BANK OF CANADA
BANQUE DU CANADA

Staff Discussion Paper/Document d'analyse du personnel—2025-15

Last updated: November 28, 2025

Do Firms' Sales Expectations Hit the Mark? Evidence from the Business Leaders' Pulse

Owen Gaboury
Canadian Economic Analysis
Bank of Canada
ogaboury@bankofcanada.ca

Farrukh Suvankulov
Canadian Economic Analysis
Bank of Canada
fsuvankulov@bankofcanada.ca

Mathieu Utting
Canadian Economic Analysis
Bank of Canada
mutting@bankofcanada.ca

DOI: https://doi.org/10.34989/sdp-2025-15 | ISSN 1914-0568

Acknowledgements

We thank Joshua Slive and Virginie Traclet for their helpful comments and Selam Abraham for excellent research support. The views expressed in the paper are solely those of the authors. No responsibility for them should be attributed to the Bank of Canada.

Abstract

This paper replicates and extends the work of Altig et al. (2022) on firms' subjective sales growth expectations using Canadian survey data from the Bank of Canada's Business Leaders' Pulse. We examine the formation, uncertainty and predictive validity of firm-level sales growth forecasts using subjective probability distributions from business leaders at a one-year-ahead horizon. The replication work performed here confirms several findings from Altig et al. (2022), including that expected sales growth predicts realized sales growth, subjective uncertainty predicts forecast errors and firms frequently revise their expectations, usually by small amounts. We also find that subjective uncertainty predicts the magnitude of forecast revisions and follows a V-shaped relationship with past sales growth. We extend the original analysis by further demonstrating that firms with weaker recent performance assign greater weight to future weak growth scenarios, and subsequently that these firms are more likely to underperform, suggesting expectations are grounded in real conditions. The results presented in this paper reinforce the value of firm-level survey data for macroeconomic forecasting and policy analysis and help validate the Business Leaders' Pulse as a reliable source of firm-level expectations data.

Topics: Firm dynamics, Monetary policy and uncertainty

JEL codes: C8, C83, D, D2, D22

Résumé

Cette étude reproduit et approfondit les travaux d'Altig et autres (2022) sur les attentes subjectives des entreprises quant à la croissance des ventes à l'aide de données canadiennes tirées de l'enquête Le Pouls des leaders d'entreprise de la Banque du Canada. Nous examinons l'élaboration des prévisions de croissance des ventes au niveau des entreprises, ainsi que l'incertitude et la validité prédictive qui leur sont associées, à l'aide de distributions de probabilités subjectives des leaders d'entreprise à l'horizon d'un an. Notre travail de réplication confirme plusieurs résultats d'Altig et autres (2022), notamment que la croissance attendue des ventes prédit la croissance réalisée des ventes, que l'incertitude subjective prédit les erreurs de prévision et que les entreprises révisent fréquemment leurs attentes, en général par de faibles ajustements. Nous constatons aussi que l'incertitude subjective prédit l'ampleur des modifications des prévisions et suit une relation en V avec la croissance passée des ventes. Nous approfondissons l'analyse initiale en montrant en outre que les entreprises dont les résultats récents ont été plus faibles accordent plus de poids aux scénarios de faible croissance à venir, et que ces entreprises sont plus susceptibles d'enregistrer des résultats plus faibles, ce qui donne à penser que les attentes sont fondées sur les conditions réelles. Les résultats présentés dans cette étude renforcent la valeur des données d'enquête auprès des entreprises pour les prévisions macroéconomiques et l'analyse des politiques, et contribuent à confirmer que le Pouls des leaders d'entreprise constitue une source fiable de données sur les attentes des entreprises.

Sujets : Dynamique des entreprises, Incertitude et politique monétaire

Codes JEL : C8, C83, D, D2, D22

1. Introduction

As firms assess economic and sectoral trends, they form expectations about their future sales growth. These expectations play a central role in guiding firms' operational and strategic decisions. Accurate forecasting helps businesses align hiring, investment and production plans with anticipated levels of demand. Existing research shows that survey data provide meaningful and accurate measures of firms' sales expectations (e.g., Bloom 2009; Bontempi, Golinelli and Parigi 2010; Armantier et al. 2017). These forecasts, in turn, have been shown to influence a range of economic decisions, including hiring, investment and wage negotiations (Bachmann et al. 2019; Fiori and Scoccianti 2023).[1]

Because firms' expectations influence many aspects of their decision-making, they also have broader macroeconomic implications. Firm-level surveys capturing these expectations offer timely signals about economic conditions and can offer valuable forward-looking information for monetary policy (Kozicki 2025). For example, building on earlier work by Martin and Papile (2004), Pichette (2012) shows that the balance of opinion on future sales growth from the Bank of Canada's Business Outlook Survey (BOS) reliably predicts real GDP growth. These findings highlight the value of systematically collected expectations data as forward-looking indicators for monetary policy.

Developing sales expectations requires that firms understand sources of uncertainty. In business operations, the sources of uncertainty that influence a company's strategy, performance and operating environment include supply chain disruptions, economic fluctuations, technological advancements and political instability. These often result in unexpected, depressed levels of economic activity (Awano et al. 2018). As economic challenges evolve over time, they shape how business leaders form expectations and make operational decisions, requiring firms to adjust their strategies in response to shifting conditions. Bachmann et al. (2019) show that higher than normal levels of uncertainty often lead firms to implement more frequent and larger output price adjustments, while Baker, Bloom and Davis (2016) and Handley and Li (2020) have linked uncertainty to reduced investment and hiring intentions.

This paper explores the accuracy of firms' sales expectations and examines how uncertainty around those expectations influences the outlook of Canadian firms. It builds and expands on the work of Altig et al. (2022) by replicating and examining the validity of a set of the hypotheses regarding sales expectations and uncertainty for Canadian firms.

[1] For the purposes of this report, we use the terms 'expectation' and 'forecast' interchangeably.

The paper uses data from the Bank of Canada's Business Leaders' Pulse (BLP), a monthly online survey designed to provide timely and flexible input into the Bank's monetary policy decision-making process (Chernis et al. 2022). The BLP collects information from Canadian business leaders on a range of topics, including sales, current business conditions, employment, inflation expectations and investment intentions. These insights are used to form a real-time picture of the economic environment faced by firms across the country. For this paper, we focus exclusively on responses to the sales section of the survey, covering the period from May 2021 to December 2024 (see Appendix for details).

Our goal is to examine how firms' expectations for their future sales evolved during and after the COVID-19 pandemic, as well as how confident firms felt in those expectations, a measure known as subjective uncertainty. In addition, by replicating results from Altig et al. (2002), this paper serves as a robustness exercise for the BLP, providing evidence for the credibility and value of survey-based insights in capturing firm-level expectations. To do this, we first describe the six hypotheses related to firms' sales expectations outlined in Altig et al. (2022) and compare our results for Canadian firms with their findings for US firms. Specifically, we test the following hypotheses:

1. Mean sales forecasts predict realized growth rates.
2. Subjective uncertainty around sales forecast predicts the magnitude of forecast errors.
3. Respondents update reported beliefs often, usually by small amounts.
4. Subjective uncertainty around sales forecasts predicts the magnitude of future forecast revisions.
5. Revisions in mean sales expectations predict future forecast errors.
6. Subjective uncertainty around sales forecast has a V-shaped relationship to past growth.

Finally, we extend the analysis by examining two additional, related hypotheses on sales expectations not explored in Altig et al. (2022):

7. Firms with weaker recent performance place greater weight on low sales growth outcomes.
8. Firms that assign higher probabilities to weak sales outcomes tend to achieve lower realized sales growth relative to others.

This provides deeper insight into how Canadian firms' sales expectations evolve over time, particularly during periods of heightened uncertainty such as the post-COVID period. Uncertainty tends to rise sharply following major shocks, slowing economic growth and constraining productivity (Bloom 2009). As a result, accurately measuring firms' subjective uncertainty enables a more precise interpretation

of survey data on sales expectations, improving the accuracy of economic forecasting models and strengthening policy-makers' ability to respond to economic disruptions.

The structure of the paper is as follows. Section 2 outlines existing literature. Section 3 provides a brief description of the survey questionnaire, the data and methodology. Section 4 discusses the results. Section 5 concludes.

2. Motivation and related literature

This section discusses the six hypotheses related to firms' sales expectations that were tested by Altig et al. (2022), along with two additional hypotheses introduced in this paper. For each hypothesis, we summarize the underlying theory, review existing evidence and explain how the results contribute to our understanding of firm-level expectations.[2] The definitions of the key variables and a detailed overview of the empirical methodology can be found in section 3.

Hypothesis 1: Expected sales growth rates predict realized sales growth rates.

The first hypothesis explored by Altig et al. (2022) examines whether firms' expected sales growth rates, measured as the probability weighted average of potential sales growth outcomes, predict their realized sales growth. Because firms have access to private information about their operations, business leaders should be able to produce accurate and informed sales growth forecasts (Barrero 2022). Confirming this relationship is important for several reasons. First, it validates the reliability of firms' reported sales growth expectations, showing that they accurately reflect future outcomes. Second, it supports the idea that firms' private information plays an important role in shaping their forecasts. Third, it demonstrates that internal forecasting methods are meaningful and informed, providing accurate insights into future business activity. Finally, proving this relationship strengthens the credibility of survey-based expectations data, supporting its use as a reliable resource for research and policy analysis.

In his 2022 paper, Barrero finds that managerial beliefs on sales growth expectations do not systematically exceed realizations. Using data from the Survey of Business Uncertainty (SBU), Barrero shows that the average forecast error made by business leaders is close to zero, supporting the notion that expectations are broadly aligned with actual outcomes. Altig et al. (2023) expand on this,

[2] We follow the structure and methodology of Altig et al. (2022) closely as part of a formal replication exercise. As a result, some sections, particularly those describing the modelling framework, hypothesis structure and results, resemble the original paper. Every effort has been made to paraphrase appropriately and ensure that all original ideas are fully cited. Any similarities in language reflect the close replication of the original analysis.

incorporating updated results from the SBU to provide further evidence that expected sales growth rates are predictive of realized sales growth rates at the firm level. Using a subset of Germany's IFO Business Climate Survey, Bachmann and Elstner (2015) also show that the majority of firms accurately predict production growth at a one-quarter-ahead horizon, while Boutros et al. (2020), drawing on data from Duke University's quarterly CFO survey, show that senior financial executives' forecasts of S&P 500 returns demonstrate a high degree of accuracy. Together, these findings validate the reliability of survey-based expectations data and strengthen their value as indicators of future firm performance.

