Institutional ownership and cross-border spillovers of monetary policy

Hsuan Fu* Taeuk Seo†

March 20, 2026

Abstract

We find that Canadian stocks with greater ownership by institutional investors from the United States (US) are more sensitive to US monetary policy surprises. Upon a 25 basis point contractionary shock to fed funds futures, a firm with one standard deviation greater US ownership share sees its stock returns lowered by an additional 27.3 basis points, or is 45.8 percent more sensitive. These firms also reduce their subsequent debt holdings and their capital expenditures by a greater margin. Neither revenue dependence on the US nor the signaling effect of the Fed on the Bank of Canada appears to drive these findings. Our results are consistent with a macroeconomic model with inelastic asset demand, complemented by external financing constraints.

Keywords: Monetary policy, international spillovers, institutional ownership.
JEL Classification: E52, E58, F21, F42, G15

*Department of finance, insurance and real estate, Université Laval, hsuan.fu@fsa.ulaval.ca.
†Department of finance, insurance and real estate, Université Laval, taeuk.seo@fsa.ulaval.ca.

1 Introduction

This paper studies whether growing foreign ownership of domestic equities transmits monetary policy across borders. We exploit the setting of US institutional investors in Canadian equities, where the aggregate US investors' share of market capitalization has risen substantially from under 7% in 1997 to 27% in 2023 (Figure 1). To examine the cross-sectional implications, we then assemble a novel quarterly-level dataset of US institutional ownership in Canadian publicly traded firms from 2000 to 2023. Canada provides a clean empirical setting: Canadian markets are open during FOMC announcements, enabling high-frequency identification, and the cross section of Canadian firms exhibits substantial variation in US institutional ownership.

Canadian firms with greater US institutional ownership are significantly more sensitive to monetary policy surprises following Federal Open Market Committee (FOMC) meetings. A 25 basis-point federal funds rate surprise (Nakamura and Steinsson, 2018) leads to a 45.8 percent greater drop in stock returns for a Canadian firm with one standard deviation higher US ownership share.

We argue that this is due to inelastic demand from US institutional investors. Their mandates, regulations, and benchmarking behavior limit their flexibility to adjust portfolios, so that a contractionary US monetary policy surprise triggers broad-based selling—including of their Canadian holdings—transmitting the shock across borders (Gabaix and Koijen, 2023). We validate the mechanism directly by showing a decline in Canadian holdings by US mutual funds with global investment mandates following a surprise US monetary policy tightening. We also formalize this intuition in a stylized partial equilibrium model (Appendix A), which delivers two predictions: price sensitivity to FOMC surprises is increasing in US ownership share, and market beta is endogenous to ownership composition. Both predictions guide our empirical design.

These cross-border spillovers have real consequences. Firms with greater US ownership reduce their capital expenditures by 2.53 percentage points more than their peers over 8 quarters following a surprise US monetary tightening and reduce their debt holdings by 3.67 percentage points over the same period.

We rule out two competing explanations. First, the effect is not driven by revenue dependence on US demand (Bräuning and Sheremirov, 2023; Iacoviello and Navarro, 2019): in horse-race regressions, the coefficient on US ownership shares dominates that of US revenue shares in both magnitude and significance. Second, the transmission does not operate through Canadian interest rates. After orthogonalizing our monetary policy surprise measure

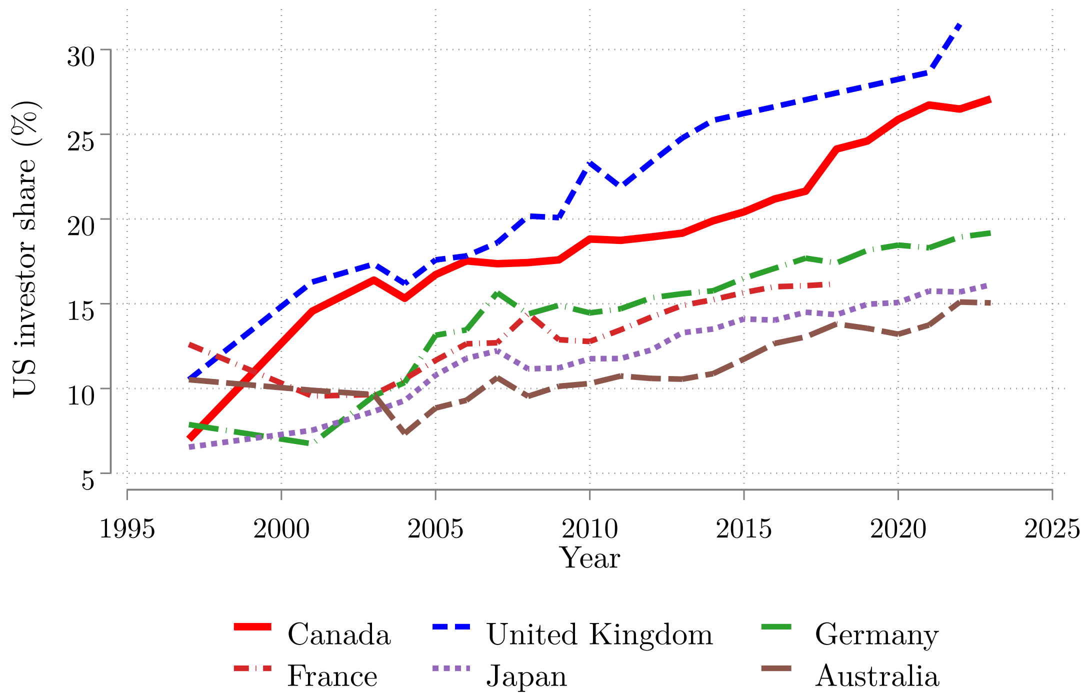

Figure 1: US investor equity ownership in selected developed economies, as percentage of total stock market capitalization. Country-level equity ownership statistics are from the Department of the Treasury, and aggregate market capitalization data are from the World Federation of Exchanges.

with respect to changes in Canadian T-bill yields, we find that it is in fact the component of US monetary policy surprises unrelated to Canadian rates that drives the sensitivity of stock returns to US ownership.

Taken together, our results show that cross-border institutional ownership amplifies the transmission of US monetary policy to non-US equity markets, thereby affecting real corporate decisions.

Related literature. Our paper contributes to three strands of literature: monetary policy and asset returns, financial heterogeneity in the investment channel of monetary policy, and inelastic financial markets.

First, we contribute to the literature on monetary policy and asset returns. This literature began with studies of domestic policy transmission (Bernanke and Kuttner, 2005; Ozdagli and Velikov, 2020; Li, İşcan and Xu, 2010) and has expanded to investigate the role of US monetary policy on global financial markets (Miranda-Agrippino and Rey, 2020;

Brusa, Savor and Wilson, 2019), international bond markets (Albagli et al., 2019), the US fixed income markets (Fang and Xiao, 2025), cross-border fund flows (Feroli et al., 2014; Ciminelli, Rogers and Wu, 2022), and the market of foreign-listed equities (Ammer, Vega and Wongswan, 2010). More recently, Di Giovanni and Hale (2022) and Di Giovanni and Rogers (2024) propose global supply linkages as a propagation mechanism for US monetary policy. Our work proposes institutional ownership as an alternative channel for cross-border policy transmission.

Second, we contribute to the literature on financial heterogeneity and the investment channel of monetary policy. The transmission of monetary policy varies across the firm distribution: prior works have documented heterogeneous responses along the dimensions of default risk (Ottonello and Winberry, 2020), investor type (Timmer, 2018), firm age and dividend policy (Cloyne et al., 2023; Gnewuch and Zhang, 2025), liquidity constraints (Jeenas, 2024), firm size (Gertler and Gilchrist, 1994), returns on capital (González et al., 2024), and debt maturity (Jungherr et al., 2024). We study foreign institutional ownership as a distinct form of financial heterogeneity and document its real effects on capital expenditure and debt across borders.

Third, we contribute to the literature on the inelastic markets hypothesis (Gabaix and Koijen, 2023). Institutional benchmarking behavior generates inelastic demand that amplifies price impact in equity markets (Pavlova and Sikorskaya, 2023), and in foreign exchange markets, where infrequent portfolio rebalancing amplifies exchange rate fluctuations (Bacchetta, Davenport and Van Wincoop, 2022). We extend this mechanism to the cross-border transmission of monetary policy.

The closest paper to ours is Lu and Wu (2023), who show that portfolio rebalancing by institutional investors amplifies the domestic US stock market's response to monetary policy. We extend their demand channel to an international setting, in which the foreign (US) portfolio rebalancing can amplify the domestic Canadian equity market, together with the study of its real consequences for foreign firms' capital expenditures and debt decisions.

2 US institutional ownership in Canadian firms

We first discuss how we measure monetary policy surprises and Canadian firms' ownership structures as well as their financial conditions.

2.1 Sample construction

We consider stock returns of publicly traded Canadian firms on FOMC meeting dates from January 2000 to December 2023. We borrow the measure of monetary policy shocks constructed from high-frequency bond prices data by Nakamura and Steinsson (2018) and source the data series extended by Acosta, Brennan and Jacobson (2024)[1]. In order to better interpret the estimated coefficients from our regression models, we normalize the monetary policy surprises so that one standard deviation corresponds to 25 basis points. Accordingly, all reported coefficients capture the effect of a 25-basis-point surprise. Additionally, we obtain Canadian T-bill yields and the Consumer Price Index from the Bank of Canada.

Daily stock returns, quarterly firm-level ownership, and the geographical segment data are from LSEG (Refinitiv). Quarterly financial statements are from Compustat North America. Quarterly fund holdings are from the Global Capital Allocation Project (GCAP) by Cavani, Maggiori and Schreger (2025). For quarterly flow variables (e.g., changes in holdings or financial statement items), if the reporting date does not coincide with the FOMC meeting date, we compute the change over the two consecutive quarters that covers the corresponding FOMC meeting. For ownership levels, we assign the most recent quarter-end observation preceding each FOMC announcement. We winsorize all resulting firm-level characteristics except stock returns at 1% and 99% levels to mitigate the effect of outliers.

