# US monetary policy spillovers and the zombie lending channel

Bruno Albuquerque[1] Chenyu (Sophia) Mao[2]

[1]International Monetary Fund

[2]University of Maryland

NBB Macroeconomic Seminar

December 21, 2022

# Outline

# Outline

# US monetary policy normalization has led to tighter global financial conditions amid a growing trend in zombification

**US monetary policy drives the global financial cycle** (Bruno and Shin, 2015; Cesa-Bianchi et al., 2018; Kalemli-Özcan, 2019; Miranda-Agrippino and Rey, 2020; Gourinchas et al., 2021; Miranda-Agrippino and Nenova, 2022).

**Important spillovers to capital or financial flows via the financial system** (Obstfeld and Rogoff, 2007; Rey, 2013; Bruno and Shin, 2015; Passari and Rey, 2015; Bräuning and Ivashina, 2020; Miranda-Agrippino and Rey, 2020).

**Amplified by financial vulnerabilities** (Chen et al., 2014; Bowman et al., 2015; Dedola et al., 2017; Fratzscher et al., 2018; Ahmed et al., 2021).

# US monetary policy normalization has led to tighter global financial conditions amid a growing trend in zombification

**US monetary policy drives the global financial cycle** (Bruno and Shin, 2015; Cesa-Bianchi et al., 2018; Kalemli-Özcan, 2019; Miranda-Agrippino and Rey, 2020; Gourinchas et al., 2021; Miranda-Agrippino and Nenova, 2022).

**Important spillovers to capital or financial flows via the financial system** (Obstfeld and Rogoff, 2007; Rey, 2013; Bruno and Shin, 2015; Passari and Rey, 2015; Bräuning and Ivashina, 2020; Miranda-Agrippino and Rey, 2020).

**Amplified by financial vulnerabilities** (Chen et al., 2014; Bowman et al., 2015; Dedola et al., 2017; Fratzscher et al., 2018; Ahmed et al., 2021).

**Corporate sector vulnerabilities** amplify the international spillovers to investment following a US monetary policy shock (Li et al., 2020; Arbatli-Saxegaard et al., 2022).

# US monetary policy normalization has led to tighter global financial conditions amid a growing trend in zombification

**US monetary policy drives the global financial cycle** (Bruno and Shin, 2015; Cesa-Bianchi et al., 2018; Kalemli-Özcan, 2019; Miranda-Agrippino and Rey, 2020; Gourinchas et al., 2021; Miranda-Agrippino and Nenova, 2022).

**Important spillovers to capital or financial flows via the financial system** (Obstfeld and Rogoff, 2007; Rey, 2013; Bruno and Shin, 2015; Passari and Rey, 2015; Bräuning and Ivashina, 2020; Miranda-Agrippino and Rey, 2020).

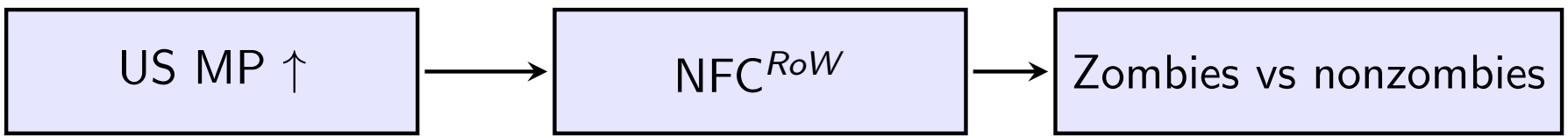
**Amplified by financial vulnerabilities** (Chen et al., 2014; Bowman et al., 2015; Dedola et al., 2017; Fratzscher et al., 2018; Ahmed et al., 2021).

**Corporate sector vulnerabilities** amplify the international spillovers to investment following a US monetary policy shock (Li et al., 2020; Arbatli-Saxegaard et al., 2022).

**Rising trend of zombies – unproductive and unviable firms** (McGowan et al., 2018; Banerjee and Hofmann, 2022; Albuquerque and Iyer, 2022). Implications of MP spillovers?

# What we do

How does the presence of zombie firms affect the international spillovers from tighter US monetary policy shocks to nonzombies firms?




**Main contribution**

Document novel zombie lending channel in the international transmission of US monetary policy.

# Preview of results

1. Zombie firms are less sensitive to US monetary policy shocks: evergreening motives.

2. **Zombie lending channel**. In industries with a greater share of zombies:
   - Intensive margin: financial performance of non-zombies is affected more
   - Extensive margin: lower firm entry rates and higher exit rates of healthy firms

3. Zombie lending channel can be mitigated with tighter macroprudential stance and more developed corporate insolvency regimes.