Hypothesis 2: Subjective uncertainty predicts the magnitude of forecast errors.

Having established that business leaders make accurate and informed forecasts, we next discuss the degree of confidence they have in forming these expectations and how this varies in response to internal and external factors. The second hypothesis demonstrates that subjective uncertainty predicts the magnitude of forecast errors, where uncertainty is measured as the standard deviation, or dispersion, of a firm's sales growth forecast and the forecast error is defined as the difference between a firm's expected and realized sales growth rates. When firms report high levels of uncertainty, it reflects a wider range of possible growth scenarios, which in turn leads to larger deviations between expected and actual outcomes.

From a firm's perspective, tracking uncertainty as an indicator of forecasting accuracy allows for better risk management through efficient planning and resource allocation. For policy-makers, understanding the implications of elevated uncertainty supports a more effective and timely policy response. Extensive literature shows that spikes in uncertainty are associated with pauses in investment and hiring (Bloom 2009; Bontempi, Golinelli and Parigi 2010; Armantier et al. 2017; Bachmann et al. 2019; Fiori and Scoccianti 2023) and contribute to declines in production and output levels (Baker, Bloom and Davis 2016). In this context, monitoring uncertainty not only enhances economic forecasting but also helps anticipate economic downturns, enabling policy-makers to respond in a more timely and targeted manner. As internal and external shocks are shown to directly influence corporate decision-making, this also has implications for investors, regulators and other corporate stakeholders who rely on firm-level data and forecasts to inform their decisions (Ben-David, Graham and Harvey 2013).

Measuring subjective uncertainty at the firm level can improve forecasting models and equip policy-makers to better anticipate and mitigate the economic effects of downturns. Establishing this link validates uncertainty as a quantifiable signal of risk in a firm's operational outlook. When business

leaders' confidence in their forecasts declines and the expectations become more volatile, high uncertainty can serve as an early warning signal for reduced investment, employment and production, and more generally as a signal of broad-based economic slowdowns. Demonstrating the correlation between uncertainty and forecast errors reinforces the use of survey-based uncertainty measures as a credible and effective tool for research and policy work.

Hypothesis 3: Respondents update their reported beliefs often, by small amounts.

The third hypothesis explores how frequently, and by how much, respondents update their forecasts between survey periods. Given the constant evolution of business conditions, we expect forecast distributions to shift between survey periods as firms incorporate new information. The value in testing this behaviour comes from demonstrating that survey respondents are reassessing their outlook, rather than from providing static or generic forecasts. Evidence of frequent updates implies that business leaders are engaged with the survey process and are continuously refining their expectations in response to changing conditions. This not only strengthens the credibility of survey-based data but also highlights their value as a real-time indicator of firms' expectations.

Altig et al (2022) show that in the SBU, nearly all respondents provide different sales and employment growth forecasts across consecutive survey periods. The authors go further to examine the magnitude of these forecast revisions; and they find that, while updates occur between nearly every survey period, they are typically small in size. These findings suggest that firms are actively considering their responses and incorporating new information in real time while broadly maintaining similar expectations. This measured relationship reinforces that firms are both engaged and thoughtful in their forecasting process.

Hypothesis 4: Subjective uncertainty predicts the magnitude of future forecast revisions.

After establishing that respondents actively revise their reported beliefs, we next examine the relationship between subjective uncertainty and the magnitude of firms' future forecast revisions. If firms that report higher levels of uncertainty also tend to make larger revisions to their expectations between surveys, this suggests instability in their outlook. We also investigate whether current subjective uncertainty predicts future changes in uncertainty itself. These relationships have important implications not only for forecasting and risk assessment but also for demonstrating that uncertainty is forward looking and reflects meaningful doubt in a firms' outlook rather than random noise. In this sense, it validates subjective uncertainty as a signal that firms anticipate potential volatility in their business environment.

In their findings, Altig et al. (2022) confirm that firms reporting greater uncertainty today tend to make larger revisions to their expectations in the future. They also show that firm-level uncertainty is even more predictive of future revisions to uncertainty itself than of revisions to expectations. Broadly, their results indicate that firms reporting low levels of uncertainty today are likely to continue reporting similar levels in future surveys, while those reporting high uncertainty anticipate not only potential changes to outcomes but also uncertainty in the stability of their own outlook. This highlights that subjective uncertainty reflects an awareness of possible volatility, both in expectations and in the confidence firms place in them.

Hypothesis 5: Revisions in expectations predict future forecast errors.

Another key hypothesis examines the relationship between revisions in expectations—defined as changes in a firm's reported sales growth forecasts between consecutive surveys—and future forecast errors. This relationship allows researchers to assess whether forecast errors are predictable based on firms' recent changes in expectations, particularly in response to past sales growth. Altig et al. (2022) interpret their findings as evidence that business executives tend to over-extrapolate from recent news in forming expectations about future firm growth. Specifically, firms are often too optimistic following positive news and too pessimistic following negative news.

Both Altig et al. (2022) and Barrero (2022) find that revisions in expectations significantly predict future forecast errors, which has been shown to affect managerial decisions, firm performance and macroeconomic outcomes. Earlier research also shows that firms exhibit systematic over-optimism or over-pessimism when forming their expectations, even more so for those that are highly leveraged (Bachmann and Elstner 2015).

This pattern is consistent with broader evidence on managerial overconfidence, which has been shown to influence firms' risk-taking behaviour. For instance, Hirshleifer and Luo (2001), Malmendier and Tate (2008) and Gervais, Heaton and Odean (2011) find that overconfident firms overestimate the likelihood of high returns from investments expenditures while underestimating downside risk. Similarly, Barrero (2022) finds that business leaders frequently over-extrapolate from recent firm performance, indicating that firm-level forecasts are heavily influenced by short-term trends. As a result, managers are likely to make larger revisions to their forecasts when faced with new information. On a broader scale, these biases can lead to inefficient resource allocation and increased macroeconomic volatility (Barrero 2022).

Understanding how revisions signal future errors offers deeper insight into the reliability of business expectations and the behavioural tendencies that shape firm decisions, along with the increased risk to business outcomes that stems from over-optimistic forecasting.

Hypothesis 6: Subjective uncertainty has a V-shaped relation to past growth and forecast revisions.

The final hypothesis tested in Altig et al. (2022) determines how firms' subjective uncertainty relates both to changes in reported past sales growth and to subsequent forecast revisions. The rationale for exploring this dynamic is to determine whether uncertainty rises not only after periods of weak performance but also following strong performance. This relationship is important because it suggests that firms interpret both positive and negative shocks as signals of potential instability, likely due to unfamiliar or rapidly changing business conditions (Bachmann et al. 2021).

Altig et al. (2022) find that firms with greater absolute past sales growth rates report higher levels of subjective uncertainty relative to others, producing a pronounced V-shaped relationship between past performance and uncertainty. Similarly, they show that firms making larger revisions to their forecasts also tend to report higher uncertainty, reinforcing the idea that subjective uncertainty is a forward-looking measure informed by recent changes.

Demonstrating this link helps establish that firms anchor their expectations not only on macroeconomic conditions but also on their own recent experiences. This insight strengthens the value of subjective uncertainty as an input into forecasting and policy analysis.

Hypothesis 7: Firms with weaker recent performance place greater weight on low sales growth outcomes.

This hypothesis extends the discussion in Altig et al. (2022) by examining a dimension they do not cover: whether firms' recent underperformance leads them to overweight negative outcomes in their expectations, resulting in greater pessimism or conservatism. This behavioural mechanism could explain persistent underinvestment, muted hiring plans or lower risk-taking among struggling firms, contributing to broader macroeconomic slowdowns. This hypothesis draws from and contributes to several strands of economic research. Firms do not form expectations in a vacuum; instead, they update beliefs using recent information. Research by Malmendier and Nagel (2016) on experience-based learning shows that economic agents disproportionately weight their personal experiences, especially negative ones, when forming expectations about future outcomes. Similarly, Kahneman and Tversky's (1979) prospect theory posits that agents exhibit loss aversion—they react more strongly to losses than to gains. If firms with weak recent performance focus more on downside risks, it may reflect a similar cognitive bias. Recent firm-level studies have documented that expectations

are shaped not only by aggregate signals but also by firm-specific shocks. For example, Coibion, Gorodnichenko and Kumar (2018) show that managers' beliefs are sticky and influenced by their firm's own experience, rather than being fully rational or based solely on public information.

Hypothesis 8: Firms that assign higher probabilities to weak sales outcomes tend to underperform relative to others.

This hypothesis tests whether firms' downside-weighted expectations are predictive of future performance. If firms anticipating weak sales consistently underperform, this suggests that their beliefs reflect meaningful private information rather than noise or excessive pessimism.

The hypothesis contributes to the literature on firm expectations (e.g., Bloom, Bond and Van Reenen 2007; Bachmann and Elstner, 2015), which shows that managerial forecasts help predict investment and output. While not directly addressed in Altig et al. (2022), this hypothesis extends their framework by examining whether the distribution of expectations—particularly the weight on negative outcomes—contains forward-looking information.

This also connects to work on belief-driven dynamics (e.g., Angeletos, Collard and Dellas 2020) and diagnostic expectations (Bordalo et al. 2019), where firms' beliefs can influence actual outcomes. Confirming this hypothesis would reinforce the value of subjective expectations as an early signal of firm-level weakness.

3. Data and empirical methodology

3.1 Sales questions in the Business Leaders' Pulse

Since the launch of the BLP in May of 2021, the survey has continuously elicited subjective probability distributions from business owners about their future sales outcomes over a 12-month horizon. This design allows the BLP to capture both firms' expectations and the uncertainty surrounding those outcomes, following evidence from Manski (2004) that consumers, and by extension business leaders, can express uncertainty about future events using subjective probabilities.