Our sample consists of 63,107 firm-FOMC-meeting observations with 575 distinct Canadian firms, 195 FOMC meetings, and 1,119 mutual funds. In total, our sample covers 57.4% of the aggregate stock market capitalization in Canada. We present key summary statistics from our sample in Table 1; specific definitions for all variables are available in the Appendix.

2.2 US institutional ownership

Our firm-level sample confirms that US investors, captured by the aggregate data, hold substantial stakes in publicly-traded Canadian firms. As of 2023:Q4, we find that the market capitalization-weighted average US institutional ownership share in our sample is 17.8%.

We also find strong cross-sectional heterogeneity in the US institutional ownership profiles. Energy and durable goods producers show the highest US ownership shares, whereas other industries tend to have smaller ownership by US financial institutions.

[1]Updated monetary policy surprises from Acosta are available through January 2026 via the San Francisco Fed's US Monetary Policy Event Study Database: https://www.frbsf.org/research-and-insights/data-and-indicators/us-monetary-policy-event-study-database/. We plan to extend the sample in a subsequent revision.

	N	Mean	SD	P25	P50	P75
Panel A: Balance sheet items (millions of 2025 USD)						
Market capitalization	59,205	4994	12779	192	694	2687
Total assets	59,980	22312	97526	195	853	3940
Debt	57,588	3595	14095	5	134	927
Property, plant & equipment (PP&E)	58,862	2404	6953	34	218	1340
Panel B: Ratios						
US ownership share	59,980	0.100	0.113	0.015	0.060	0.144
US revenue share	21,199	0.381	0.247	0.181	0.342	0.565
Gross profitability	59,463	0.040	0.052	0.007	0.033	0.064
Cash flow	57,541	-0.057	7.746	-0.003	0.015	0.031
PP&E growth (annualized)	56,746	1.037	0.197	0.976	1.002	1.042
Tobin's Q	56,888	1.658	1.932	0.710	1.080	1.752
Book leverage	57,588	0.215	0.199	0.027	0.183	0.337
Cash-to-assets	59,417	1.579	189.294	0.015	0.057	0.176
Market β	57,743	0.855	0.539	0.457	0.755	1.159

Table 1: Summary statistics. The table reports number of observations, mean, standard deviation, as well as the quartile cutoff points for selected characteristics. Panel A shows the balance sheet items in inflation-adjusted terms using the 2025 Canadian Consumer Price Index. Panel B shows various financial ratios, and Panel C shows changes in holdings. Δ holdings are in million shares by the mutual funds with global investment portfolio. All variables are winsorized at 1% and 99% levels.

However, this US-Canada allocation is highly nonlinear as there are firms that have almost non-existent US investors. The first quartile of US ownership is at 1.5% in Table 1. Note that the US ownership in the low quintile of Table 2 is as small as 0.3%. Conversely, there are firms almost exclusively owned by US investors with a maximum of 99% ownership in our sample. Overall, US ownership exhibit considerable cross-firm variations.

Table 2 further presents time-series mean of within-quintile median characteristics across 5 US ownership share bins[2]. By comparing the quintiles, we find several defining characteristics for firms with high US ownership ratios.

Specifically, by focusing on the difference between top and bottom quintiles in Table 2, firms with higher US investor shares are generally *large* firms with higher book values of their assets as well as larger market capitalization. These firms also tend to have a greater share of their revenues earned from US consumers, spend more on capital investments, and

[2]For similar tabulations, see Belo, Lin and Bazdresch (2014).

Characteristic	Q1	Q2	Q3	Q4	Q5
US Share	0.003	0.020	0.054	0.112	0.242
Panel A: Stock variables (millions of 2025 USD)					
Total assets	424	1108	2209	1638	1528
Market cap	225	593	955	879	1192
Panel B: Ratios					
US revenue share	0.360	0.313	0.329	0.370	0.377
PP&E growth (annualized)	0.004	0.021	0.016	0.020	0.030
Tobin's Q	1.132	1.088	1.024	1.062	1.200
Cash flow	0.011	0.017	0.015	0.016	0.017
Cash-to-assets	0.069	0.048	0.055	0.057	0.070
Book leverage	0.164	0.213	0.184	0.167	0.174
Gross profitability	0.033	0.035	0.032	0.029	0.033
Market β	0.351	0.408	0.551	0.540	0.633

Table 2: Summary Statistics by US ownership quintiles. This table presents the time-series mean of within-quintile median characteristics across quintiles of US ownership share, from Q1 (low) to Q5 (high). As in Table 1, Panel A reports stock variables in millions of 2025 US dollars, and Panel B reports financial ratios.

hold more cash.

However, we find little difference in leverage, Tobin's Q or profitability across these quintiles. This thereby suggests that while firms with higher US shares tend to be larger in size, their financial constraints and investment opportunities are not ex ante significantly different from their peers with lower US shares.

3 Return sensitivities and real effects

In this section, we report our main results. Generally, our findings highlight the spillover effects of US monetary policy surprises in the Canadian stock market, and US ownership is important for understanding the channel of inelastic market demand.

3.1 Return sensitivities

We first examine the effect of monetary policy surprises on Canadian equity returns by estimating the following panel firm-level regression:

$$R_{i,t} = \alpha_i + \beta_0 \text{USShare}_{i,t} + \beta_1 \text{MPS}_t + \beta_2 \text{USShare}_{i,t} \times \text{MPS}_t + \gamma X_{i,t} + \varepsilon_{i,t}. \quad (1)$$

The left hand side variable $R_{i,t}$ is the daily stock return of Canadian firm i on the announcement date t denominated in Canadian dollars. The right hand side variable MPS_t is the high-frequency monetary policy surprise. $\text{USShare}_{i,t}$ is the total ownership share of US institutions in a Canadian firm i as of announcement date t; specifically, we assign the most recent quarter-end ownership observation preceding each FOMC announcement. $X_{i,t}$ denotes a vector of firm and market-level controls: Tobin's Q, profitability, sales growth, leverage, log of market capitalization and log of total assets. To account for unobserved heterogeneity, we also include a set of firm α_i fixed effects; our extended specification also includes FOMC fixed effects absorbing monetary policy surprises but allowing tighter identification of the interaction effect β_2.

Our specification allows us to identify the price sensitivity of two otherwise identical Canadian firms with different US ownership shares to the same monetary policy surprise. Our coefficient of interest is β_2: capturing the additional response of a firm with higher US ownership to the same FOMC surprise relative to a firm with lower US ownership. For interested readers, we also introduce a stylized model with inelastic asset demand in Section A of the Appendix to validate the intuition behind our proposed setup.

We present our estimation results in Table 3. Column (1) shows that upon a 25 basis-point monetary policy surprise, the average Canadian stock return drops by 0.84%. The estimate is not only statistically significant but also economically meaningful. Given that the daily return is 0.15% on average, a shock of 25 basis points can flip the returns to the negative area. The coefficient remains significant after including the US investor shares, signaling the potential transmission channel via the large institutional investors in the U.S.

This result is also consistent with the univariate regressions in Table A.1, confirming that US monetary policy surprises do spill across borders and show significant impact on foreign markets. On the other hand, the influence of Canadian monetary policy surprises seems to be less persistent throughout the sample period. While the literature found that the announcement effect related to US monetary policy might not travel across borders (Brusa, Savor and Wilson, 2019), our findings show that the US monetary policy *surprises* can play

	(1)	(2)	(3)
MPS	-0.842***	-0.597**	
	(0.308)	(0.251)	
US investor share		-0.201	-0.382
		(0.330)	(0.302)
US share x MPS		-2.418**	-2.039**
		(1.082)	(0.901)
Constant	2.175	2.175	1.924
	(1.612)	(1.611)	(1.224)
Controls	Y	Y	Y
Firm FE	Y	Y	Y
FOMC FE	N	N	Y
N clusters	183	183	183
Adjusted R^2	0.015	0.016	0.084
Observations	45726	45726	45726

Table 3: Firm-level monetary policy responses, equity ownership. The table reports coefficient estimates from regression equation (1). Firm-announcement date double clustered standard errors are in parentheses. Letters 'Y' (for 'Yes') and 'N' (for 'No') denote whether firm-level controls, firm fixed effect are included in each regression specification. Stars next to coefficients (*, **, ***) denote significance at 10, 5, and 1% levels respectively.

a rather important role in the foreign markets.

Next, we find a negative β_2 in Equation (1) for the interaction term between monetary policy surprises and US shares, which implies an amplifying effect of US monetary policy surprises associated with higher US ownership. The coefficient estimate implies that a firm with one standard deviation higher US ownership share from Table 1 responds negatively by an additional 27.3 basis points ($-2.418 \times 0.113 \approx 0.273$), or an additional 45.8 percent ($0.458 \approx 0.273/0.597$) compared to another firm with zero US ownership share. Existing firm-specific characteristics do not drive this effect, as we control for firm fixed effects and other time-varying financial ratios across all regressions in Table 3.

To further rule out the dominating impacts of few but unique monetary policy announcements, such as during the pandemic period, we control for the FOMC fixed effect in column (3). Since monetary policy surprises are specific in each of the FOMC meeting date, they would be completely absorbed by the FOMC fixed effect if included in the same regression. We thus leave out monetary policy surprises in column (3). Our result of significant $\beta_2 < 0$ still holds and remains quantitatively similar to column (2). Therefore, we confirm that the influence of US ownership on the Canadian stock returns is not driven by few monetary policy decisions in our sample.

It is worth mentioning that the coefficient β_0 for the US ownership share is found to be negative. This finding is qualitatively consistent with the prediction by Pavlova and Sikorskaya (2023), in which one of their model predictions states that firms with higher institutional ownership would have lower equity returns because this type of investor has inelastic demand. Although Table 3 does not find significant results, this could be due to the construction of our panel data, which includes only the return observations around the monetary announcements rather than the whole time series of equity returns. Generally, around the FOMC announcement dates, it is intuitive that the supply channel dominates the demand channel in our analysis.