# Outline

# Data

**Micro data**. Non-US nonfinancial listed firms (S&P Compustat, and Capital IQ), 43 countries (17 EMEs and 26 AEs), 22,917 firms over 2000q1-2019q4 = 1,032,772 firm-quarter observations. Nfirms

**Country data.** Macro variables (national sources), iMaPP (Alam et al., 2019), insolvency regimes (Araujo et al., 2022).

**Monetary policy surprises**. HF identification from unexpected changes in 3-month ahead contracts on Fed funds futures in a 30-min window surrounding FOMC meetings (Gürkaynak et al., 2005; Gertler and Karadi, 2015). MP Shocks

**MP surprises used as instruments for the country-specific one-year government bond yield.**

# Zombie firms

Unproductive and unviable firms that manage to avoid immediate default (Caballero et al., 2008).

**Not a new phenomenon**. But its share has been increasing worldwide, preventing a necessary *creative destruction* process – congestion effects (McGowan et al., 2018; Banerjee and Hofmann, 2022; Albuquerque and Iyer, 2022).

# Zombie firms

Unproductive and unviable firms that manage to avoid immediate default (Caballero et al., 2008).

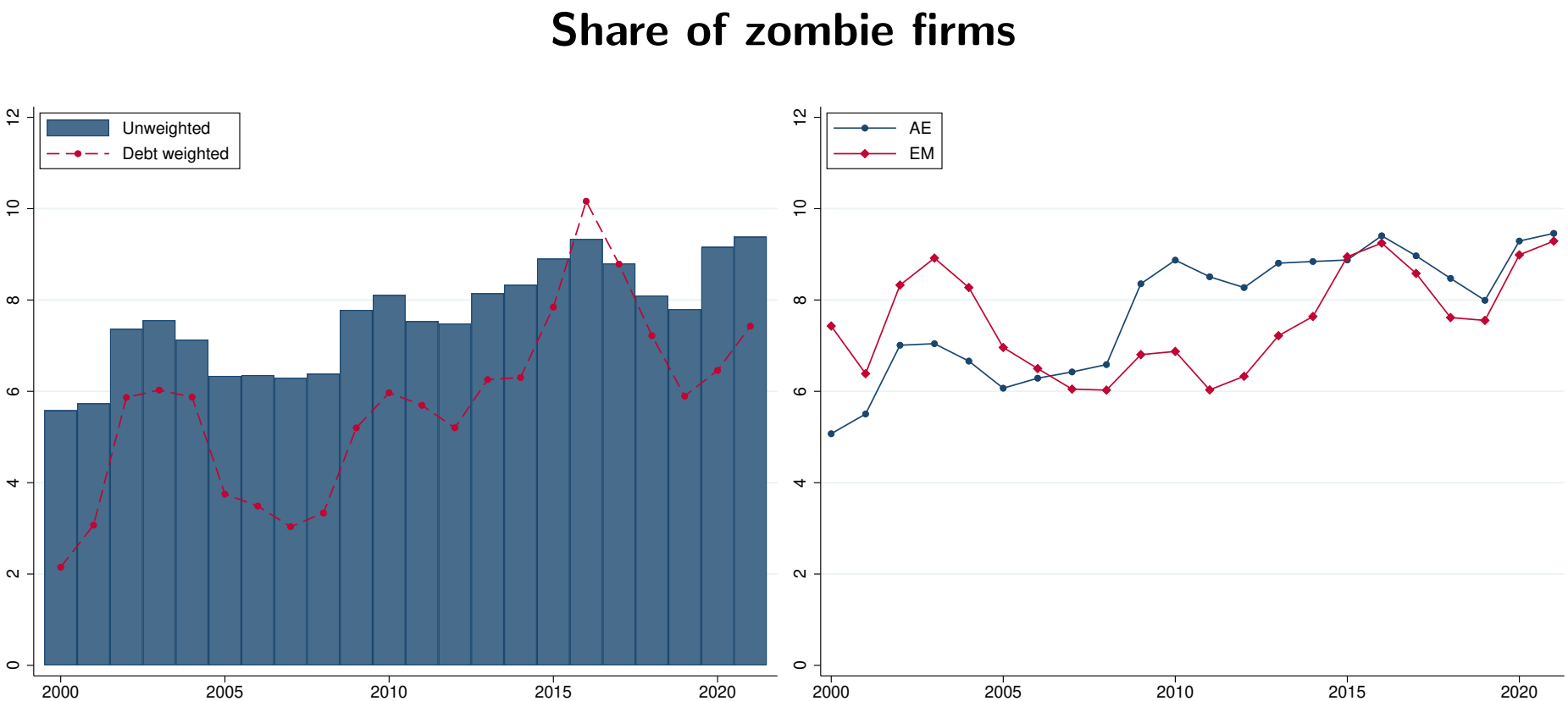
**Not a new phenomenon**. But its share has been increasing worldwide, preventing a necessary *creative destruction* process – congestion effects (McGowan et al., 2018; Banerjee and Hofmann, 2022; Albuquerque and Iyer, 2022).