As of December 2024, the BLP sales section featured a sample size of 6,888 responses from 2,095 unique firms. On average, the survey receives about 300 responses per month. The dataset forms an unbalanced panel, with around one-third of firms remaining in the panel for at least 12 months, owing to natural attrition.

In the BLP's sales section, we first ask firms to report their current sales revenue in dollars and their past sales growth rate. Specifically, we ask the following questions: "For the current quarter, what

would you estimate the total dollar value of your sales revenue will be?" and "Looking back, over the past 12 months, what was the approximate percentage growth rate in your sales revenue?" Following the SBU in the United States, the BLP then asks respondents to define five one-year-ahead future sales growth rate scenarios, defined as support points[3]:

> "Looking ahead, from now to four quarters from now, what approximate percentage sales revenue growth rate would you assign to each of the following scenarios?"
>
> - The lowest percentage sales revenue growth rate would be about: ___
> - A low percentage sales revenue growth rate would be about: ___
> - A middle percentage sales revenue growth rate would be about: ___
> - A high percentage sales revenue growth rate would be about: ___
> - The highest percentage sales revenue growth rate would be about: ___

Next, respondents are asked to assign probabilities associated with each of the potential growth scenarios:

> "Please assign a percentage likelihood to the sales revenue growth rates that you entered in the previous question."
>
> - Lowest: the likelihood of realizing a ___% sales revenue growth rate: ___%
> - Low: the likelihood of realizing a ___% sales revenue growth rate: ___%
> - Middle: the likelihood of realizing a ___% sales revenue growth rate: ___%
> - High: the likelihood of realizing a ___% sales revenue growth rate: ___%
> - Highest: the likelihood of realizing a ___% sales revenue growth rate: ___%

Together, this framework provides the basis for the BLP's sales questions, allowing us to analyze both firms' sales growth forecasts and uncertainty surrounding their expectations.

3.2 Measuring subjective expectations, uncertainty and forecast errors

Using the information collected in the sales questionnaire, we calculate one-year-ahead sales growth expectations for each firm by taking the mean (first moment) sales growth rate:

$$Mean(SaleGR) = \sum_{i=1}^{5} p_i \cdot SaleGR_i \qquad (1)$$

[3] As documented by Altig et al. (2022), prior to the launch of the SBU, Atlanta Fed staff conducted a series of field tests and cognitive interviews, which demonstrated that business decision-makers are both willing and able to articulate their firm's outlook using discrete probability distributions with self-selected support points.

We measure the firm's subjective uncertainty by taking the standard deviation (second moment) of the sales growth rate:

$$SD(SaleGR) = \left[\sum_{i=1}^{5} p_i\left(SaleGR_i - Mean(SaleGR)\right)^2\right]^{1/2}. \quad (2)$$

Following Dominitz and Manski (1997), Manski (2004) and Altig et al. (2022), we have subjective uncertainty, $SD(SaleGR)$, reflect the dispersion of firms' forecast distributions. Firms' report five future sales growth rate outcomes, $SaleGR_i$, with associated probabilities, p_i, for $i = 1,2,3,4,5$, which are interpreted as the percent change in current sales, $Sale_t$. To ensure consistency with business-level dynamics literature (Altig et al. 2023), we normalize growth rates as arc percentage changes using the formula $SaleGR_i = \frac{2SaleGR_i}{SaleGR_i+2}$. This ensures that growth rates are symmetric around zero and bounded between -2 and 2, and provides a more accurate approximation of log changes using a second-order Taylor expansion, particularly for large growth rates.

To evaluate the underlying dataset and assess the key characteristics such as firms' forecasting performance and accuracy, the analysis focuses on residual forecast errors, the difference between actual and forecasted sales growth. Given the reported sales support points, $SaleGr_i$, and associated probabilities, we compute the realized sales growth rate from t to $t + 12$ for a firm as:

$$RSaleGR_{t,t+12} = \frac{Sale_{t+12} - Sale_t}{(1/2)(Sale_{t+12} + Sale_t)}. \quad (3)$$

We then define the four-quarter-ahead forecast error at month *t* as:

$$Err(SaleGR)_t^q = RSaleGR_{t,t+3q} - Mean(SaleGR)_t^q. \quad (4)$$

This formulation allows for an evaluation of how closely firms' expectations align with realized sales growth, providing insight into the accuracy of their forecasts.

Table 1 reports summary statistics of the support points and their associated probabilities. The average of the outcomes of sales growth rate responses across all support points ranges from -3.42% for the lowest growth scenario up to 20.23% for the highest. The mean of the associated probabilities is bell-shaped, with the highest probability mean outcome reported at the middle support point, at an average of 32.3%. Firms tend to place more weight on lower growth scenarios; the lowest case is assigned a mean likelihood of 17.9%, compared with 9.2% for the highest case. This

pattern suggests that firms are cautious in their outlook, emphasizing weaker sales expectations. Overall, these findings align closely with the data observed in the SBU, indicating a consistent pattern across the different datasets.

Table 1: Summary statistics for support points and associated probabilities

Support points (%)	**N**	**Mean (%)**	**SD (%)**
Lowest	6,888	-3.42	11.34
Low	6,888	1.76	8.62
Middle	6,888	6.85	9.72
High	6,888	12.99	15.63
Highest	6,888	20.23	23.63
Associated probabilities	**N**	**Mean**	**SD**
Lowest	6,888	0.179	0.189
Low	6,888	0.218	0.135
Middle	6,888	0.323	0.176
High	6,888	0.184	0.129
Highest	6,888	0.092	0.086

Note: This table reports the mean and standard deviations of the five support points (upper panel) and their associated subjective probability distribution (lower panel) over future sales growth rates.

Table 2 displays the descriptive statistics for the sales growth rate forecasts, uncertainty, realized sales growth and current sales. As of December 2024, 1,978 firms had a realized sales growth rate, meaning that they have responded at both time *t* and *t* + *12*. From the table, the average sales growth rate forecast is 5.4% and has a standard deviation of 0.114. The mean of the sales growth rate uncertainty is 5.8%, with associated standard deviation of 0.073. In general, these results are comparable to the findings of Altig et al. (2002); however, analysis of the BLP dataset reveals greater heterogeneity in realized sales growth rates evidenced by a larger standard deviation. The discrepancies here derive mainly from the difference in current sales figures, largely reflecting smaller firm sizes in the Canadian economy.

Table 2: Summary statistics for forecast means, uncertainty and realizations over the next four quarters

Firm-level variable	N	Mean	SD	P10	P25	P50	P75	P90
Sales growth rate forecast, $Mean(SaleGR)$	6,888	0.054	0.114	-0.037	0.011	0.043	0.089	0.162
Sales growth rate uncertainty, $SD(SaleGR)$	6,887	0.058	0.073	0.012	0.021	0.040	0.069	0.118
Realized sales growth rate, $RSaleGR_{t,t+12}$	1,978	0.041	0.332	-0.400	-0.133	0.025	0.222	0.462
Current sales (thousands of dollars), $Sale_t$	6,888	12,671	36,233	130	400	1,900	7,300	25,000

Note: This table reports summary statistics generated using the Bank of Canada's Business Leaders' Pulse Survey. The data are winsorized at the 1st and 99th percentiles before computing the summary statistics.

4. Results

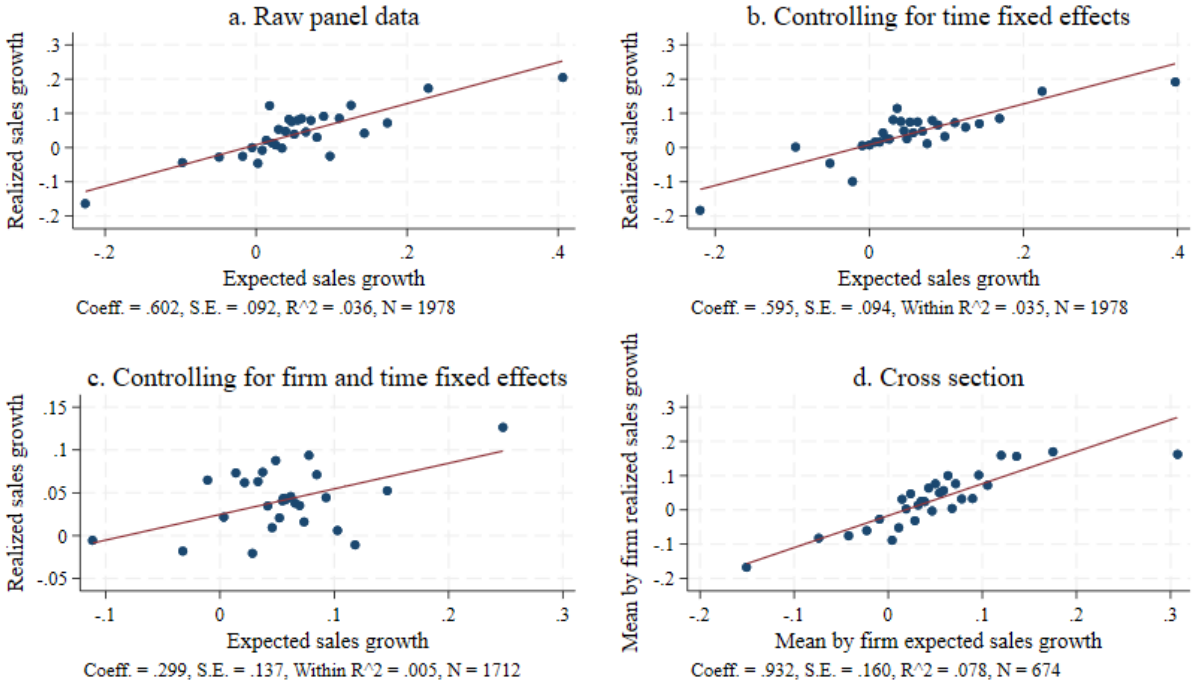
Next, we return to the hypotheses specified in Altig et al. (2022) and replicate the findings using BLP data. This section discusses the findings, compares them with the SBU as outlined in Altig et al. and broadly discusses the policy implications. Following this, we extend the analysis by examining the two additional related hypotheses on sales expectations described in section 2.

Hypothesis 1: Expected sales growth rates predict realized sales growth rates.