3.2 Mutual fund holdings

We proceed to assess if these return responses are actually driven by institutional investors' trading activities. Using GCAP data, we focus on US mutual funds with international investment mandates and study the changes in their quarterly holdings of Canadian firms in response to monetary policy surprises using the following regression:

$$\Delta N_{i,t} = \alpha_i + \beta_1 \text{MPS}_t + \beta_2 \text{OutstandingShare}_{i,t} \times \text{MPS}_t + \gamma X_{i,t} + \varepsilon_{i,t}, \tag{2}$$

where $\Delta N_{i,t}$ is the change of the aggregated number of shares[3] in firm i that are held by international mutual funds in quarter t. It is worth mentioning that, for the same firm, we observe that some mutual funds choose to hold their investments in both the US dollar and the Canadian dollar. When calculating the $\Delta N_{i,t}$, investments reported in different currencies are indexed separately by different i because we cannot be sure that the price per share is identical across US and Canadian markets in that quarter. It is probable that share units are non-comparable, as a lower price per share corresponds to a larger variation in share units. For the firms, who report investments in both currencies, we identify the investment in US dollar as cross-listing firms, and in this case, $\text{CrossListing}_{i,t}$ is a dummy variable that takes the value of one. OutstandingShare is the number of common equity shares outstanding as of date t. This follows Khan, Kogan and Serafeim (2012), which estimated the firm's transaction pressures by the change in the number of shares held by mutual funds, normalized by the number of firm's outstanding shares.

[3] The number of shares in Equation (2) is in millions.

	Dependent variables:						
	Δ Holdings					Δ Holdings std.	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MPS	-3.199***	-3.254***	-3.216***	-3.360***	0.300	-0.636*	-0.639*
	(0.561)	(0.624)	(0.650)	(0.622)	(0.626)	(0.344)	(0.367)
Cross Listing			0.036				
			(0.071)				
Outstanding Share				-0.003	-0.003		
				(0.003)	(0.003)		
Outstanding Share × MPS					-0.014***		
					(0.003)		
Constant	0.049***	-0.471	0.582	-2.080	-2.004	0.012***	-0.522
	(0.006)	(4.486)	(0.658)	(3.126)	(3.115)	(0.003)	(0.650)
Controls	N	Y	Y	Y	Y	N	Y
Firm FE	Y	Y	N	Y	Y	Y	Y
Observations	14061	11583	11583	11583	11583	14061	12930
Adjusted R^2	-0.009	-0.006	0.001	-0.002	0.000	0.005	0.002

Table 4: Fund-level monetary policy responses. As expressed as $\Delta N_{i,t}$ in (2), Δ Holdings is the change of firm i's shares held by all mutual funds except for the domestic funds. MPS is the monetary policy surprise (Nakamura and Steinsson, 2018) and OutstandingShare is the quarterly outstanding common shares. Cross Listing is an indicator variable that takes value 1 when the investments are labeled by the US dollar. The firm fixed effects distinguish securities issued in different currencies even the issuer firms are the same ones. Stars next to coefficients (*, **, ***) denote significance at 10, 5, and 1% levels respectively.

Our coefficient of interest in equation (2) is β_1, and the findings can be summarized by Table 4. The negative β_1 implies that mutual funds sell stocks in both the US and Canadian markets in response to contractionary US monetary policy surprises. On average, in response to a monetary policy shock of 25 basis points, mutual funds sell approximately 3.2 million shares in a quarter. The coefficient continues to be significant and even slightly higher after controlling for the firm's financial conditions in column (2).

Since the observed stock sales might be driven by large-scale sales that occurred only to some firms listed on the stock market, we follow the idea of Khan, Kogan and Serafeim (2012) to control for the outstanding shares of common equity. We find that the outstanding shares alone have an insignificant link to the change in holdings (column (4)). However, it exhibits a strong impact when we interact outstanding shares with monetary policy surprises in column (5). Indeed, firms with more outstanding shares are found to be sold more by US institutional investors in response to positive monetary policy shocks.

Next, we standardize our holdings by outstanding shares and use them as the dependent variable in columns (6) and (7). We find consistent results that US institutional investors sell 0.65% of outstanding shares in response to positive monetary policy shocks. Despite the fact that the coefficient is significant at only 10%, the result in column (6) is not driven by the firm's existing financial conditions, as the estimated selling pressure is quantitatively similar to that in column (7). Overall, the findings on holdings confirm the price impacts of monetary policy shocks shown in Tables 3 and A.1.

To assess the international transmission of US policy shocks in the spirit of Ammer, Vega and Wongswan (2010), we identify the Canadian firms that are dual-listed on the US market by the dummy variable, Cross Listing. We have to exclude the firm's fixed effects in Column (3) because they would absorb the variations in the Cross-Listing indicator. To mitigate the bias that may occur in the coefficient of monetary policy surprises, we keep the firm-specific control variables in the OLS regression. We find that US institutional investors do not sell more dual-listed shares in the US market than in the Canadian market.

This finding in Column (3) is complementary to that of Ammer, Vega and Wongswan (2010) as it confirms the international transmission channel by the significant coefficient of US monetary policy surprises, but it also demonstrates that the selling pressure coming from US monetary policy surprises is not only specific to dual-listed firms but also to the domestic firms in the Canadian stock market.

3.3 Effect on financing and investment

Having shown the price impact and transaction pressure associated with US ownership in Canadian firms, we now examine whether US ownership also affects firms' financial decisions and their investment. We regress cumulative log changes in firm capital stock and debt holdings over l quarters using a local projection approach (Jordà, 2005; Ottonello and Winberry, 2020):

$$\Delta \log y_{i,t+l} = \alpha_i + \delta_{t,l} + \beta_{0,l}\text{USShare}_{i,t} + \beta_{1,l}\text{MPS}_t + \beta_{2,l}\text{USShare}_{i,t} \times \text{MPS}_t + \gamma_l X_{i,t} + \varepsilon_{i,t+l}. \quad (3)$$

The left hand side variable $y_{i,t+l}$ is either the net growth rate in physical capital ($k_{i,t+l}$) or total debt ($d_{i,t+l}$) of firm i at quarter $t+l$. Our measure of physical capital is the net property, plant and equipment of a firm in a given quarter in 2025 prices. $\text{USShare}_{i,t}$ is the US investor ownership share in firm i as of quarter t, and MPS_t is the aggregated US monetary surprises in that quarter. Our set of control covariates is the same as in the earlier stock return specifications.

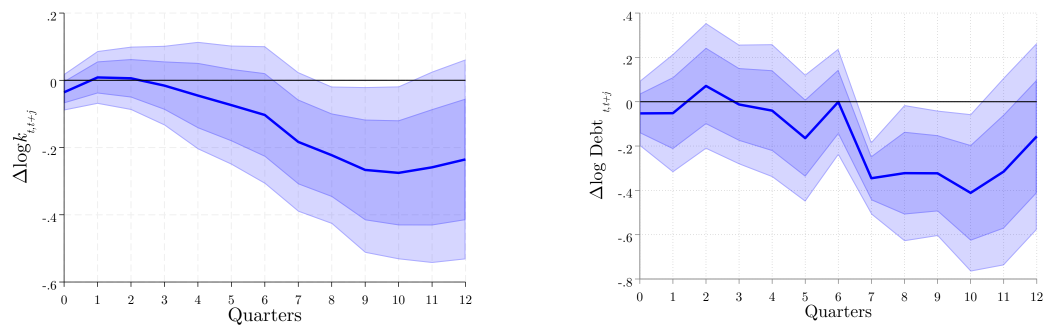

Figure 2: Investment (left) and debt (right) responses to a monetary policy shock, quarters 0 to 12. The two panels plot coefficients from a regression of cumulative changes in log net capital stock (left) and log total debt (right), 0 (contemporaneous) to 12 quarters ahead on an interaction term between the total US monetary policy surprise during the quarter and the US ownership share in the quarter, in addition to other control variables. The dark and light blue bands respectively denote 68% and 90% confidence intervals based on firm-quarter double clustered standard errors.

The coefficient of interest is $\beta_{2,l}$ from (3), which would identify the differential response of firm policies to monetary policies depending on US institutional ownership. The resulting plots of $\beta_{2,l}$ at various horizons are presented in Figure 2, where their confidence intervals, as well as impulse response functions, can inform the magnitude, significance, and timing of the real effects.

Our estimates show that firms with greater US ownership reduce their capital expenditures. In Figure 2, both investment from the asset side and debt from the liability side show a downward-trending evolution following the monetary policy surprises. In terms of magnitude, a firm with one standard deviation higher US share holdings (11.4%) has a 2.53 percent lower real capital stock and 3.67 percent lower debt holdings 8 quarters following a contractionary monetary policy shock of 25 basis points. There is a lag of two to three (six to seven) quarters based on the impulse response functions (the one standard error band). Taken together, the evidence indicates that sizable US ownership affects not only stock market prices but may also generate selling pressures associated with medium-term divestment in Canadian firms.

4 Alternative channels

In this section, we check our above results are driven by alternative channels.

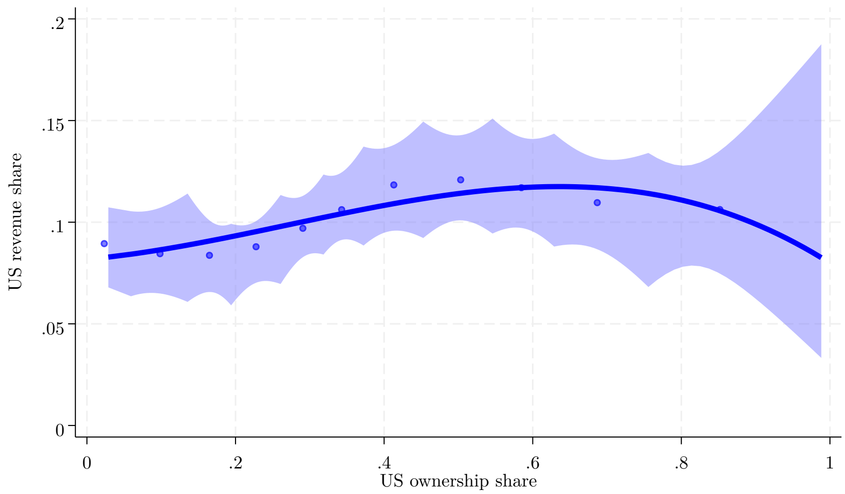

Figure 3: Binned scatterplot, share of total revenue from US (vertical axis) versus ownership share of Canadian firms (horizontal axis). Estimation follows Cattaneo et al. (2024): each of the 18 bins contains 239 distinct firm-year observations and are estimated with firm and year fixed effects. The plot also includes a third order polynomial line fitting the binscatter and a 95% confidence band based on firm-year double clustered standard errors.