Zombie firms must have for two consecutive years (Albuquerque and Iyer, 2022):

1. ICR$<1$
2. Leverage above the median sector
3. Real sales growth$<0$

To **exit zombie status**, a firm needs ICR$>1$, **or** leverage below median sector, **or** sales growth$>0$ for two consecutive years.

# Zombie firms have been rising around the world




Countries Industries Prob Alt BEL

# Zombie firms invest less and are riskier

$$Y_{i,c,n,t} = \beta \text{Zombie}_{i,c,n,t} + \zeta_{c,n,t} + \epsilon_{i,c,n,t},$$

**Panel A**

| | (1) Log K | (2) ΔK | (3) ΔIntan | (4) ΔEmp | (5) Liq.asset | (6) Debt | (7) ΔDebt | (8) Int.rate |
|---|---|---|---|---|---|---|---|---|
| Zombie | -0.570*** | -2.621*** | -3.689*** | -9.772*** | -19.052*** | 17.824*** | -2.563*** | 0.294*** |
| | (0.011) | (0.040) | (0.051) | (0.109) | (0.117) | (0.082) | (0.079) | (0.061) |
| Observations | 1,730,423 | 1,640,517 | 1,296,188 | 900,075 | 1,726,514 | 1,735,920 | 1,585,142 | 1,192,461 |
| Adjusted $R^2$ | 0.243 | 0.109 | 0.133 | 0.068 | 0.138 | 0.161 | 0.027 | 0.166 |

**Panel B**

| | (1) ΔSales | (2) TFP | (3) Log Assets | (4) ICR | (5) ROA | (6) PD | (7) Altman | (8) Loan shr |
|---|---|---|---|---|---|---|---|---|
| Zombie | -3.989*** | -0.149*** | -0.634*** | -33.992*** | -10.613*** | 0.788*** | -11.007*** | 2.178*** |
| | (0.051) | (0.004) | (0.009) | (1.007) | (0.087) | (0.011) | (0.246) | (0.132) |
| Observations | 1,311,264 | 727,941 | 1,735,905 | 1,125,474 | 1,292,834 | 1,355,147 | 1,292,026 | 1,733,620 |
| Adjusted $R^2$ | 0.118 | 0.006 | 0.247 | 0.072 | 0.134 | 0.289 | 0.064 | 0.148 |

*Notes:* All regressions include country-industry-quarter fixed effects. Standard errors in parentheses clustered by country-industry-quarter. Asterisks, *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels.