We begin the analysis by first evaluating how accurately firms form their expectations by comparing their projected sales growth rates with the actual growth rates they ultimately achieve. As previously discussed, evaluating how closely firms' expectations align with realized growth rates provides insight into the reliability of firms' forecasting abilities.

In **Chart 1**, we plot firms' sales expectations against realized sales growth. In each panel, we group observations into 30 bins and plot the average values for each bin. Firm-level sales growth forecasts align well with realized sales growth at a four-quarter-ahead horizon (panel a), suggesting that Canadian firms demonstrate a strong ability to predict their future sales growth. It is all the more notable that the period covered includes challenging conditions: namely, the COVID-19 pandemic and subsequent high inflationary period.

Chart 1: Subjective sales growth rate expectations predict realized sales growth rates



Note. This chart shows bin-scatter plots of sales growth expectations for the next 12 months on the horizontal axis against realized sales growth rates over the ensuing four quarters on the vertical axis. The red line in each panel represents the fitted linear relationship estimated using OLS regression in either the raw panel data, with controls for time effects, with controls for firm and time effects, or in the cross-section. Regression statistics are reported below each panel. Data are from May 2021 to December 2024.

Chart 1, panel a displays a bin-scatter of firm-level values for the realized sales growth at time $t + 12$ and the expected sales growth at time t. The subheading of the graph displays the corresponding OLS regression results, with an estimated slope coefficient of the expected sales growth rate of 0.602 and a firm-clustered standard error of 0.092. Panels b and c display the same regression while controlling for time and firm fixed effects, which shows a similarly positive, although weaker, relationship to the raw panel regression. This provides evidence that Canadian firms' expected sales growth rates accurately predict their realized sales growth rates. Finally, panel d provides a cross-sectional analysis, examining whether differences in firms' expected sales growth rates predict differences in realized sales growth rates across all firms in a given period. Unlike the previous panels, which focus on within-firm variation over time, this cross-section highlights whether firms with higher growth expectations relative to others also tend to achieve stronger realized growth. This approach

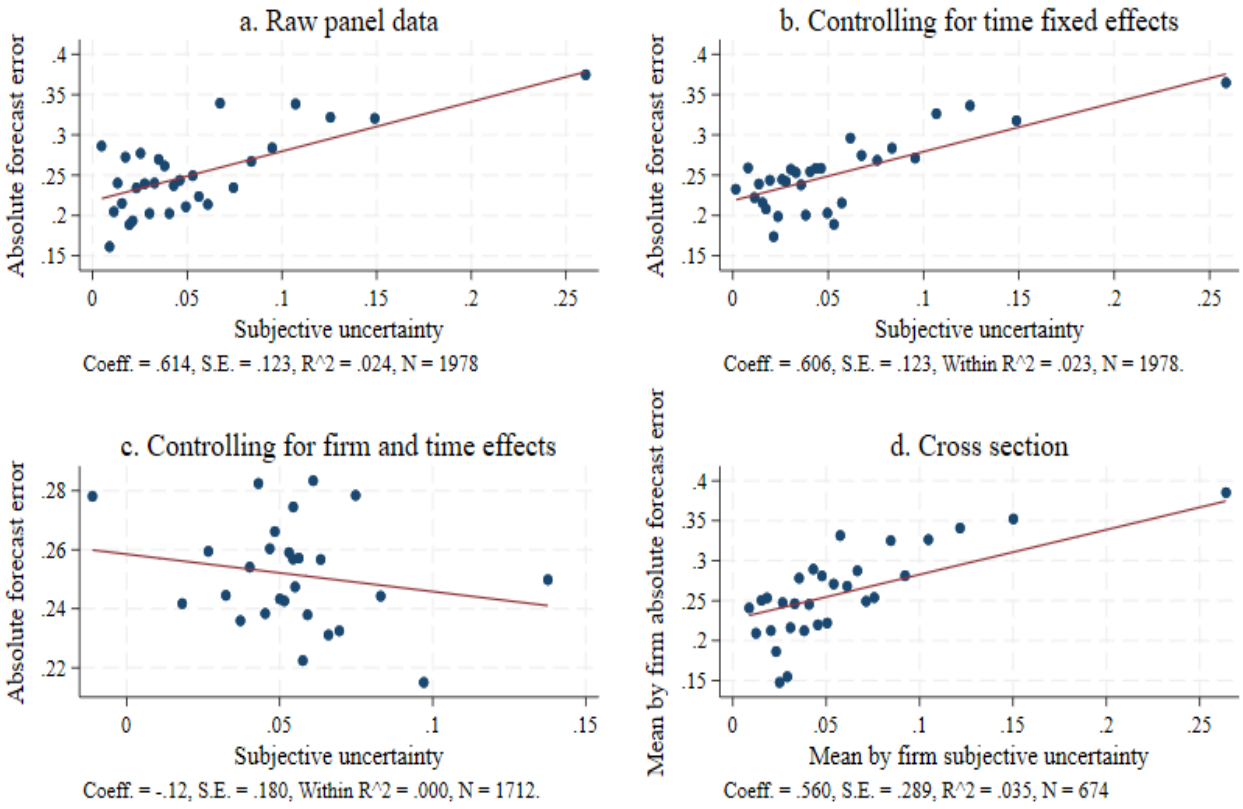
adds an important dimension to the analysis by showing that the predictive relationship holds both over time and across firms.

Hypothesis 2: Subjective uncertainty predicts the magnitude of forecast errors.

Developing a better understanding of subjective uncertainty around sales expectations faced by businesses is important for a multitude of reasons, as outlined above. Namely, this insight helps in assessing firms' sales forecasts and, consequently, the uncertainty surrounding projections based on these forecasts.

Chart 2 illustrates the relationship between subjective uncertainty in firms' sales expectations, as measured by equation (2), and the absolute value of forecast errors, as determined by equation (4). We find a positive relationship between subjective uncertainty, captured by the dispersion of their mean forecasted sales growth, and the magnitude of forecast errors. Panel a displays a strong positive relationship using the raw panel data. Controlling for time fixed effects in panel b has little impact on the fitted relationship, suggesting that aggregate time-specific shocks do not drive the result. However, panel c, shows that controlling for firm and time fixed effects weakens the predictive power and the relationship is no longer statistically significant. This reflects the fact that including firm fixed effects removes time-invariant firms, while time fixed effects eliminate macroeconomic shocks that should in theory impact all firms. Since the BLP's observation period spans the volatile COVID-19 pandemic, controlling for such shocks may dampen variation that contributes meaningfully to forecast error dynamics. Finally, panel d shows in a cross-sectional analysis that firms with higher subjective tend to have larger absolute forecast errors on average, reaffirming the relationship at the aggregate level.

Chart 2: Subjective uncertainty predicts the magnitude of forecast errors



Note. This chart shows bin-scatter plots of sales growth expectations for the next 12 months on the horizontal axis, against the respondent's absolute forecast error for its sales growth rate over the ensuing four quarters on the vertical axis. Following the approach of the Survey of Business Uncertainty, we group observations into 30 bins and plot the average values for each bin. The red line in each panel represents the fitted linear relationship estimated using OLS regression in either the raw panel data, with controls for time effects, with controls for firm and time effects, or in the cross-section. Regression statistics are reported below each panel. Data are from May 2021 to December 2024.

These results closely match those of the SBU, where the positive relationship between subjective uncertainty and forecast error magnitude in the raw data remains significant and subsequently becomes weaker, while still remaining significant, as firm and time fixed effects are included.

Hypothesis 3: Respondents update their reported beliefs often, by small amounts.

This section assesses how firms change their sales forecast distributions over time, particularly between nearest surveys. By design, BLP firms are asked about their sales every three months. **Table 3** shows that nearly all respondents update their forecast distribution in month $t + 3$ compared with their previous survey responses in month t. Specifically, the BLP data shows that 99.5% of sales growth responses feature different support points compared with the prior survey, and 98.5% show

updated associated probabilities. These results are similar to those of the SBU, which find that 94.7% percent of responses feature updated sales growth support points compared with the prior survey, and 95.% show updated associated probabilities.

Notably, in the BLP data, 100% of sales respondents revise both their sales growth expectations (first moment) and sales growth uncertainty (second moment) in consecutive surveys. The fact that respondents are not providing the same or generic forecasts every time implies that business leaders are actively reconsidering and updating their beliefs based on latest information, which broadly aligns with the findings of the SBU.

Table 3: Share of respondents who update their probability distributions for a given outcome

Revisions to:	**Share**	**N**
Vector of probabilities for sales growth	0.985*** (0.002)	3,717
Vector of support points for sales growth	0.995*** (0.001)	3,717
Sales growth expectations	0.999*** (0.000)	3,717
Sales growth uncertainty	0.999*** (0.000)	3,717

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

To determine by how much respondents are updating their reported beliefs, we apply the cosine similarity measure used in Altig et al. (2022) to assess changes in support points and associated probability vectors across consecutive same-topic surveys. More specifically, we use cosine similarity to compare the directional alignment of these vectors over time. For any pair of vectors χ and χ' in $\mathbb{R}^n$, we define cosine similarity as:

$$Cos(\theta) = \frac{\chi' \cdot \chi}{\|\chi'\| \cdot \|\chi\|}, \quad (5)$$

where $\|\chi\|$ is the Euclidean norm of χ. In simple terms, cosine similarity measures how similar two vectors are based on the angle between them. In the context of the BLP, these vectors represent firms' forecast distribution across two consecutive survey rounds. A cosine similarity of one indicates no revision of beliefs, a value of zero indicates the updated beliefs are entirely uncorrelated with previous ones, and a value of negative one indicates a complete reversal of beliefs.

Table 4 reports the results of the cosine computation. The mean cosine similarity is 0.832 for sales growth support points and 0.888 for the associated probabilities. Since the mean cosine similarity is much closer to one than zero, there is clear evidence that, while respondents nearly always update their forecast distributions, they do so by small amounts, keeping broadly similar responses. Again, this suggests that firms are not randomly plotting their support points and associated probabilities but are making deliberate and informed adjustments.