4.1 Current account vs. capital account

International studies show that countries with stronger trade linkages to the US market are more susceptible, at an aggregated level, to the Fed's monetary tightening (Iacoviello and Navarro, 2019; Bräuning and Sheremirov, 2023). Measured by the geographical segment data in the income statement, firm's foreign revenues are trade-oriented elements in the current account, which potentially represent a different channel from US ownership that reflects financial investments recorded in the capital account.

To assess whether the current account channel also generates firm-level price impacts, we first visualize its relationship with the ownership channel. Figure 3 shows that firms with greater US equity ownership tend to derive more revenue from the United States, with a whole-sample correlation of 4.4% (significant at the 1% level). Yet, like ownership shares, revenue shares exhibit substantial heterogeneity.

Table 5 compares the US revenue shares with the ownership shares across industries, using the North American Industry Classification System (NAICS) code. For the revenue shares attributed to the U.S., the cross-industry mean is 38.10% with a standard deviation at 14.28%. On the other hand, for the equity shares owned by the US institutional investors, the cross-industry mean is 8.82% with a standard deviation at 3.22%. This result is consistent

Sector Name	Code	Firms	Rev. (%)	Own. (%)	Corr. (×100)
Mining, Quarrying, Oil & Gas	21	29	34.52	13.73	-5.74***
Utilities	22	9	37.72	6.90	5.16*
Construction	23	5	39.51	5.75	-21.15***
Manufacturing	31–33	81	44.55	9.36	-0.85
Retail Trade	44–45	10	39.52	10.55	52.15***
Wholesale Trade	42	14	35.57	5.50	5.66**
Transport. & Warehousing	48	9	34.00	13.40	38.95***
Information	51	26	41.42	10.52	7.90***
Finance & Insurance	52	30	28.25	8.97	0.87
Real Estate & Leasing	53	8	29.79	7.99	27.22***
Prof., Scientific & Tech. Svc.	54	18	36.33	10.47	47.10***
Admin., Waste Mgmt. & Remed.	56	5	31.40	6.38	17.27***
Educational Services	61	1	38.73	14.36	71.76***
Health Care & Social Assist.	62	3	31.39	8.21	-26.98***
Arts, Entertain. & Recreation	71	4	20.05	3.50	-48.18***
Other Services (excl. Public)	81	2	86.87	5.45	54.55***
Whole sample		254			4.40***

Table 5: US revenue and ownership shares by industry. The table shows average share of revenue and equity ownership at the North American Industry Classification (NAICS) level. The table also reports the within-industry correlation coefficient and their significance levels: one, two and three stars (*, **, ***) denote significance at 10%, 5% and 1% levels respectively.

with the cross-sectional statistics in Table 2 where the revenue shares are often higher than the US institutional investor's common equity shares.

Additionally, in Table 5, we also estimate Pearson's correlation for each industry. We find that the correlation between revenues and ownership shares is not always positive. Some industries, including Mining, Quarrying, and Oil and Gas Extraction; Construction; Health Care and Social Assistance; and Arts, Entertainment, and Recreation, are found to have the negative correlation between revenues and ownership shares. Generally, these industries have lower US ownership shares as they are highly regulated by the government.

To further examine whether the large variations found in the revenue shares play a role in our baseline analysis, we estimate an extended "horse-race" regression of Equation (1) as follows:

$$
\begin{aligned}
R_{i,t} = \alpha + \beta_0 \text{MPS}_t &+ \beta_1 \text{OwnerShare}_{i,t} + \beta_2 \text{RevenueShare}_{i,t} \\
&+ \beta_3 \text{OwnerShare}_{i,t} \times \text{MPS}_t + \beta_4 \text{RevenueShare}_{i,t} \times \text{MPS}_t \\
&+ \gamma' X_{i,t} + \varepsilon_{i,t},
\end{aligned} \tag{4}
$$

where $\text{RevenueShare}_{i,t}$ represents the firm's revenues generated by sales in the United States, and $\text{OwnerShare}_{i,t}$ is the same as $\text{USShare}_{i,t}$ in the previous specifications. We modify the name here to distinguish the ownership share from the revenue share.

We present our estimation results from (4) in Table 6. Column (3) shows that while firms with higher US revenue shares tend to have lower stock returns on FOMC announcement dates, the coefficient on the interaction term shows no significant difference in their sensitivity to monetary policy surprises. In comparison with the baseline result in column (2), the marginally significant coefficient of the interaction term indicates that it is indeed US ownership shares, rather than US revenue shares, who amplify the price impact of US monetary policy shocks.

In column (4), we then run a horse race between US ownership shares and US revenue shares. The coefficients β_3 and β_4 validate our earlier results: firms with higher US ownership shares are more sensitive to monetary policy surprises, but no significant difference exists for firms with high US revenue shares. When time-fixed effects are added, these coefficients remain similar in quantity in column (5).

In short, the interaction term between monetary policy surprises and US ownership shares is always significant (columns (2), (4), and (5) in Table 6), but it is not the case for the interaction term with US revenue shares. We thus rule out the alternative channel of US revenue shares in the cross-section regression analysis.

4.2 Signaling effect of US monetary policy

> *We are now independent from government, but we are not independent from the Fed.*
>
> Changyong Rhee, Governor of the Bank of Korea

In a *Reuters Exclusive* interview with Schneider, Saphir and Kim (2022), the governor of the Bank of Korea expressed the policymaking challenge faced by all small open economies: Monetary policies in small open economies, such as Canada and South Korea (Bank of

	(1)	(2)	(3)	(4)	(5)
MPS	-0.464	-0.345	-0.731**	-0.613*	
	(0.309)	(0.280)	(0.368)	(0.346)	
OwnerShare	-0.439	-0.472		-0.458	-0.663
	(0.417)	(0.419)		(0.431)	(0.430)
RevenueShare	-0.285		-0.294*	-0.281	-0.226
	(0.174)		(0.170)	(0.178)	(0.171)
OwnerShare x MPS		-1.200*		-1.178*	-0.934**
		(0.632)		(0.620)	(0.370)
RevenueShare x MPS			0.675	0.684	0.583
			(0.511)	(0.505)	(0.499)
Constant	0.622	0.565	0.612	0.660	0.133
	(1.966)	(1.969)	(1.966)	(1.961)	(1.564)
Controls	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y
FOMC FE	N	N	N	N	Y
N clusters	183	183	183	183	183
Observations	18861	18861	18861	18861	18861

Table 6: Firm-level monetary policy responses, US ownership versus revenue shares. The table reports coefficient estimates of the regression equation (4). Firm-announcement date double clustered standard errors are in parentheses. Stars next to coefficients (*, **, ***) denote significance at 10, 5, and 1% levels respectively.

Canada, 2025; Bank of Korea, 2017), often depend heavily on US monetary policies. As shown in Figure 4, Canada's interest rate decisions closely mirror those of the Fed. During our sample period, the cross-country correlation between the policy rates is 0.93 in levels and 0.56 in monthly first differences. This raises the question of whether our earlier results reflect a direct effect of U.S. monetary policy, or instead an indirect effect operating through its predictive power for future Canadian monetary policy.

To study this, we first confirm whether US monetary policy surprises affect Canadian interest rates by regressing the same-day changes in 1-month Canadian Treasury bill yields on US monetary policy surprises. We compute the same-day changes because this is the highest frequency data that we are able to collect for Canadian interest rates, and our goal is to minimize the estimation window to isolate any other potential spillover effects due to the monetary policy shocks.

As shown in Table 7, the univariate regression shows a significant coefficient for US monetary policy surprises in column (1). A positive shock of 25 basis points is associated

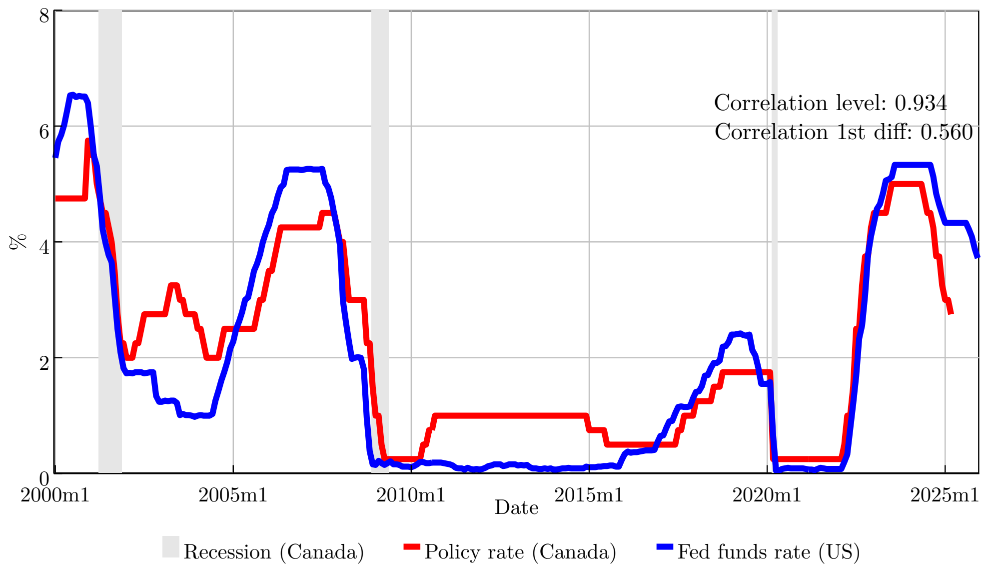

Figure 4: Policy rates of the Bank of Canada and the US Federal Reserve. The figure plots the policy rates set by the Bank of Canada (blue line) and the US Federal Reserve (red line) from January 2000 to December 2023. Shaded areas indicate Canadian recessions from the Business Cycle Council of the C.D. Howe Institute.