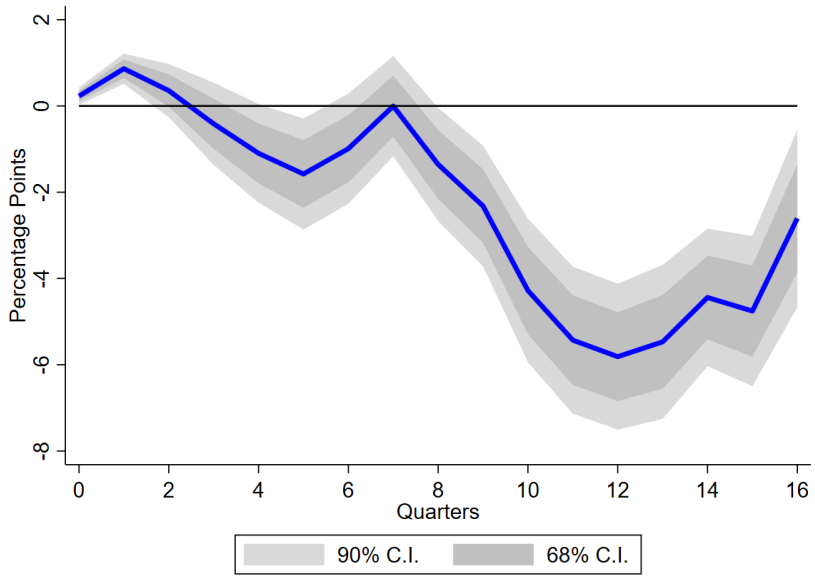
# Outline

# US corporate investment and employment decline after a contractionary MP shock

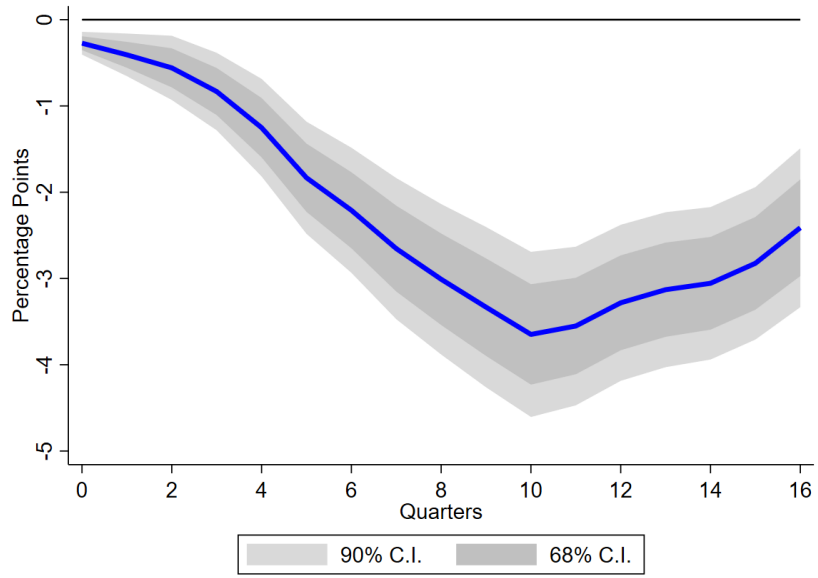
$$\Delta_h Y_{i,t+h} = \alpha_i^h + \beta^h \hat{R}_t^{US} + \Gamma_h' W_{i,t-1} + \Theta_h' X_{t-1} + e_{i,t}^h$$

# US corporate investment and employment decline after a contractionary MP shock

$$\Delta_h Y_{i,t+h} = \alpha_i^h + \beta^h \hat{R}_t^{US} + \Gamma_h' W_{i,t-1} + \Theta_h' X_{t-1} + e_{i,t}^h$$




Investment growth




Employment growth

# First stage: transmission of US MP shocks to foreign interest rates

# First stage: transmission of US MP shocks to foreign interest rates

$$R_{c,t} = \alpha_c + \delta_c Z_t + \Theta_h' X_{c,t-1} + u_{c,t}$$

- $R_{c,t}$: one-year gov. bond yield in each country
- $Z_t$: US MP surprise
- $X_{c,t-1}$: 4 lags of real GDP growth, inflation, CAB/GDP, and REER

# First stage: transmission of US MP shocks to foreign interest rates

$$R_{c,t} = \alpha_c + \delta_c Z_t + \Theta_h' X_{c,t-1} + u_{c,t}$$

- $R_{c,t}$: one-year gov. bond yield in each country
- $Z_t$: US MP surprise
- $X_{c,t-1}$: 4 lags of real GDP growth, inflation, CAB/GDP, and REER

**Sensitivity instrument** (Guren et al., 2021):

$$\hat{R}_{c,t} = \hat{\delta}_c Z_t$$

**Identifying Assumption:** Conditional on $X_{c,t-1}$, there are no aggregate factors that are both correlated with US MP shocks in the time series and that differentially affect firm outcomes in the same countries that tend to be more sensitive to US monetary policy.

