.212
	0.457	0.977	0.430	0.447	0.459	0.516
DB_t # MNR	-0.344	1.797*	-0.218	0.070	0.383	0.425
	0.522	0.926	0.537	0.585	0.628	0.600
RB_t # C	0.058	0.616	0.370	-0.129	0.889*	-0.096
	0.640	0.761	0.642	0.532	0.477	0.655
RB_t # JKL	-0.141	0.660	-0.154	0.281	0.037	0.344
	0.439	0.601	0.424	0.426	0.481	0.455
RB_t # MNR	-0.544	1.448*	0.801	1.012*	-0.859*	0.060
	0.542	0.754	0.591	0.613	0.502	0.605
RA_t # C	-0.277	-2.023***	-0.836	0.070	0.365	-0.792
	0.490	0.757	0.705	0.531	0.376	0.604
RA_t # JKL	-0.790	--	-0.756	-0.775	-0.603	0.029
	0.533		0.602	0.538	0.572	0.631
RA_t # MNR	0.199	0.498	-0.438	-0.083	-1.300**	0.168

	0.500	0.786	0.509	0.523	0.620	0.594
NN_t # C	-0.041	-0.709	-0.247	-0.428	0.481**	-0.600
	0.371	0.435	0.535	0.332	0.232	0.542
NN_t # JKL	-0.167	-0.124	-0.266	-0.261	-0.599**	-0.077
	0.283	0.425	0.267	0.280	0.267	0.267
NN_t # MNR	-0.141	0.045	-0.289	-0.342	-0.522	-0.314
	0.347	0.432	0.310	0.334	0.416	0.342
DB_{t-1} # C	0.510	--	-0.748	-0.303	0.417	-0.531
	0.431		0.537	0.465	0.460	0.525
DB_{t-1} # JKL	0.285	0.078	0.669*	0.244	0.051	0.159
	0.417	0.805	0.393	0.425	0.453	0.480
DB_{t-1} # MNR	-0.360	1.963***	-0.049	-0.121	-0.728	0.103
	0.545	0.643	0.550	0.548	0.651	0.524
RB_{t-1} # C	-0.408	-0.922	0.328	0.805	0.331	1.255***
	0.549	0.710	0.473	0.495	0.419	0.454
RB_{t-1} # JKL	1.082**	-0.279	0.125	-0.036	0.239	0.287
	0.444	0.644	0.425	0.406	0.432	0.417
RB_{t-1} # MNR	-0.445	-1.236*	0.029	-0.766	-0.859**	-0.873*
	0.473	0.731	0.482	0.483	0.423	0.473
RA_{t-1} # C	-0.958*	0.577	-0.138	0.039	-0.421	-0.005
	0.496	0.725	0.741	0.501	0.401	0.430
RA_{t-1} # JKL	0.194	0.553	-0.212	0.425	0.026	0.083
	0.466	0.671	0.468	0.483	0.498	0.533
RA_{t-1} # MNR	0.464	-1.600*	0.198	0.205	0.119	-0.181
	0.462	0.819	0.478	0.462	0.568	0.517
NN_{t-1} # C	-0.467	0.163	0.228	0.510**	-0.269	0.504*
	0.304	0.494	0.349	0.257	0.222	0.290
NN_{t-1} # JKL	0.427	-0.205	0.007	0.210	0.173	0.030
	0.269	0.432	0.260	0.254	0.250	0.273
NN_{t-1} # MNR	0.035	0.380	0.329	0.065	-0.461	-0.128
	0.270	0.337	0.320	0.283	0.286	0.288
Panel B: Growth expectation						
$Growthexp_{t-1}$	1.278***	1.272***	1.271***	1.277***	1.275***	1.277***
	0.058	0.058	0.058	0.058	0.058	0.058
Expectation error	0.375***	0.364***	0.362***	0.375***	0.370***	0.377***
	0.063	0.063	0.063	0.063	0.064	0.064
Positive error	0.024	0.025	0.018	0.020	0.023	0.022
	0.093	0.093	0.093	0.093	0.093	0.093
DB_t	0.061	0.057	0.057	0.064	0.057	0.057
	0.210	0.209	0.207	0.209	0.209	0.209
RB_t	-0.054	-0.061	-0.061	-0.058	-0.061	-0.057
	0.205	0.205	0.204	0.205	0.205	0.204
RA_t	0.147	0.136	0.136	0.138	0.137	0.137
	0.211	0.211	0.211	0.212	0.211	0.211
NN_t	-0.211*	-0.218*	-0.217*	-0.214*	-0.217*	-0.216*
	0.128	0.128	0.128	0.129	0.128	0.128
DB_{t-1}	0.093	0.095	0.102	0.091	0.094	0.094
	0.184	0.185	0.184	0.184	0.185	0.185
RB_{t-1}	0.080	0.083	0.083	0.080	0.081	0.080
	0.196	0.198	0.198	0.196	0.197	0.196