	(1) ΔCanadian T-bill	(2) MPS_{CA}
MPS_{US}	0.255**	-0.0927
	(0.0969)	(0.135)
Constant	-1.20×10^{-10}	0.00113
	(0.0181)	(0.0186)
Observations	183	186
Adjusted R^2	0.060	0.003

Table 7: US monetary policy surprises and Canadian T-bill yield changes. Column (1) shows same-day 1-month Canadian Treasury bill yield responses to US monetary policy surprises. Column (2) shows Canadian monetary policy surprise responses to US monetary policy surprises at the following Bank of Canada meeting. HC3 standard errors are in parentheses. ***, **, * indicate significance at 1%, 5%, and 10% levels.

with a 0.255% change in Canadian T-bill yield. In column (2), we examine the correlation between the US monetary shocks and the Canadian monetary policy surprises constructed by Koeppl, Kronick and McNeil (2024). These two shocks are found to be orthogonal, implying that the influence of US monetary shocks does not come from the unexpected component

	(1)	(2)	(3)
MPS US orth.	-0.838***	-0.583**	
	(0.286)	(0.234)	
Δ Canada T-bill	-0.00237	-0.0349	
	(0.395)	(0.347)	
USShare		-0.172	-0.364
		(0.330)	(0.301)
USShare x MPS US orth.		-2.521**	-2.164**
		(1.035)	(0.861)
USShare x Δ Canada T-bill		0.276	0.425
		(0.550)	(0.520)
Constant	2.188	2.183	1.922
	(1.610)	(1.609)	(1.224)
Controls	Y	Y	Y
Firm FE	Y	Y	Y
FOMC FE	N	N	Y
N clusters	183	183	183
Adj. R-squared	0.0156	0.0161	0.0845
Observations	45726	45726	45726

Table 8: Firm-level monetary policy responses, Fed's monetary policy shocks orthogonalized from Canadian interest rate changes. The table reports coefficient estimates of the regression equation (5). Firm-announcement date double clustered standard errors are in parentheses. Stars next to coefficients (*, **, ***) denote significance at 10, 5, and 1% levels respectively.

of Canadian monetary policy. In other words, we cannot completely rule out the indirect channel of predictability for future Canadian policy rates.

To further refine our baseline regression (1), we regress the US monetary policy surprises on the same-day changes of Canadian T-bill yields, and obtain the residual denoted as "MPS US orth." We then run the following horse-race regression, between (1) the Canadian T-bill yield changes on the FOMC date and (2) the US monetary policy surprise residualized from its correlation with the Canadian T-bill yield changes.

$$\begin{aligned} R_{i,t} = \alpha &+ \beta_0 \text{USShare}_{i,t} + \beta_1 \text{MPS US orth.}_t + \beta_2 \Delta \text{ Canada T-bill}_t \\ &+ \beta_3 \text{USShare}_{i,t} \times \text{MPS US orth.}_t + \beta_4 \text{USShare}_{i,t} \times \Delta \text{ Canada T-bill}_t \\ &+ \gamma' X_{i,t} + \varepsilon_{i,t}, \end{aligned} \tag{5}$$

We present our results in Table 8. Column (1) first shows that the yield changes of Canadian T-bill do not seem to explain the Canadian stock returns. On the contrary, the coefficient of the refined US monetary policy shocks is significant at 1% level.

To evaluate the cross-sectional variations in Canadian stock returns, we further introduce US investor shares and their interaction terms with both US and Canadian monetary policy variables in columns (2) and (3) of Table 8. It is not surprising that the stock returns of high US investor shares are not more sensitive to the yield changes of Canadian T-bill. After adding the FOMC fixed effects, the coefficients in column (3) remain quantitatively similar to those in column (2). To summarize, since the significant coefficients are related only to the *orthogonalized* US monetary policy surprises, we can rule out the indirect influence on the cross section of stock returns transmitted via Canadian monetary policy.

5 Conclusion

We find that Canadian stocks with greater US institutional ownership are significantly more sensitive to high-frequency monetary policy surprises around FOMC announcements. This effect is robust to controlling for a wide set of firm characteristics, including size, leverage, and Tobin's Q, as well as firm and FOMC fixed effects. We validate the underlying mechanism by showing that US mutual funds with international mandates reduce their holdings of Canadian equities following a surprise monetary tightening, consistent with inelastic demand from institutional investors amplifying price impacts across borders.

These price effects have real consequences. Firms with higher US ownership reduce both their capital expenditures and debt holdings over the quarters following a contractionary US monetary policy shock, suggesting that the decline in equity valuations constrains their external financing and investment decisions.

Our findings highlight the importance of investor composition for the international transmission of monetary policy. An open-economy model with heterogeneous investor demand would help quantify the general equilibrium and welfare implications of this channel; we leave this for future research.

References

Acosta, Miguel, Connor M. Brennan, and Margaret M. Jacobson. 2024. "Constructing high-frequency monetary policy surprises from SOFR futures." *Economics Letters*, 242: 111873.

Albagli, Elias, Luis Ceballos, Sebastian Claro, and Damian Romero. 2019. "Channels of US monetary policy spillovers to international bond markets." *Journal of Financial Economics*, 134(2): 447–473.

Ammer, John, Clara Vega, and Jon Wongswan. 2010. "International Transmission of U.S. Monetary Policy Shocks: Evidence from Stock Prices." *Journal of Money, Credit and Banking*, 42(s1): 179–198.

Bacchetta, Philippe, Margaret Davenport, and Eric Van Wincoop. 2022. "Can sticky portfolios explain international capital flows and asset prices?" *Journal of International Economics*, 136: 103583.

Bank of Canada. 2025. "Monetary Policy Report." Bank of Canada 2025-04, Ottawa.

Bank of Korea. 2017. *Monetary Policy in Korea.* . 4 ed., Seoul:Bank of Korea.

Belo, Frederico, Xiaoji Lin, and Santiago Bazdresch. 2014. "Labor Hiring, Investment, and Stock Return Predictability in the Cross Section." *Journal of Political Economy*, 122(1): 129–177.

Bernanke, Ben S., and Kenneth N. Kuttner. 2005. "What Explains the Stock Market's Reaction to Federal Reserve Policy?" *The Journal of Finance*, 60(3): 1221–1257.

Brusa, Francesca, Pavel Savor, and Mungo Wilson. 2019. "One Central Bank to Rule Them All." *Review of Finance*, rfz015.

Bräuning, Falk, and Viacheslav Sheremirov. 2023. "The Transmission Mechanisms of International Business Cycles: International Trade and the Foreign Effects of US Monetary Policy." *IMF Economic Review*, 71(1): 300–325.

Cattaneo, Matias D., Richard K. Crump, Max H. Farrell, and Yingjie Feng. 2024. "On Binscatter." *American Economic Review*, 114(5): 1488–1514.

Cavani, Bruno, Matteo Maggiori, and Jesse Schreger. 2025. "GCAP Public Security-Level Data on US Fund Holdings." National Bureau of Economic Research.

Ciminelli, Gabriele, John Rogers, and Wenbin Wu. 2022. "The effects of US monetary policy on international mutual fund investment." *Journal of International Money and Finance*, 127: 102676.

Cloyne, James, Clodomiro Ferreira, Maren Froemel, and Paolo Surico. 2023. "Monetary Policy, Corporate Finance, and Investment." *Journal of the European Economic Association*, 21(6): 2586–2634.

Di Giovanni, Julian, and Galina Hale. 2022. "Stock market spillovers via the global production network: Transmission of US monetary policy." *Journal of Finance*, 77(6): 3373–3421.

Di Giovanni, Julian, and John Rogers. 2024. "The impact of US monetary policy on foreign firms." *IMF Economic Review*, 72(1): 58–115.

Fang, Chuck, and Kairong Xiao. 2025. "What Do $40 Trillion of Portfolio Holdings Say about Monetary Policy Transmission?"

Feroli, Michael, Anil K Kashyap, Kermit L Schoenholtz, and Hyun Song Shin. 2014. "Market tantrums and monetary policy."

Gabaix, Xavier, and Ralph S J Koijen. 2023. "In Search of the Origins of Financial Fluctuations: The Inelastic Markets Hypothesis."

Gertler, Mark, and Simon Gilchrist. 1994. "Monetary policy, business cycles, and the behavior of small manufacturing firms." *Quarterly Journal of Economics*, 109(2): 309–340.

Gnewuch, Matthias, and Donghai Zhang. 2025. "Monetary policy, firm heterogeneity, and the distribution of investment rates." *Journal of Monetary Economics*, 149: 103721.

González, Beatriz, Galo Nuño, Dominik Thaler, and Silvia Albrizio. 2024. *Firm heterogeneity, capital misallocation and optimal monetary policy.* ECB Working Paper No. 2890.

Iacoviello, Matteo, and Gaston Navarro. 2019. "Foreign effects of higher U.S. interest rates." *Journal of International Money and Finance*, 95: 232–250.

Jeenas, Priit. 2024. "Firm Balance Sheet Liquidity, Monetary Policy Shocks, and Investment Dynamics." *UPF Economics Working Paper Series No. 1872.*

Jordà, Òscar. 2005. "Estimation and Inference of Impulse Responses by Local Projections." *American Economic Review*, 95(1): 161–182.

Jungherr, Joachim, Matthias Meier, Timo Reinelt, and Immo Schott. 2024. "Corporate debt maturity matters for monetary policy."

Khan, Mozaffar, Leonid Kogan, and George Serafeim. 2012. "Mutual fund trading pressure: Firm-level stock price impact and timing of SEOs." *Journal of Finance*, 67(4): 1371–1395.

Koeppl, Thorsten V., Jeremy M. Kronick, and James McNeil. 2024. "Using functional shocks to assess conventional and unconventional monetary policy in Canada." *Canadian Journal of Economics*, 57(4): 1314–1336.

Li, Yun Daisy, Talan B. İşcan, and Kuan Xu. 2010. "The impact of monetary policy shocks on stock prices: Evidence from Canada and the United States." *Journal of International Money and Finance*, 29(5): 876–896.