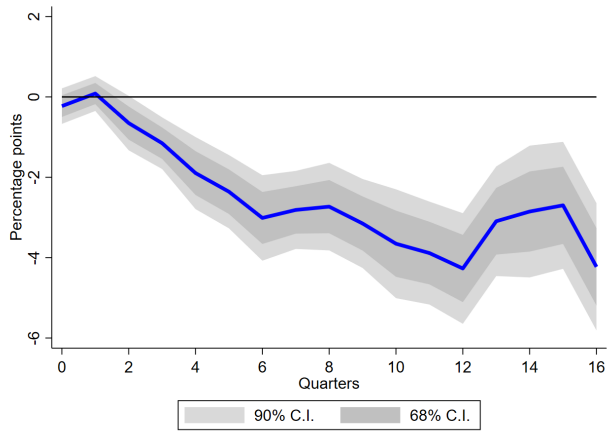
Pooled regression Sensitivity

# US monetary policy has important negative spillovers to firms in the rest of the world...

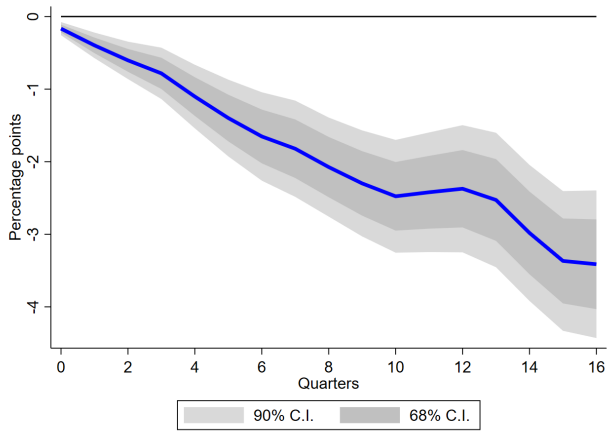
$$\Delta_h Y_{i,t+h} = \alpha_i^h + \beta^h \hat{R}_{c,t} + \Gamma_h' W_{i,t-1} + \Theta_h' X_{c,t-1} + e_{i,t}^h$$

# US monetary policy has important negative spillovers to firms in the rest of the world...

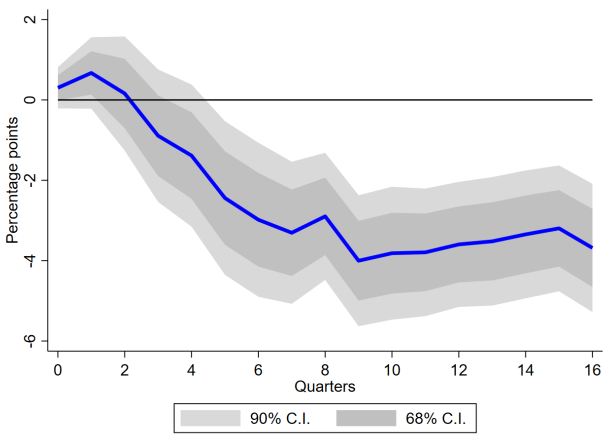
$$\Delta_h Y_{i,t+h} = \alpha_i^h + \beta^h \hat{R}_{c,t} + \Gamma_h' W_{i,t-1} + \Theta_h' X_{c,t-1} + e_{i,t}^h$$



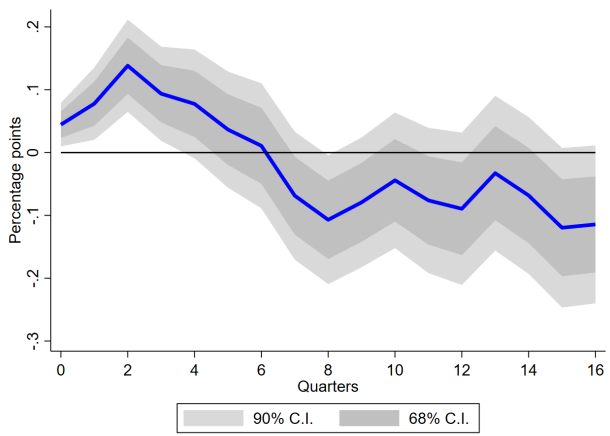

(e) Investment growth




(f) Employment growth




(g) Debt growth




(h) Interest rate change

# ... but ambiguous effect on zombie firms' financial performance

Zombie firms' response to US monetary policy tightening relative to nonzombies:

- **stronger**
  - **Risk-taking and bank lending channels**: lenders prioritize lending to higher NPV projects. Firms more bank-dependent have less flexibility to cushion shocks (Becker and Ivashina, 2014; Ippolito et al., 2018)

# ... but ambiguous effect on zombie firms' financial performance

Zombie firms' response to US monetary policy tightening relative to nonzombies:

- **stronger**
  - **Risk-taking and bank lending channels**: lenders prioritize lending to higher NPV projects. Firms more bank-dependent have less flexibility to cushion shocks (Becker and Ivashina, 2014; Ippolito et al., 2018)

- **weaker**
  - **Evergreening motives**: $\uparrow$ interest rates increase zombies' probability of filing for bankruptcy $\Longrightarrow$ **incentive for banks to evergreen zombies to avoid the realization of losses**.