Table 4: Cosine similarity between responses in nearest same-topic surveys

Vectors of responses	**Mean cosine similarity between vectors reported in months *T* and *T*+3 (SE)**	**N**
Vector of support points for sales growth	0.832*** (0.006)	2,386
Vector of probabilities for sales growth	0.888*** (0.006)	2,386

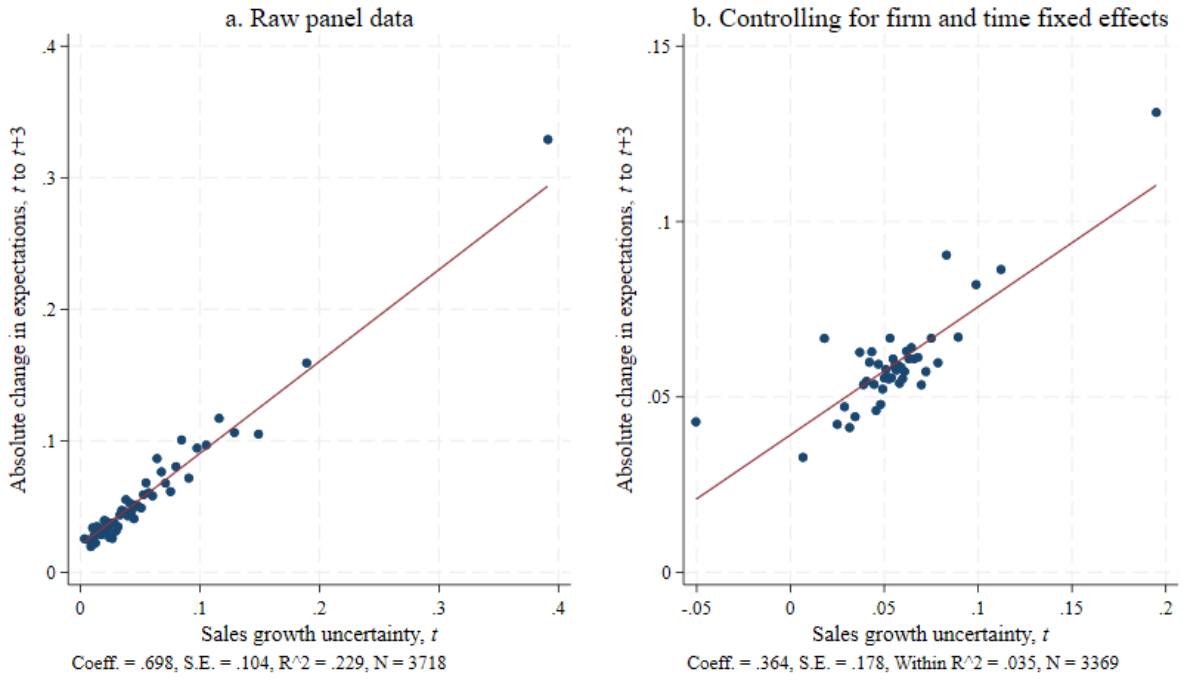
Note: Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Hypothesis 4: Subjective uncertainty predicts the magnitude of future forecast revisions.

We next examine whether firms' reported subjective uncertainty is associated with the magnitude of their future forecast revisions. A positive relationship would indicate that higher uncertainty reflects real instability in firms' outlooks rather than noise, strengthening the case for using survey-based uncertainty as a meaningful indicator of business sentiment.

Chart 3 plots firms' absolute change in sales growth rate expectation from time *t* to time *t* + 3 against subjective uncertainty in time *t*. In line with the SBU, both the raw panel and fixed effects regressions show that firms reporting greater uncertainty today make larger future forecast revision, with this relationship being statistically significant at the 99% confidence level.

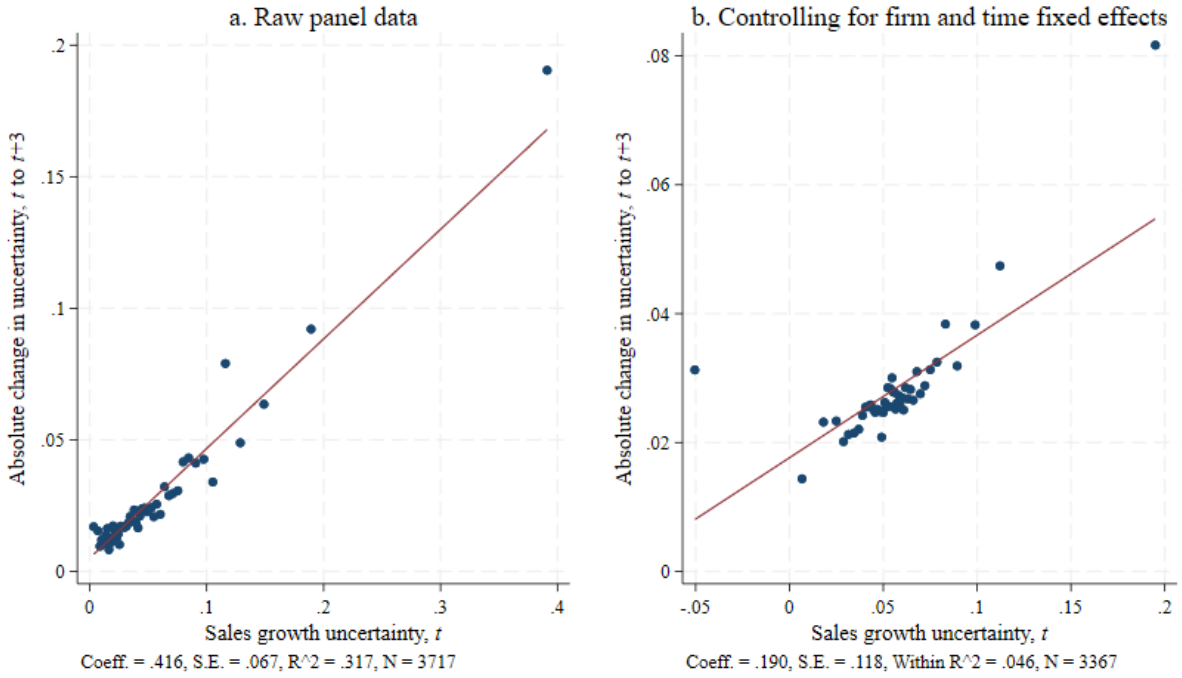
Chart 3: Subjective uncertainty predicts the magnitude of forecast errors



Note. This chart shows two bin-scatter plots. On the horizontal axis, both panels show 50 quantiles of subjective uncertainty for sales growth rates over the next 12 months, measured in month *t*. On the vertical axis, the panels show the absolute value of the change in sales growth rate expectations from month *t* to *t* + 3. Panel a shows the relationship in the raw panel data. Panel b shows the relationship controlling for firm and time fixed effects. Regression statistics are reported below each panel. Data are from May 2021 to December 2024.

Chart 4 shows firms' absolute change in uncertainty from time *t* to *t* + 3 against their subjective uncertainty surrounding their sales growth rate in time *t*. The BLP data show a positive relationship in the raw panel regression. This suggests that a firms' current subjective uncertainty is also predictive of future revisions to its subjective uncertainty, with the relationship being statistically significant at the 99% confidence level. However, when controlling for firm and time fixed effects, this relationship weakens considerably and becomes insignificant at all levels, contrary to the SBU. This could be due to several factors; but most notably, persistent firm-specific and macroeconomic factors in the raw panel data may have inflated the relationship between subjective uncertainty and forecast revisions. At the same time, the inclusion of firm and time fixed effects may be removing not only broad trends but also some of the meaningful variation in how firms adjust their expectations.

Chart 4: Subjective uncertainty predicts the magnitude of future forecast revisions



Note. This chart shows two bin-scatter plots. On the horizontal axis, both panels show 50 quantiles of subjective uncertainty for sales growth rates over the next 12 months, measured in month *t*. On the vertical axis, the panels show the absolute value of the change in sales growth rate uncertainty from month *t* to *t* + 3. Panel a shows the relationship in the raw panel data. Panel b shows the relationship controlling for firm and time fixed effects. Regression statistics are reported below each panel. Data are from May 2021 to December 2024.

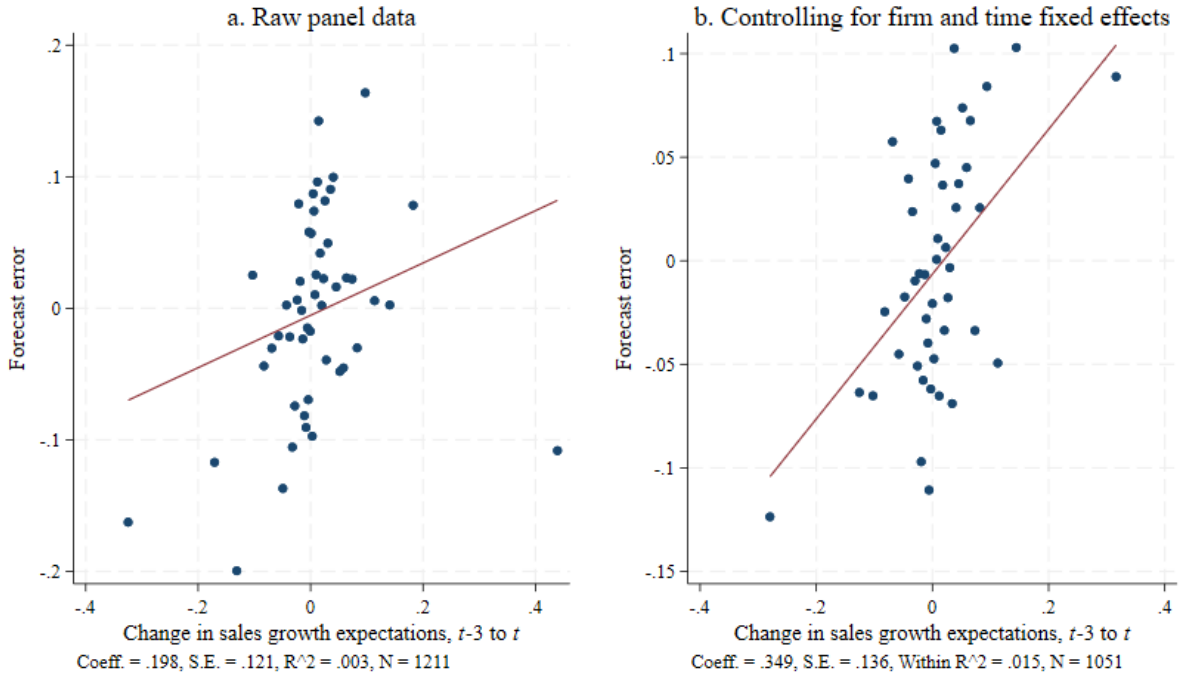
Hypothesis 5: Revisions in expectations predict future forecast errors.