Long, J. Scott, and Laurie H. Ervin. 2000. "Using Heteroscedasticity Consistent Standard Errors in the Linear Regression Model." *The American Statistician*, 54(3): 217–224.

Lu, Xu, and Hong Xiang Wu. 2023. "Monetary Transmission and Portfolio Rebalancing: A Cross-Sectional Approach." Available at SSRN.

Miranda-Agrippino, Silvia, and Hélene Rey. 2020. "US monetary policy and the global financial cycle." *The Review of Economic Studies*, 87(6): 2754–2776.

Nakamura, Emi, and Jón Steinsson. 2018. "High-Frequency Identification of Monetary Non-Neutrality: The Information Effect." *The Quarterly Journal of Economics*, 133(3): 1283–1330.

Ottonello, Pablo, and Thomas Winberry. 2020. "Financial Heterogeneity and the Investment Channel of Monetary Policy." *Econometrica*, 88(6): 2473–2502.

Ozdagli, Ali, and Mihail Velikov. 2020. "Show me the money: The monetary policy risk premium." *Journal of Financial Economics*, 135(2): 320–339.

Pavlova, Anna, and Taisiya Sikorskaya. 2023. "Benchmarking Intensity." *The Review of Financial Studies*, 36(3): 859–903.

Schneider, Howard, Ann Saphir, and Cynthia Kim. 2022. "Bank of Korea's Rhee says policy tightening unlikely to end before Fed." *Reuters Exclusive*.

Timmer, Yannick. 2018. "Cyclical investment behavior across financial institutions." *Journal of Financial Economics*, 129(2): 268–286.

Appendix

A Stylized model

A.1 Conceptual framework

We propose a stylized partial equilibrium model to illustrate our amplification mechanism. The model delivers two testable predictions:

1. Price sensitivity to FOMC surprises is increasing in US ownership share.

2. Market beta is endogenous to ownership composition.

A.2 Environment

Assets. There are N Canadian stocks, indexed by $i \in \{1, \ldots, N\}$, each in fixed supply normalized to one. Investors do not discount future payoffs. Stock i pays a random dividend at $t = 1$:

$$D_i = \bar{d}_i + \varepsilon_i, \qquad \varepsilon_i \overset{iid}{\sim} \mathcal{N}(0, \sigma^2) \tag{A.1}$$

where $\bar{d}_i > 0$ is the expected payoff and ε_i is idiosyncratic risk, independent across stocks.[4]

Investors. A continuum of risk-averse investors of unit mass trades each stock. For stock i, a fraction $\omega_i \in [0, 1]$ of investors are 'U', or US institutional investors and the remaining $1 - \omega_i$ Canadian ('C', or domestic) investors.

The composition parameter ω_i is predetermined, reflecting institutional factors such as index inclusion and firm visibility. One could endogenize ω_i through a richer portfolio allocation stage; the amplification channels identified in Proposition 1 would remain operative in such an extension.

Timing. Investors trade their stock holdings using the following sequence.

[4] Adding a systematic factor to the payoff (e.g., $D_i = \bar{d}_i + \beta_i^f s + \varepsilon_i$) would introduce a fundamental channel alongside the demand channel. The ownership amplification result in Proposition 1 would continue to hold; we omit the fundamental factor to isolate the demand mechanism.

$t = 0$: Investors hold initial portfolios. The economy is in a pre-FOMC equilibrium.

$t = 0^+$: The FOMC meets. A monetary policy surprise s is publicly realized, where $s > 0$ denotes a tightening.

$t = 1$: Markets reopen. Investors observe s and optimally choose their stock holdings.

$t = 2$: Stock dividends are realized, and payoffs are distributed. Investors consume their wealth W_j.

A.3 Preferences and portfolio choice

At $t = 1$, each investor of type $j \in \{U, C\}$ chooses per-capita holdings q_i^j in each stock i. Following a US monetary tightening, holding Canadian equities becomes more expensive for investors with exposure to US financial conditions—through higher domestic yields (opportunity cost), tighter margin requirements, and mandate-driven rebalancing pressure. We model this as a type-specific per-share cost $\delta_j s$, with $\delta_j \geq 0$ for a monetary policy surprise s with mean 0 and finite variance σ_s^2. Investor j's terminal wealth is:

$$W_j = \bar{W}_j + \sum_{i=1}^{N} q_i^j \left(D_i - P_i - \delta_j\, s\right) \tag{A.2}$$

where $\bar{W}_j$ is wealth invested in the risk-free bond and P_i is the stock price of firm i. Since $D_i = \bar{d}_i + \varepsilon_i$ with $\varepsilon_i \perp s$, the conditional moments of wealth given s are:

$$\mathbb{E}[W_j \,|\, s] = \bar{W}_j + \sum_{i=1}^{N} q_i^j \left(\bar{d}_i - \delta_j\, s - P_i\right) \tag{A.3}$$

$$\mathrm{Var}(W_j \,|\, s) = \sum_{i=1}^{N} \left(q_i^j\right)^2 \sigma^2 \tag{A.4}$$

The monetary policy surprise s shifts the conditional mean through the holding cost but does *not* affect the conditional variance, which depends only on the idiosyncratic payoff risk σ^2.

Each investor maximizes a mean-variance objective over terminal wealth. We set $\gamma > 0$ as the common coefficient of absolute risk aversion. Since the ε_i are independent across stocks, the objective separates by stock, and we can state the problem for a generic stock i.

Canadian investors. Domestic investors are unconstrained and solve:

$$\max_{q_i^C} \; q_i^C \left(\bar{d}_i - \delta_C\, s - P_i\right) - \frac{\gamma}{2}\left(q_i^C\right)^2 \sigma^2 \tag{A.5}$$

where the first term is the expected excess payoff (net of the holding cost $\delta_C s$) and the second is the variance penalty. The first-order condition is:

$$\bar{d}_i - \delta_C\, s - P_i - \gamma\sigma^2\, q_i^C = 0 \tag{A.6}$$

Solving for per-capita demand:

$$q_i^C = \frac{\bar{d}_i - \delta_C\, s - P_i}{\gamma\sigma^2} \tag{A.7}$$

US institutional investors. US investors additionally face a tracking error penalty for deviating from their benchmark allocation $\bar{q}_i \geq 0$, and solve:

$$\max_{q_i^U} \; q_i^U \left(\bar{d}_i - \delta_U\, s - P_i\right) - \frac{\gamma}{2}\left(q_i^U\right)^2 \sigma^2 - \frac{\lambda}{2}\left(q_i^U - \bar{q}_i\right)^2 \tag{A.8}$$

where $\lambda > 0$ governs the strength of the tracking error penalty. The first-order condition is:

$$\bar{d}_i - \delta_U\, s - P_i - \gamma\sigma^2\, q_i^U - \lambda\left(q_i^U - \bar{q}_i\right) = 0 \tag{A.9}$$

Solving for per-capita demand:

$$q_i^U = \frac{\bar{d}_i - \delta_U\, s - P_i + \lambda\,\bar{q}_i}{\gamma\sigma^2 + \lambda} \tag{A.10}$$

Demand structure. The per-capita demand functions (A.7)–(A.10) are linear in price with slopes:

$$b_C \equiv \frac{1}{\gamma\sigma^2}, \qquad b_U \equiv \frac{1}{\gamma\sigma^2 + \lambda} \tag{A.11}$$

Since $\lambda > 0$, US investors' demand is less price-elastic: $b_U < b_C$. The tracking error penalty anchors their holdings near the benchmark, reducing their responsiveness to price changes. We set the benchmark at the unconstrained per-capita optimum absent shocks, $\bar{q}_i = \bar{d}_i/(\gamma\sigma^2)$, so that both investor types share a common demand intercept $a_i \equiv \bar{d}_i/(\gamma\sigma^2)$. Per-capita demands then take the form:

$$q_i^U(P_i, s) = a_i - \hat{\delta}_U\, s - b_U\, P_i \tag{A.12}$$

$$q_i^C(P_i, s) = a_i - \hat{\delta}_C\, s - b_C\, P_i \tag{A.13}$$

where $\hat{\delta}_j \equiv \delta_j/(\gamma\sigma^2 + \lambda_j)$ (with $\lambda_C = 0$) are the demand-scaled policy sensitivities.

Assumption 1 (Inelastic US demand)**.** *US institutional investors have lower price sensitivity than domestic investors:* $b_U < b_C$.

This follows directly from the tracking error penalty $\lambda > 0$ in (A.11).[5]

Assumption 2 (Asymmetric policy exposure)**.** *US investors are more responsive to US monetary policy than Canadian investors:* $\delta_U > \delta_C \geq 0$.

US investors respond more strongly because a Fed tightening directly raises their domestic opportunity cost and triggers mandate-driven outflows from international allocations. Canadian investors may also respond—for instance, through global risk aversion or comovement between Canadian and US rates—but to a lesser degree. The special case $\delta_C = 0$ recovers a pure ownership channel where transmission operates entirely through US investors.

A.4 Equilibrium

Market clearing for stock i requires that aggregate demand (per-capita demand weighted by investor mass) equals the unit supply:

$$\omega_i\, q_i^U(P_i, s) + (1 - \omega_i)\, q_i^C(P_i, s) = 1 \tag{A.14}$$

Substituting (A.12)–(A.13) into (A.14) and solving yields the equilibrium price:

$$P_i(s) = \frac{a_i - D(\omega_i)\, s - 1}{B(\omega_i)} \tag{A.15}$$

where

$$D(\omega_i) \equiv \omega_i\, \hat{\delta}_U + (1 - \omega_i)\, \hat{\delta}_C \tag{A.16}$$

[5]See Pavlova and Sikorskaya (2023) for evidence that benchmarking generates inelastic demand, and Gabaix and Koijen (2023) for the broader inelastic markets framework.

is the ownership-weighted average demand sensitivity to US monetary policy, and

$$B(\omega_i) \equiv \omega_i \, b_U + (1 - \omega_i) \, b_C \tag{A.17}$$

is the ownership-weighted average price sensitivity. Under Assumption 1, $B(\omega_i)$ is decreasing in ω_i: markets with greater US institutional ownership have lower aggregate demand elasticity.