# ... but ambiguous effect on zombie firms' financial performance

Zombie firms' response to US monetary policy tightening relative to nonzombies:

- **stronger**
  - **Risk-taking and bank lending channels**: lenders prioritize lending to higher NPV projects. Firms more bank-dependent have less flexibility to cushion shocks (Becker and Ivashina, 2014; Ippolito et al., 2018)

- **weaker**
  - **Evergreening motives**: $\uparrow$ interest rates increase zombies' probability of filing for bankruptcy $\Longrightarrow$ **incentive for banks to evergreen zombies to avoid the realization of losses**.

The overall effect remains an empirical question.

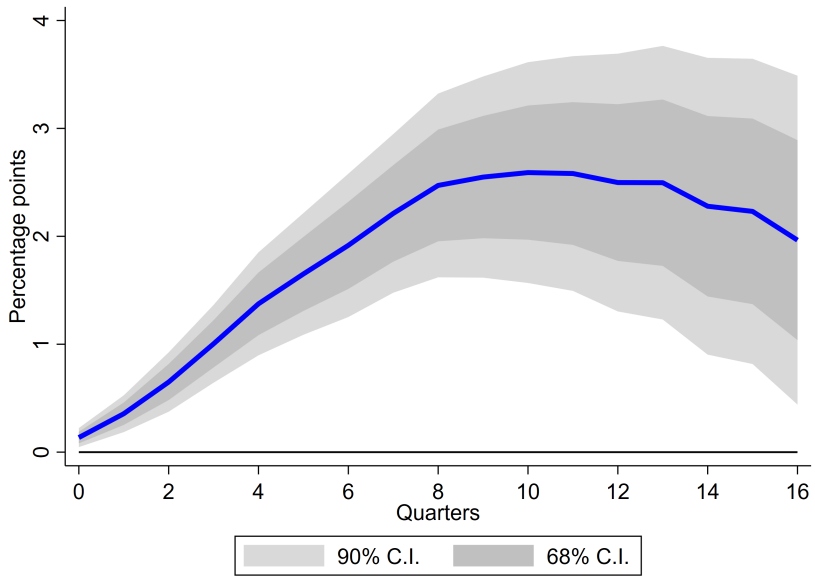
# Zombie firms respond less to monetary policy shocks

$$\Delta_h Y_{i,t+h} = \alpha_i^h + \alpha_{c,s,t}^h + \beta^h \hat{R}_{c,t} \times \text{Zom}_{i,t-1} + \Gamma_h' W_{i,t-1} + e_{i,t}$$

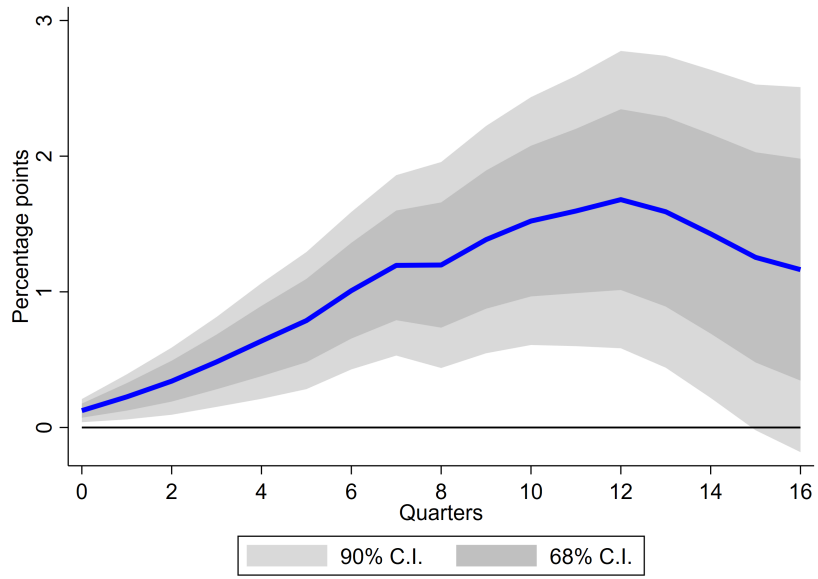
# Zombie firms respond less to monetary policy shocks

$$\Delta_h Y_{i,t+h} = \alpha_i^h + \alpha_{c,s,t}^h + \beta^h \hat{R}_{c,t} \times \text{Zom}_{i,t-1} + \Gamma_h' W_{i,t-1} + e_{i,t}$$