The analysis next examines whether revisions in a firm's expectations predict its future forecast errors. If so, this would suggest that firms are actively incorporating new information into their outlooks, offering insight into how expectations are formed and where prediction errors persist.

Following the work of Coibion and Gorodnichenko (2015), the error in the sales growth rate forecast formed at time t, given by equation (4), is regressed on same-firm changes in sales growth, $Mean(SaleGr)_{t-3}^{q} - Mean(SaleGr)_{t}^{q}$, along with a constant.

Chart 5 displays two bin-scatter plots with the error in the sales growth rate forecast on the vertical axis and the absolute value of a firm's most recent expectations revision on the horizontal axis. Panel a shows the raw regression, which suggests only a weak relationship. Panel b displays the same regression controlling for firm and time fixed effects, yielding a significant relationship.

Chart 5: Revisions in sales growth expectations predict future forecast errors



Note. This chart shows two bin-scatter plots. On the horizontal axis, both panels show 50 quantiles of the change in the four-quarter-ahead sales growth rate expectations from $t-3$ to t. On the vertical axis, both panels show the forecast error in sales growth rates over a four-quarter-ahead horizon. Panel a shows the relationship in the raw panel data. Panel b shows the relationship controlling for firm and time fixed effects. Regression statistics are reported below each panel. Data are from May 2021 to December 2024.

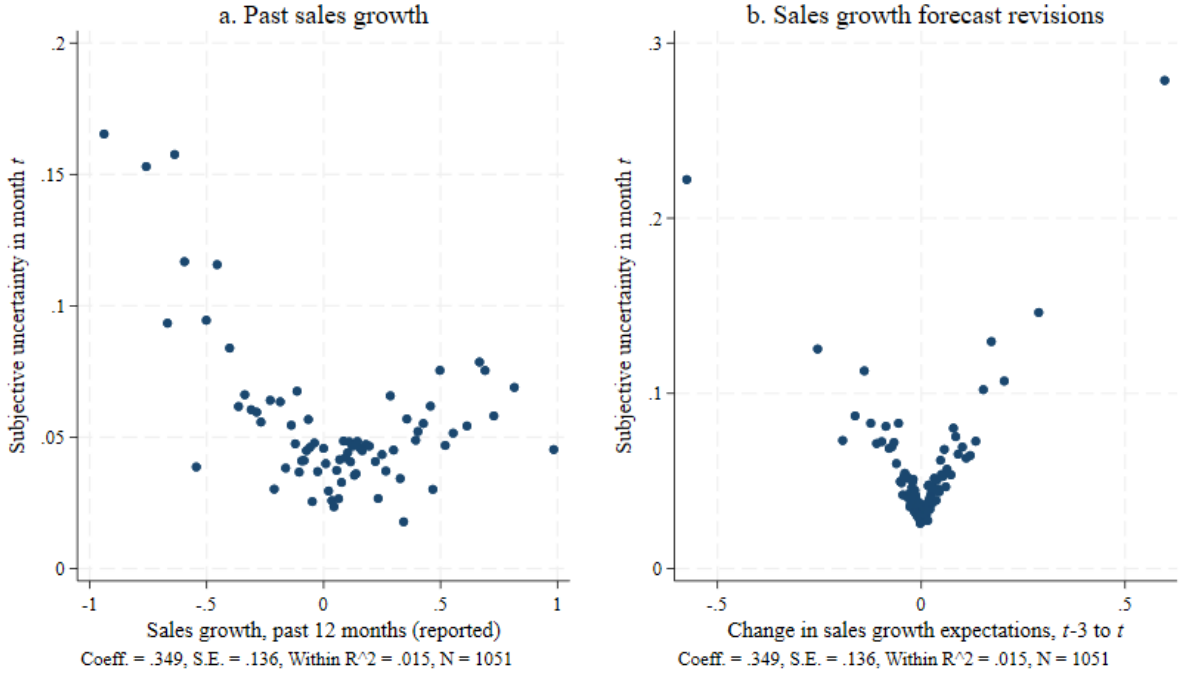
These results suggest a finding similar to Altig et al. (2022): Canadian business leaders tend to over-extrapolate from recent news and events when forming their expectations about sales growth.

Hypothesis 6: Subjective uncertainty has a V-shaped relation to past growth and forecast revisions.

The final hypothesis tests whether subjective uncertainty is systematically linked to firms' recent experiences by regressing it on the absolute values of past sales growth and recent expectation revisions. A V-shaped relationship would indicate that uncertainty peaks when past performance has been either very strong or very weak and is lowest during moderate growth. This suggests that firms anchor expectations on recent extremes rather than solely on fundamentals or macroeconomic conditions. The findings challenge the conventional view that uncertainty rises only during downturns and may help explain why positive economic data do not always lead to increased hiring or investment. The results also align with models of stochastic volatility, where large recent shocks raise near-term uncertainty and firms expect volatility to return even after quiet periods.

Chart 6 displays two bin-scatter plots with uncertainty about the q-quarter ahead forecast at time t, on the vertical axis, measured as $SD(SaleGr)_t^q$. Panel a relates subjective uncertainty to the realized past sales growth rates over the previous year, $RSaleGR_{t,t-12}$. Like the SBU, results from the BLP show that firms with greater absolute growth rates in the past year report higher levels of subjective uncertainty, which creates a V-shape pattern. Panel b shows subjective uncertainty at time t against the absolute value of a firm's most recent expectations revision given by $\left|Mean(SaleGr)_{t-3}^q - Mean(SaleGr)_t^q\right|$. Again, the distinct V-shape pattern demonstrates that firms reporting larger revisions to sales growth expectations report higher levels of uncertainty.

Chart 6: Subjective uncertainty has a V-shaped relation to past growth and forecast revisions



Note. This chart shows two bin-scatter plots with subjective uncertainty over four-quarter-ahead sales growth rates at *t* on the vertical axis. Panel a shows 100 quantiles of past sales growth rate from month t − 12 to *t* on the horizontal axis. Panel b shows 100 quantiles of the change in the four-quarter-ahead sales growth rate expectations from *t* − 3 to *t*. Data are from May 2021 to December 2024.

Finally, both the realized past sales growth rate and most recent expectation revision are regressed on subjective uncertainty. With an *r*-squared of 0.294, the results show that subjective uncertainty rises with a firm's absolute growth rate in the recent past and with the magnitude of its recent forecast revisions. Very much like the SBU, the findings from the BLP suggest that levels of

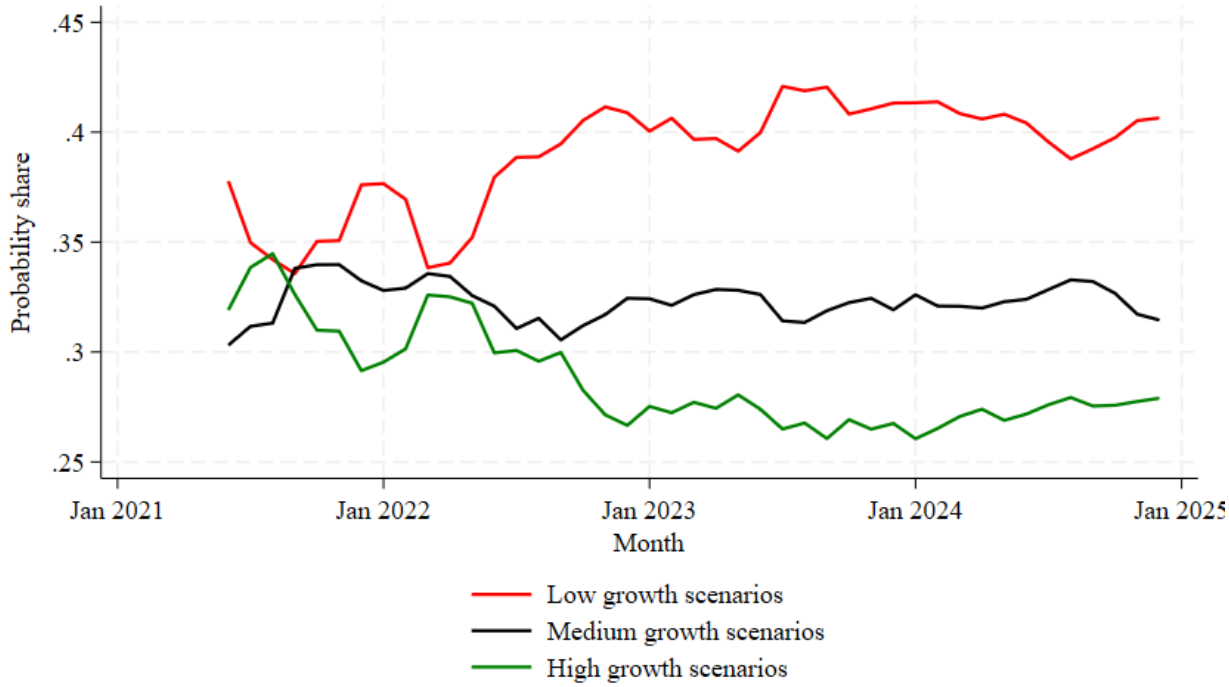
uncertainty are high in the wake of large recent changes to sales levels and of large revisions to future growth expectations.

Hypothesis 7: Firms with weaker recent performance place greater weight on low sales growth outcomes.

After confirming that the core properties of subjective distributions, uncertainty and forecast errors documented in Altig et al. (2022) also hold for Canadian firms, we extend the analysis by examining how firms' recent experiences shape their perception of risk, and how these perceptions relate to future performance. This builds on Altig et al.'s hypothesis that uncertainty peaks following periods of either very poor or very strong sales growth.