A.5 Ownership amplification

Proposition 1 (Ownership amplification)**.** *The price sensitivity of stock i to US monetary policy surprises is:*

$$\frac{\partial P_i}{\partial s} = \frac{-D(\omega_i)}{B(\omega_i)} \tag{A.18}$$

Under Assumptions 1–2, this sensitivity is strictly increasing in magnitude in ω_i:

$$\frac{\partial}{\partial \omega_i} \left| \frac{\partial P_i}{\partial s} \right| = \frac{\hat{\delta}_U \, b_C - \hat{\delta}_C \, b_U}{[B(\omega_i)]^2} > 0 \tag{A.19}$$

Proof. From (A.15), $\partial P_i / \partial s = -D(\omega)/B(\omega)$, which is negative for all $\omega \in [0, 1]$ when $\hat{\delta}_C > 0$ (or for $\omega > 0$ when $\hat{\delta}_C = 0$). Differentiating $D(\omega)/B(\omega)$:

$$\frac{d}{d\omega} \frac{D(\omega)}{B(\omega)} = \frac{D'(\omega)B(\omega) - D(\omega)B'(\omega)}{B(\omega)^2} = \frac{(\hat{\delta}_U - \hat{\delta}_C)B(\omega) - D(\omega)(b_U - b_C)}{B(\omega)^2}$$

The numerator simplifies to $\hat{\delta}_U b_C - \hat{\delta}_C b_U$. Substituting $\hat{\delta}_j = \delta_j \, b_j$, this equals $b_U b_C(\delta_U - \delta_C) > 0$ by Assumption 2. □

The amplification operates through two reinforcing channels:

1. *Inelasticity effect* (denominator $B(\omega_i)$): higher ω_i tilts the investor base toward less price-elastic participants, reducing $B(\omega_i)$, so that a given demand shift produces a larger price decline.

2. *Composition effect* (numerator $D(\omega_i)$): higher ω_i shifts the investor mix toward the more policy-sensitive type, increasing the ownership-weighted demand response $D(\omega_i) = \omega_i \hat{\delta}_U + (1 - \omega_i)\hat{\delta}_C$.

When $\hat{\delta}_C > 0$, there is a baseline level of transmission even at $\omega_i = 0$: $\partial P_i/\partial s|_{\omega=0} = -\hat{\delta}_C/b_C$. This common component is absorbed by FOMC fixed effects in the empirical specification; the cross-sectional variation in ω_i identifies the amplification.

Corollary 1 (Inelastic demand amplification)**.** *For any $\omega_i > 0$, the price sensitivity $|\partial P_i/\partial s|$ is decreasing in b_U: more inelastic US demand amplifies the price impact of monetary policy surprises.*

A.6 Endogenous beta

Stock i's return driven by the monetary policy shock is $R_i \propto (\partial P_i/\partial s) \cdot s$. The value-weighted market return is $R_m = \sum_j w_j R_j$. Since the idiosyncratic dividend shock ε_i is independent across stocks, for a well-diversified market:

$$\beta_i = \frac{\text{Cov}(R_i, R_m)}{\text{Var}(R_m)} \propto \frac{D(\omega_i)}{B(\omega_i)} \tag{A.20}$$

Corollary 2 (Endogenous beta)**.** *Stock i's market beta is increasing in its US ownership share ω_i. Controlling for beta in cross-sectional regressions attenuates the estimated ownership amplification effect.*

Proof. From Proposition 1, $D(\omega)/B(\omega)$ is increasing in ω. Since β_i is proportional to $D(\omega_i)/B(\omega_i)$ by (A.20), the result follows. □

This result has an important implication for empirical design: market beta is a function of US ownership through the price impact mechanism in Proposition 1. Including beta as a control absorbs part of the ownership channel, biasing the estimated effect toward zero. Our baseline empirical specifications, therefore, exclude beta from the control set; specifications that include beta should be interpreted as providing a lower bound on the ownership amplification effect.

Corollary 3 (Beta decomposition)**.** *Stock i's market beta can be decomposed into inelastic and composition effects. The market beta increases in US ownership relative to that of the market portfolio.*

Proof. From Equation (A.20), and $R_j \propto (\partial P_j/\partial s) \cdot s$ for $j = i, m$,

$$\frac{\text{Cov}(R_i, R_m)}{\text{Var}(R_m)} \propto \frac{\left(\frac{\partial P_m}{\partial s}\right)\left(\frac{\partial P_i}{\partial s}\right)\sigma_s^2}{\left(\frac{\partial P_m}{\partial s}\sigma_s\right)^2} = \frac{\frac{\partial P_i}{\partial s}}{\frac{\partial P_m}{\partial s}} = \frac{D(\omega_i)}{B(\omega_i)} \times \frac{B(\omega_m)}{D(\omega_m)}, \tag{A.21}$$

where ω_m represents the US ownership in the market portfolio. Plugging in the expressions in (A.16) and (A.17), we can decompose β_i into two elements attributed to composition and inelasticity effects, respectively.

$$
\begin{aligned}
\frac{\omega_i \hat{\delta}_U + (1-\omega_i)\hat{\delta}_C}{\omega_i b_U + (1-\omega_i) b_C} \times \frac{\omega_m b_U + (1-\omega_m) b_C}{\omega_m \hat{\delta}_U + (1-\omega_m)\hat{\delta}_C} \\
&= \underbrace{\frac{\omega_i(\hat{\delta}_U - \hat{\delta}_C) + \hat{\delta}_C}{\omega_m(\hat{\delta}_U - \hat{\delta}_C) + \hat{\delta}_C}}_{\text{composition effect}} \times \underbrace{\frac{\omega_m(b_U - b_C) + b_C}{\omega_i(b_U - b_C) + b_C}}_{\text{inelastic effect}} \\
&= \frac{\omega_m(b_U - b_C) + b_C}{\omega_i(b_U - b_C) + b_C} \quad \text{if } \hat{\delta}_U = \hat{\delta}_C
\end{aligned}
$$

In the absence of composition effect ($\hat{\delta}_U = \hat{\delta}_C$), a stock with US institutional ownership higher than the market portfolio automatically has higher β because of Assumption 1: $b_U - b_C < 0$. When $\hat{\delta}_U \neq \hat{\delta}_C$, the composition effect may either amplify or dampen this relationship depending on the sign of $\hat{\delta}_U - \hat{\delta}_C$. Because $\hat{\delta}_j = \delta_j \, b_j$, Assumption 2 ($\delta_U > \delta_C$) does not by itself guarantee $\hat{\delta}_U > \hat{\delta}_C$: the lower price sensitivity of US investors ($b_U < b_C$) works in the opposite direction. Nevertheless, the overall result that β_i is increasing in ω_i is unaffected, as it relies on the cross-derivative condition $\hat{\delta}_U b_C - \hat{\delta}_C b_U = b_U b_C(\delta_U - \delta_C) > 0$ established in Proposition 1, which holds under both assumptions jointly. The inelastic demand channel is therefore the primary driver of the cross-sectional relationship between ownership and beta. □

A.7 Mapping to the empirical specification

At $\omega_i = 0$, the price sensitivity is $-\hat{\delta}_C / b_C$, common across stocks. A first-order Taylor expansion of (A.18) around $\omega_i = 0$ gives:

$$
\frac{\partial P_i}{\partial s} \approx -\frac{\hat{\delta}_C}{b_C} - \frac{\hat{\delta}_U b_C - \hat{\delta}_C b_U}{b_C^2} \cdot \omega_i \tag{A.22}
$$

The first term is a baseline sensitivity common to all stocks, absorbed by FOMC fixed effects α_t. The second term captures the cross-sectional amplification. This motivates the baseline regression specification:

$$
R_{i,t} = \alpha_i + \alpha_t + \beta \cdot (\omega_{i,t} \times \text{MPS}_t) + \Gamma' X_{i,t} + \varepsilon_{i,t} \tag{A.23}
$$

where α_i and α_t are firm and FOMC fixed effects, $\omega_{i,t}$ is the US ownership share, MPS_t is the high-frequency monetary policy surprise, and $X_{i,t}$ are firm-level controls. The model predicts $\beta < 0$: firms with higher US ownership experience larger return declines following contractionary surprises, with the FOMC fixed effect absorbing the common response $\hat{\delta}_C/b_C$. Corollary 2 predicts that including market beta in $X_{i,t}$ attenuates $|\hat{\beta}|$.

B Data

We download quarterly equity holdings data at the firm level from LSEG Workspace for publicly traded companies in Canada from 2000 to 2025. This dataset identifies the equity holders of each firm that allows us to estimate the ownership structure at firm level. Table 1 presents the average share by the US investors at 10.7%, which is approximately half of 27.2% by the Canadian investors.

The second block of our data is sourced from Compustat Global. We collect the fundamentals from the financial statements, including Current Assets, Total Assets, Common Equity, Cash and Short-Term Investments, Common Shares Outstanding, Debt in Current Liabilities, Total Liabilities, Property, Plant, and Equipment, Stockholders' Equity, Cost of Goods Sold, Operating Income After Depreciation, Sales Revenue, Interest Expense, Acquisitions – Cash Flow, and Close Price. These variables help us control the firm-specific variations, such as stock returns, market capitalization, Tobin's Q, etc. as reported also in Table 1.

Thirdly, we collect the geographical segment data of sales revenues from the LSEG Workspace to estimate the US share of sales revenues in each firm. The data is available at quarterly frequency. Note that not every firm declares the geographical breakdown in their income statements. Among those who report such information, the average US share in sales revenue is about 38%, much higher than the observed US ownership. This pattern holds throughout different percentiles, implying that the clients need not always be the investors of the firms.

Finally, we use the GCAP data, which is the US fund-level holding data constructed by Cavani, Maggiori and Schreger (2025) based on regulatory filings of portfolio holdings from Form N-PORT. Different from the ownership data of LSEG Workspace, the GCAP holdings data are at mutual fund level rather than fund-family level. This granularity allows us to refine our analysis to the mutual funds with relevant investment objectives. Specifically, we shall be able to isolate the US domestic funds from our sample. This dataset is similar to the commercial database CRSP Mutual Fund, but it has more complete coverage and holdings data of foreign firms. The quarterly data begins from October 2019 and the second quarter of 2025 serves as the latest observation. In total, we manage to gather 24 quarters of data which explains the much smaller sample size in Table 1. Considering the coverage of merely 6-year long data, the number of observations is actually comparable to the LSEG's ownership data. The change of holdings expressed in million shares is aggregated across mutual funds to the firm level. When the holding data is missing in the time series, we re-scale the change of holdings by the number of quarters from the previous observations.