**Differential response of zombie firms relative to nonzombies**



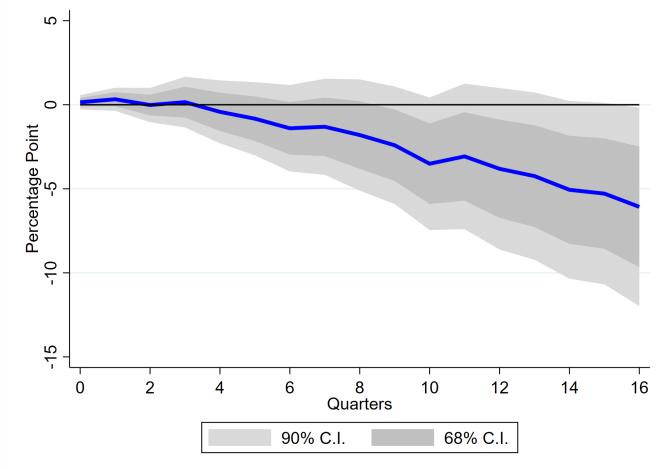

Investment growth



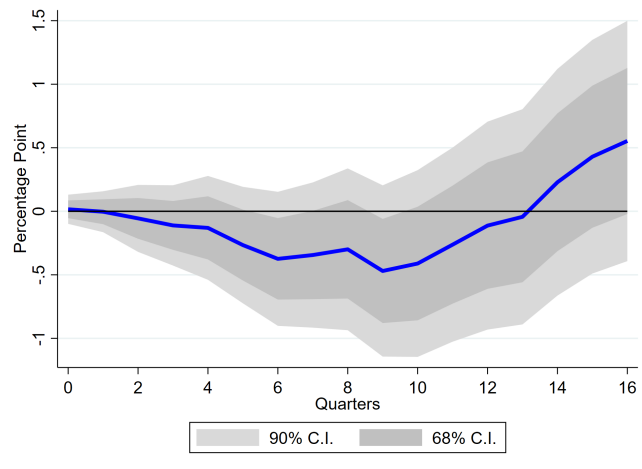

Employment growth

BS 2022 Region

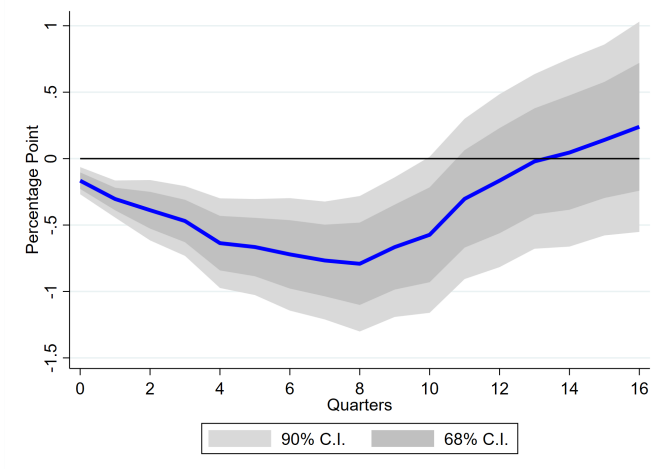
# Zombies' reaction is different from traditional metrics of financial constraints...