The rationale for testing these relationships is to determine how the evolution of forecast distributions materializes in firms' realized sales growth. **Chart** 7 illustrates that, over time, firms are increasingly attributing more weight to their low and lowest case growth scenario and in the following section we determine if this trend materializes in firms' sales growth outcomes.

Chart 7: Evolution of sales growth scenarios



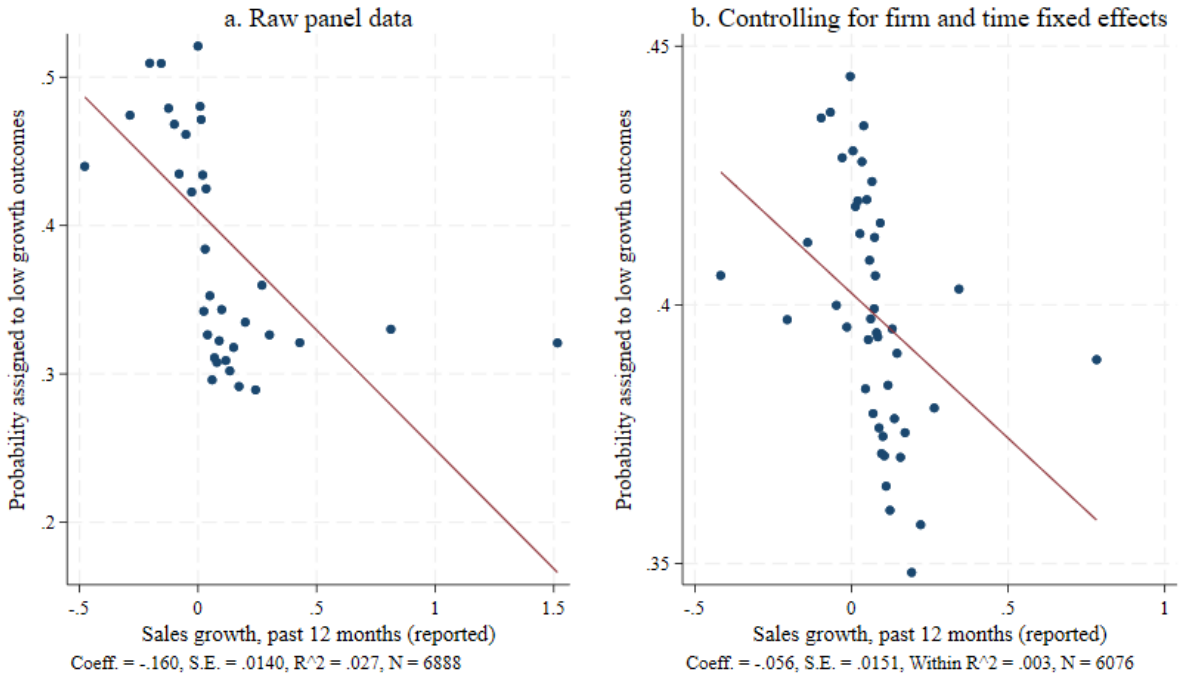
Note. This chart displays the evolution of firms' future sales growth scenarios as reported in the Business Leaders' Pulse survey. The *low growth scenario* combines the probabilities of the *lowest* and *low* case growth outcomes, while the *high growth scenario* combines the *high* and *highest* case outcomes. The data are weighted by current monthly sales and smoothed using a three-month moving average. Data are from May 2021 to December 2024.

To do this, we first show that firms with weaker recent sales growth assign a higher probability to their low and lowest case growth scenarios in their forecast distributions. We then demonstrate that these downside leaning outlooks are, to some extent, self-fulfilling; that is, firms that assign a greater probability to weak outcomes tend to realize lower sales growth relative to other firms. Together, these findings suggest that subjective risk assessments reflect both backward-looking anchoring and forward-looking predictive content.

Having established that firms anchor their expectations on recent performance—reacting to positive and negative news and incorporating this information into their forecasts—we next examine how weak recent sales growth influences the probabilities mass firms assign to weak sales growth outcomes.

Chart 8 presents two bin-scatter plots showing the probabilities assigned to low and lowest case growth scenarios on the vertical axis and reported past sales growth rates over the previous year, $RSaleGR_{t,t-12}$, on the horizontal axis. In panel a, the raw regression yields a slope coefficient on the reported mean past sales growth of -0.16 and standard error of 0.014, indicating a strong and statistically significant negative relationship. In panel b, the regression includes controls for firm and time fixed effects, producing a smaller but still statistically significant coefficient of -0.06 with associated standard error of 0.015.

Chart 8: Downside expectations rise following weak past sales growth



Note. This chart shows two bin-scatter plots. On the horizontal axis, both panels show 50 quantiles of past sales growth rate from month $t-12$ to t. On the vertical axis, both panels show the probability assigned to the low and lowest growth scenarios. Panel a shows the relationship in the raw panel data. Panel b shows the relationship controlling for firm and time fixed effects. Regression statistics are reported below each panel. Data are from May 2021 to December 2024.

These results suggest that firms reporting weaker past sales growth systematically assign more weight to lower growth outcomes in their future outlook. While Altig et al. (2022). show that subjective uncertainty rises with large changes in recent past sales growth, our findings go a step further by demonstrating that firms not only express heightened uncertainty but also shift the direction of their future expectations toward weaker outcomes. This indicates that past experiences influence not just the dispersion of expectations but also the direction of anticipated outcomes.

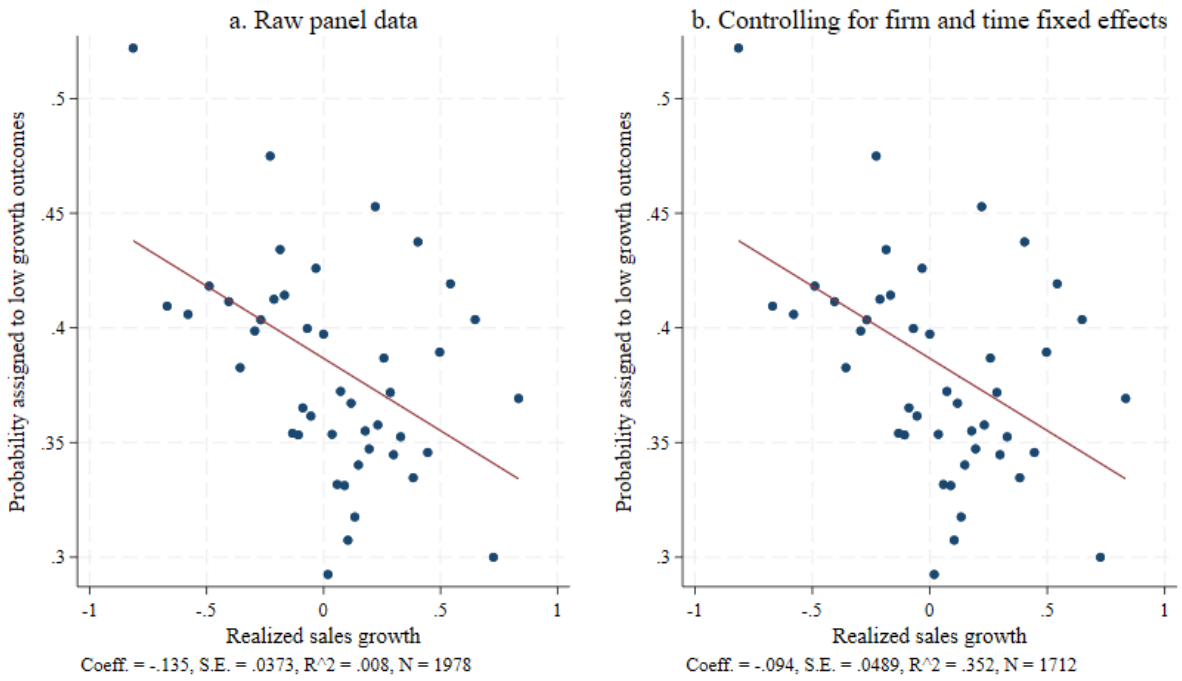
These findings are particularly useful in showing that survey-based expectations, including the distributional features of the BLP and similar surveys, offer early signals about firm behaviour and future performance. Moreover, they highlight potential behavioural bias in expectations formation, as firms appear to anchor their outlook to recent trends. As demonstrated by the steady rise in low and lowest case growth scenario probabilities (**Chart 4**; **Appendix**), this anchoring may serve as an early warning indicator of broader economic weakness and could help inform timely policy responses.

Hypothesis 8: Firms that assign higher probabilities to weak sales outcomes tend to underperform relative to others.

Next, we examine the relationship between downside growth expectations and realized sales outcomes. Specifically, we test whether firms that assign a greater probability to their low and lowest case growth scenarios tend to underperform relative to other firms. In other words, their pessimism is not merely cautionary but reflects real underlying risks that are ultimately reflected in future performance. Demonstrating that firms' pessimistic expectations are predictive of actual outcomes is important for a number of reasons. Showing that firms' downside expectations consistently align with realized performance supports the idea that these expectations reflect genuine internal information, not just pessimistic views in the wake of poor performance. Not only does this further validate the credibility of subjective expectations data, but it justifies policy attention to distributional beliefs, particularly when firms become more pessimistic in their outlook (**Chart 4; Appendix**).

Chart 9 presents two bin-scatter plots showing the probabilities assigned to low and lowest case growth scenarios on the vertical axis and realized sales growth over the subsequent 12 months, $RSaleGR_{t,t+12}$, on the horizontal axis. In panel a, the raw regression yields a slope coefficient of –0.14 with a standard error of 0.037, indicating a statistically significant negative relationship. In panel b, the regression includes controls for firm and time fixed effects; the coefficient remains negative and marginally statistically significant (p = 0.054), suggesting that firms assigning greater probability to weak growth outcomes tend to realize lower future sales growth.

Chart 9: Firms expecting weak growth underperform relative to others



Note. This chart shows two bin-scatter plots. On the horizontal axis, both panels show 50 quantiles of realized sales growth rates. On the vertical axis, both panels show the probability assigned to the low and lowest growth scenarios. Panel a shows the relationship in the raw panel data. Panel b shows the relationship controlling for firm and time fixed effects. Regression statistics are reported below each panel. Data are from May 2021 to December 2024.