RA_{t-1}	-0.168	-0.167	-0.154	-0.159	-0.169	-0.159
	0.180	0.179	0.178	0.178	0.179	0.178
NN_{t-1}	-0.035	-0.034	-0.033	-0.040	-0.034	-0.034
	0.096	0.096	0.098	0.096	0.097	0.096
C-Manufacturing	0.340	0.336	0.332	0.342	0.335	0.335
	0.330	0.331	0.335	0.329	0.330	0.332
JKL-Information/ Financial sectors	-0.211	-0.206	-0.211	-0.209	-0.206	-0.204
	0.291	0.292	0.293	0.292	0.293	0.292
MNR - Professional/ Arts	-0.216	-0.230	-0.226	-0.222	-0.229	-0.228
	0.297	0.299	0.297	0.297	0.300	0.298
DB_t # C	-1.137*	-1.153*	-1.177*	-1.166*	-1.159*	-1.148*
	0.591	0.597	0.604	0.599	0.597	0.600
DB_t # JKL	0.258	0.254	0.259	0.234	0.244	0.252
	0.420	0.421	0.419	0.418	0.418	0.423
DB_t # MNR	0.299	0.309	0.324	0.303	0.315	0.311
	0.492	0.493	0.491	0.504	0.495	0.484
RB_t # C	-0.430	-0.422	-0.432	-0.435	-0.423	-0.421
	0.467	0.461	0.466	0.463	0.463	0.464
RB_t # JKL	0.233	0.246	0.239	0.230	0.236	0.236
	0.392	0.391	0.383	0.383	0.391	0.391
RB_t # MNR	0.074	0.092	0.096	0.088	0.091	0.088
	0.424	0.426	0.421	0.419	0.425	0.424
RA_t # C	0.373	0.371	0.410	0.345	0.369	0.373
	0.492	0.493	0.497	0.490	0.493	0.495
RA_t # JKL	0.316	0.327	0.348	0.315	0.324	0.321
	0.642	0.645	0.654	0.644	0.644	0.643
RA_t # MNR	0.223	0.243	0.250	0.240	0.244	0.244
	0.437	0.438	0.434	0.441	0.441	0.439
NN_t # C	-0.083	-0.076	-0.076	-0.087	-0.075	-0.073
	0.312	0.316	0.323	0.313	0.316	0.320
NN_t # JKL	0.072	0.078	0.081	0.069	0.074	0.070
	0.249	0.249	0.249	0.250	0.249	0.248
NN_t # MNR	-0.084	-0.069	-0.072	-0.081	-0.068	-0.074
	0.286	0.288	0.283	0.285	0.289	0.288
DB_{t-1} # C	0.505	0.521	0.536	0.525	0.526	0.518
	0.611	0.614	0.616	0.614	0.615	0.612
DB_{t-1} # JKL	0.610	0.593	0.585	0.601	0.597	0.604
	0.400	0.400	0.397	0.395	0.399	0.400
DB_{t-1} # MNR	0.197	0.210	0.193	0.208	0.211	0.219
	0.461	0.457	0.454	0.451	0.456	0.452
RB_{t-1} # C	0.075	0.082	0.084	0.066	0.080	0.079
	0.438	0.431	0.431	0.426	0.428	0.426
RB_{t-1} # JKL	0.187	0.171	0.176	0.178	0.174	0.181
	0.406	0.409	0.407	0.402	0.406	0.403
RB_{t-1} # MNR	-0.108	-0.121	-0.101	-0.092	-0.114	-0.113

	0.413	0.419	0.410	0.407	0.416	0.415
RA_{t-1} # C	0.657	0.646	0.671	0.612	0.651	0.636
	0.432	0.429	0.434	0.424	0.428	0.425
RA_{t-1} # JKL	-0.079	-0.092	-0.094	-0.107	-0.089	-0.098
	0.496	0.497	0.496	0.502	0.499	0.498
RA_{t-1} # MNR	0.656*	0.662*	0.644*	0.656*	0.660*	0.654*
	0.383	0.382	0.377	0.384	0.385	0.385
NN_{t-1} # C	-0.332	-0.336	-0.341	-0.335	-0.336	-0.339
	0.276	0.275	0.278	0.272	0.273	0.272
NN_{t-1} # JKL	0.183	0.174	0.176	0.186	0.175	0.180
	0.240	0.241	0.240	0.239	0.241	0.241
NN_{t-1} # MNR	0.331	0.332	0.336	0.338	0.329	0.335
	0.219	0.220	0.222	0.220	0.220	0.219

*This table presents results from the bivariate probit model of investment plans and growth expectation, which is augmented with the interaction terms of 'funding states' and sectors. 'sector' is now categorised as 0 if other sectors, 1 if C-Manufacturing, 2 if JKL-Communication/Technology/Financial services/Real Estate, 3 if Professional/Scientific/Arts/Entertainment to allow for convergence of the model. *, ** and *** represent significance at 10%, 5% and 1%.*

ERC
Enterprise Research Centre

Contact Us

Centre Manager
Enterprise Research Centre
Warwick Business School
Coventry, CV4 7AL

Email: Centremanager@enterpriseresearch.ac.uk

UKRI Economic and Social Research Council
Department for Business, Innovation, Science and Trade
BRITISH BUSINESS BANK
Intellectual Property Office