C Variable definitions

We note each variable by the database name (`LSEG`: LSEG Refinitiv, `CP`: Compustat North America Quarterly) followed by their respective within-database names.

- Stock returns: for FOMC event studies: difference between the closing price(`LSEG:TRDPRC_1`) and the opening price (`LSEG:OPEN_PRC`) divided by the opening price; for estimation of market betas, difference between the closing price and the previous trading day's closing price, divided by the previous trading day's closing price
- Property, plant and equipment (PP&E): net PP&E (`CP: PPENTQ`)
- Total assets: (`CP: ATQ`)
- Debt: sum of current debt in current liabilities (`CP: DLCQ`) and long-term debt (`CP: DLTTQ`).
- Market capitalization: for quarterly analyses, product of share price (`CP: PRCCQ`) and number of shares outstanding (`CP: cshoq`); for daily return analyses
- Book leverage: debt divided by total assets
- Gross profitability: quarterly sales (`CP: SALEQ` net of cost of goods sold (`CP: COGSQ`) divided by lagged total assets
- Cash flow: income before taxes (`CP: IBQ` plus depreciation expense (`CP: DPQ`), divided by lagged total assets
- Tobin's Q: sum of market capitalization and debt divided by total assets

- Cash-to-assets: cash and equivalents (`CP: CHEQ`) divided by lagged total assets
- Market beta: coefficient estimate from a regression of daily individual stock returns net of 30-day Canadian treasury rates on daily TSX index returns using 3-year calendar windows. Each window much have at least 200 daily observations.

The industry label is sourced from `LSEG`, including `NAICS Sector Name All`, `NAICS Sector All Code`, `NAICS Subsector All Code`, and `NAICS National Industry Name`. When one firm is associated with multiple industries, we delete the lines where `NAICS National Industry Name` is NA, and keep only the primary industry to ensure that the firm-industry pair is unique.

D Index-level regressions

Our first step is to establish the cross-border influence of the US monetary policy surprises on the international stock market. Following Bernanke and Kuttner (2005), we run the following regression on every monetary policy announcement date t:

$$R_t = \alpha + \beta \text{MPS}_{j,t} + \varepsilon_t, \quad j \in \text{US}, \text{CA}, \tag{D.24}$$

where R_t is the daily equity returns on the S&P/TSX composite market index, and $\text{MPS}_{j,t}$ represents the monetary policy surprises by the central bank of country j at day t.[6] In Table A.1, our preliminary results show that a 25 basis point US monetary policy surprise leads to a 1.04% point decrease in the S&P/TSX composite index returns on the announcement day. This magnitude is quantitatively comparable to a drop of 1.14% in the index returns in response to Canadian monetary policy surprises, despite its statistical insignificance.

We furthermore find that this sensitivity is particularly strong for the latter part of our sample: the β-estimate corresponding to the US monetary policy shocks in Equation (D.24) is about -0.06% after 2010 (Column (5)), equivalent to 1.5 times of the sensitivity before 2010 (-0.04%, Column (3)). In contrast, the Canadian monetary policy surprises had a sizable presence prior to 2010 and posed a weaker influence more recently.

[6] Note that Canada started scheduling regular monetary policy meetings only from 2001.

	Full Sample		Pre 2010		Post 2010	
	(1)	(2)	(3)	(4)	(5)	(6)
MPS_{US}	-1.04***		-0.91**		-1.43**	
	(-3.22)		(-2.27)		(-2.16)	
MPS_{CA}		-1.14		-1.70***		-0.39
		(-1.30)		(-2.67)		(-0.20)
Constant	0.22***	-0.04	0.23*	-0.24*	0.22**	0.09
	(3.08)	(-0.38)	(1.99)	(-1.69)	(2.40)	(0.63)
Observations	183	187	72	73	111	114
Adjusted R^2	0.066	0.043	0.079	0.154	0.047	-0.005

Table A.1: Stock market responses to monetary policy surprises, US and Canada. Numbers in parentheses are heteroskedasticity consistent standard errors. The table reports coefficient estimates and their t-statistics from regression equation (D.24). The t-statistics are based on Long and Ervin (2000) heteroskedasticity-consistent (HC(3)) standard errors. Stars next to coefficients (*, **, ***) denote significance at 10, 5, and 1% levels respectively.

E Placebo regressions

We show that our results are not driven by spurious correlations between US ownership shares and Canadian stock returns, by using the same specification as the baseline but replacing the dependent variable with returns on the previous trading day. We present the estimation results in Table A.5.

F Full tables

We provide complete tables of the regression estimates as well as coefficient estimates used to construct figures in the main text.

	(1)	(2)	(3)
MPS	-0.842***	-0.597**	
	(0.308)	(0.251)	
US investor share		-0.201	-0.382
		(0.330)	(0.302)
US share × MPS		-2.418**	-2.039**
		(1.082)	(0.901)
Tobin's Q	0.0450	0.0447	0.0449
	(0.0421)	(0.0420)	(0.0372)
Profitability	0.642	0.653	0.555
	(0.904)	(0.903)	(0.796)
Sales growth	-0.00569	-0.00752	0.00981
	(0.0600)	(0.0602)	(0.0524)
Leverage	-0.233	-0.239	-0.173
	(0.186)	(0.183)	(0.191)
log Market cap	-0.150	-0.152	-0.130
	(0.119)	(0.119)	(0.0869)
log Total asset	0.147	0.154	0.125
	(0.139)	(0.139)	(0.0980)
Constant	2.175	2.175	1.924
	(1.612)	(1.611)	(1.224)
Controls	Y	Y	Y
Firm FE	Y	Y	Y
FOMC FE	N	N	Y
N clusters	183	183	183
Adjusted R^2	0.015	0.016	0.084
Observations	45726	45726	45726

Table A.2: Firm-level monetary policy responses, equity ownership. The table reports coefficient estimates from regression equation (1). Firm-announcement date double clustered standard errors are in parentheses. Letters 'Y' (for 'Yes') and 'N' (for 'No') denote whether firm-level controls, firm and FOMC-date fixed effect are included in each regression specification. Stars next to coefficients (*, **, ***) denote significance at 10, 5, and 1% levels respectively.

Quarter (h)	Coefficient	Std. Error
0	-0.0356	(0.0330)
1	0.0085	(0.0477)
2	0.0059	(0.0572)
3	-0.0158	(0.0720)
4	-0.0454	(0.0971)
5	-0.0738	(0.1076)
6	-0.1031	(0.1244)
7	-0.1833	(0.1261)
8	-0.2228*	(0.1242)
9	-0.2666*	(0.1498)
10	-0.2753*	(0.1563)
11	-0.2588	(0.1730)
12	-0.2352	(0.1808)

Table A.3: Local projection coefficients (Investment). The table reports coefficient estimates and their standard errors from the local projection regression of Equation (3) used to construct the left panel of Figure 2. The dependent variable is the cumulative change in the log of real capital stock over the horizon h (Quarters). Stars denote significance at 10 percent levels, calculated from firm-quarter double clustered standard errors.

Quarter (h)	Coefficient	Std. Error
0	-0.0527	(0.0893)
1	-0.0518	(0.1623)
2	0.0712	(0.1725)
3	-0.0125	(0.1642)
4	-0.0403	(0.1823)
5	-0.1645	(0.1744)
6	-0.0010	(0.1461)
7	-0.3453***	(0.0995)
8	-0.3224*	(0.1867)
9	-0.3231*	(0.1720)
10	-0.4114*	(0.2159)
11	-0.3152	(0.2573)
12	-0.1563	(0.2563)

Table A.4: Local projection coefficients (Debt). The table reports coefficient estimates and their standard errors from the local projection regression of Equation (3) used to construct the right panel of Figure 2. The dependent variable is the cumulative change in the log of nominal debt over the horizon h (Quarters). Stars denote significance at 10, 5 and 1 percent levels, calculated from firm-quarter double clustered standard errors.

	(1)	(2)	(3)
MPS	-0.240	-0.235	
	(0.336)	(0.336)	
US investor share		-0.200	-0.209
		(0.388)	(0.397)
US share × MPS		-0.0594	-0.196
		(0.651)	(0.773)
Market β	-0.0680	-0.0666	-0.0584
	(0.179)	(0.178)	(0.132)
Tobin's Q	-0.0481	-0.0480	-0.0501
	(0.0437)	(0.0437)	(0.0415)
Profitability	1.063	1.059	1.349*
	(0.866)	(0.863)	(0.745)
Sales growth	-0.0566	-0.0574	-0.0594
	(0.0741)	(0.0741)	(0.0646)
Leverage	-0.158	-0.163	-0.0932
	(0.211)	(0.212)	(0.211)
log Market cap	-0.0620	-0.0630	-0.0423
	(0.0854)	(0.0856)	(0.0815)
log Total asset	-0.0129	-0.00633	-0.0183
	(0.105)	(0.107)	(0.0849)
Constant	1.546	1.541	1.167
	(1.183)	(1.185)	(1.230)
Controls	Y	Y	Y
Firm FE	Y	Y	Y
FOMC FE	N	N	Y
N clusters	167	167	167
Adjusted R^2	0.010	0.010	0.055
Observations	41000	41000	41000

Table A.5: Placebo test: firm-level monetary policy responses, equity ownership. The table reports coefficient estimates from a placebo test of the regression equation (1). Instead of using the FOMC date announcement date returns, it uses returns from the previous trading day. Firm-announcement date double clustered standard errors are in parentheses. Letters 'Y' (for 'Yes') and 'N' (for 'No') denote whether firm-level controls, firm and FOMC-date fixed effect are included in each regression specification. Stars next to coefficients (*, **, ***) denote significance at 10, 5, and 1% levels respectively.