5. Conclusion

The Bank of Canada's BLP provides unique insights into how business leaders form sales forecasts and conceptualize uncertainty around these expectations. Overall, survey insights provide timely business intelligence that informs our understanding of the economy in general, but this analysis also shows that the BLP data can inform the forecasting of macroeconomic variables that are closely monitored by the Bank. In particular, the BLP also captures firm-level subjective uncertainty, making it the only source of its kind in Canada. This information is important not just for central banks but also for businesses, as it highlights evolving economic trends and potential risks. The timeliness of these insights strengthens monetary policy deliberations and contributes to a more comprehensive understanding of the Canadian economy (Chernis et al. 2022).

Our main findings suggest that the hypothesis-testing results from the BLP are broadly consistent with those from the Atlanta Fed's SBU. This points to the robustness of the BLP's findings, despite the fact that the BLP was launched during the COVID-19 period—when uncertainty was

generally elevated—whereas the SBU has longer time series dating back to the early 2010s. The similarity in results suggests that despite differences in timing and national context, business managers in both countries may approach the sales expectations questions in similar ways. They appear to use comparable methods and thought processes when forming their expectations and assigning probabilities. This also suggests that firms in the United States and those in Canada perceive risks and volatility in similar ways.

Our analysis shows, first, that firms' expected sales growth rates are strong predictors of their realized growth rates—indicating that Canadian firms' expectations have substantial predictive power over their future sales outcomes. Second, we find that subjective uncertainty has predictive power over the magnitude of forecast errors and of future forecast revisions. Third, Canadian firms update their forecasts often, though typically by small amounts, indicating that business leaders are consistently and actively reconsidering their sales outlooks. Fourth, updated forecasts predict future forecast errors—indicating that Canadian business leaders tend to over-extrapolate when forming their expectations about sales growth. Finally, it holds that firms reporting larger revisions to sales growth expectations between reporting periods exhibit higher levels of uncertainty.

Our results provide support for two additional hypotheses not examined in Altig et al. (2022), offering new evidence on the role of firm-specific experience in shaping expectations and outcomes. First, we find that firms with weaker recent performance tend to assign greater weight to low sales growth scenarios, consistent with the idea that downside expectations are shaped asymmetrically by negative past experiences. Second, firms that assign higher probabilities to weak outcomes are more likely to underperform relative to their peers, indicating that such expectations reflect underlying vulnerabilities rather than mere pessimism. Together, these findings underscore the value of analyzing the full distribution of firms' subjective expectations and reveal meaningful feedback loops between beliefs and performance. This contributes to the growing literature on the behavioural and informational content of firm expectations, with important implications for forecasting accuracy and policy design.

References

Altig, D., J. M. Barrero, N. Bloom, S. J. Davis, K. Foster, B. H. Meyer and E. Mihaylov. 2023. *Survey of Business Uncertainty: Methodology*. Federal Reserve Bank of Atlanta. https://www.atlantafed.org/-/media/documents/research/surveys/business-uncertainty/sbu-methodology.pdf

Altig, D., J. M. Barrero, N. Bloom, S. J. Davis, B. Meyer and N. Parker. 2022. "Surveying Business Uncertainty." *Journal of Econometrics* 231 (1): 282–303.

Angeletos, G.-M., F. Collard and H. Dellas. 2020. "Business-Cycle Anatomy." *The American Economic Review* 110 (10): 3030–3070.

Armantier, O., G. Topa, W. van der Klaauw and B. Zafar. 2017. "An Overview of the Survey of Consumer Expectations." *Federal Reserve Bank of New York Economic Policy Review* 23 (2): 51–72.

Awano, G., N. Bloom, T. Dolby, P. Mizen, R. Riley, T. Senga, J. Van Reenen, J. Vyasand P. Wales. 2018. "A Firm-Level Perspective on Micro- and Macro-Level Uncertainty: An Analysis of Business Expectations and Uncertainty from the UK Management and Expectations Survey." ESCoE Discussion Paper No. 2018-10.

Bachmann, R., B. Born, S. Elstner and C. Grimme. 2019. "Time-Varying Business Volatility and the Price Setting of Firms." *Journal of Monetary Economics*, 101: 82–99.

Bachmann, R., K. Carstensen, S. Lautenbacher and M. Schneider. 2021. "Uncertainty and Change: Survey Evidence of Firms' Subjective Beliefs." National Bureau of Economic Research Working Paper No. 29430.

Bachmann, R. and S. Elstner. 2015. "Firm Optimism and Pessimism." *European Economic Review* 79: 297–325.

Baker, S. R., N. Bloom and S. J. Davis. 2016. "Measuring Economic Policy Uncertainty." *Quarterly Journal of Economics* 131 (4): 1593–1636.

Barrero, J. M. 2022. "The Micro and Macro of Managerial Beliefs." *Journal of Financial Economics* 143 (2): 640–667.

Ben-David, I., J. R. Graham and C. R. Harvey. 2013. "Managerial Miscalibration." *Quarterly Journal of Economics* 128 (4): 1547–1584.

Bloom, N. 2009. "The Impact of Uncertainty Shocks." *Econometrica* 77 (3): 623–685.

Bloom, N., S. Bond and J. Van Reenen. 2007. "Uncertainty and Investment Dynamics." *Review of Economic Studies* 74 (2): 391–415.

Bontempi, M. E., R. Golinelli and G. Parigi. 2010. "Why Demand Uncertainty Curbs Investment: Evidence from a Panel of Italian Manufacturing Firms." *Journal of Macroeconomics* 32 (1): 218–238.

Bordalo, P., N. Gennaioli, R. La Porta and A. Shleifer. 2019. "Diagnostic Expectations and Stock Returns." *The Journal of Finance* 74 (6): 2839–2874.

Boutros, M., I. Ben-David, J. R. Graham, C. R. Harvey and J. Payne. 2020. "The Persistence of Miscalibration." RePEc Working Paper.

Chernis, T., C. D'Souza, K. MacLean, T. Reader, J. Slive and F. Suvankulov. 2022. "The Business Leaders' Pulse—An Online Business Survey." Bank of Canada Staff Discussion Paper No 2022-14.

Coibion, O. and Y. Gorodnichenko. 2015. "Information Rigidity and the Expectations Formation Process: A Simple Framework and New Facts." *American Economic Review* 105 (8): 2644–2678.

Coibion, O., Y. Gorodnichenko and S. Kumar. 2018. "How Do Firms Form Their Expectations? New Survey Evidence." *The American Economic Review* 108 (9): 2671–2713.

Dominitz, J. and C. F. Manski. 1997. "Using Expectations Data to Study Subjective Income Expectations." *Journal of the American Statistical Association* 92 (439): 855–867.

Fiori, G. and F. Scoccianti. 2023. "The Economic Effects of Firm-Level Uncertainty: Evidence Using Subjective Expectations." *European Economic Review* 157: 104480.

Gervais, S., J. B. Heaton and T. Odean. 2011. "Overconfidence, Compensation Contracts and Capital Budgeting." *Journal of Finance* 66 (5), 1735–1777.

Handley, K. and J. F. Li. 2020. "Measuring the Effects of Firm Uncertainty on Economic Activity: New Evidence for One Million Documents." National Bureau of Economic Research Working Paper No. 27896.

Hirshleifer, D. and G. Y. Luo. 2001. "On the Survival of Overconfident Traders in a Competitive Securities Market." *Journal of Financial Markets* 4 (1): 73–84.

Kahneman, D. and A. Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica* 47 (2): 263–291.

Kozicki, S. (2025). "Talking to Canadians: How Real-World Insights Shape Monetary Policy." Remarks at the C. D. Howe Institute, Toronto, Ontario, June 5.

Malmendier, U. and G. Tate. 2008. "Who Makes Acquisitions? CEO Overconfidence and the Market's Reaction." *Journal of Financial Economics, 89*(1), 20–43.

Malmendier, U. and S. Nagel. 2016. "Learning from Inflation Experiences." *The Quarterly Journal of Economics* 131 (1): 53–88. https://www.jstor.org/stable/26495134

Manski, C. F. 2004. "Measuring Expectations." *Econometrica* 72 (5): 1329–1376.

Martin, M. and C. Papile. 2004. "The Bank of Canada's Business Outlook Survey: An Assessment." Bank of Canada Staff Working Paper No. 2005-15.

Pichette, L. 2012. "Extracting Information from the Business Outlook Survey Using Statistical Approaches." Bank of Canada Staff Discussion Paper No. 2012-8.

Appendix

Business Leaders' Pulse data collection, cleaning and sample restrictions

The panel of the Bank of Canada's Business Leaders' Pulse (BLP) is built by recruiting firms from Statistics Canada's Business Register with specific targets for regions, industries and firm size to ensure that the panel composition accurately reflects the distribution of these characteristics within the Canadian economy. Each month, panel members receive a personalized survey link by email that provides them with one of three question cohorts: sales, employment or a special questions section. These cohorts are rotated monthly so that each group will see the sales section once per quarter. This design allows for the collection of information on firms' current sales amounts and expected future growth scenarios and, in turn, their realized sales growth at a one-year-ahead horizon.

Due to the BLP's self-administered, online format, all survey responses are subject to an automated data-cleaning routine that follows the guidelines outlined in Altig et al.'s (2022) paper. First, if a firm's probability distribution sums to a value between 0.95 and 0.105, it is rescaled to 100. Next, firms with a 100% certain forecast for any outcome are dropped. Firms with three or more missing values and firms with identical future growth estimates across all scenarios are dropped. Additionally, future sales growth estimates that are in descending order are reversed to ensure they follow the correct order of lowest to highest potential growth scenarios. Finally, any firms with non-sorted growth rates—that is, those that do not follow an ascending, lowest to highest, order—are dropped.

Data entry errors are common in open-ended questions, making additional response cleaning necessary. Business leaders often think in yearly intervals, which may lead to reporting current sales for the next year in place of quarterly projections. Additionally, respondents are prone to entry errors, often adding or dropping zeros from their reported current sales values. In such cases, using a flagging system to detect possible errors, outlying responses are manually reviewed and compared with firms' historical entries. The dataset is adjusted to correct obvious data entry errors, ensuring consistency across data points in the panel. Flagged observations that cannot be corrected are excluded from the analysis.