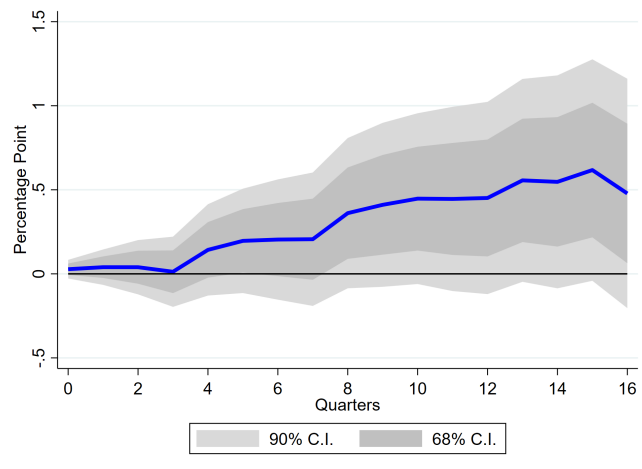

(i) Small - Large




(j) Young - Old



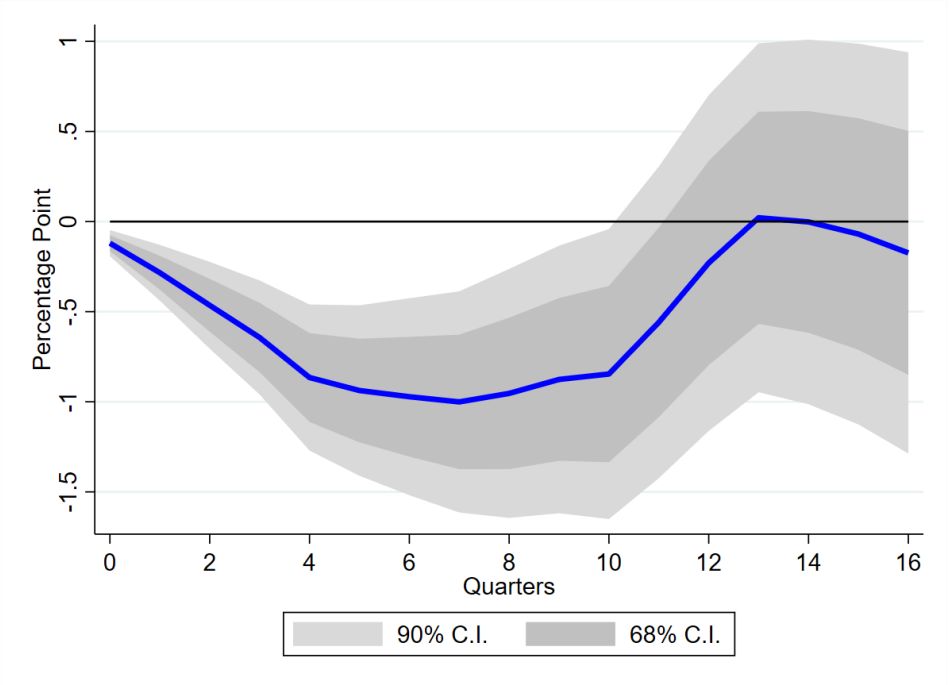

(k) High - Low PD




(l) High - Low Leverage

# ... and from distressed nonzombies

$$\Delta_h Y_{i,t+h} = \alpha_i^h + \alpha_{c,s,t}^h + \beta^h \hat{R}_{c,t} \times \text{Distress}_{i,t-1} + \Gamma_h' W_{i,t-1} + e_{i,t}$$




Investment growth

# Outline

# Firms

A static model with two periods $t = 0, 1$ and two types of agents (Faria-e-Castro et al., 2022):

- Firms $(b, z)$: pre-existing loans $b$ and productivity $z$
- Lenders $a$: risk-neutral with deep pockets, endowed with capital $a$

**Firm's problem**

$$\begin{aligned} V(z, b; Q) \quad &= \quad \max_{b', k' \geq 0} -b - k' + Qb' + \beta^f [z(k')^\alpha - b'] \\ &s.t. \quad b' \leq \theta k' \end{aligned}$$

# Firms

A static model with two periods $t = 0, 1$ and two types of agents (Faria-e-Castro et al., 2022):

- Firms $(b, z)$: pre-existing loans $b$ and productivity $z$
- Lenders $a$: risk-neutral with deep pockets, endowed with capital $a$

**Firm's problem**

$$\begin{aligned} V(z, b; Q) \quad &= \quad \max_{b', k' \geq 0} -b - k' + Qb' + \beta^f [z(k')^\alpha - b'] \\ &s.t. \quad b' \leq \theta k' \end{aligned}$$

There exists a $Q^{min}(z, b)$ such that the firm defaults iff $Q < Q^{min}(z, b)$. The threshold is given by:

$$Q^{min}(z, b) = \beta^f + \frac{1}{\theta} - \frac{(\beta^f \alpha z)^{1/\alpha}}{\theta} \{\frac{1-\alpha}{\alpha b}\}^{\frac{1-\alpha}{\alpha}}$$

The threshold is increasing in b and decreasing in z.

# Lenders

**Lender's problem (Relationship Lending)**

$$W(z,b,a) = \max_{Q \geq \beta^k} \mathbb{1}[V(z,b;Q) \geq 0] \times [u(a+b) - Qb'(z;Q) + \beta^k b'(z;Q) - u(a)]$$

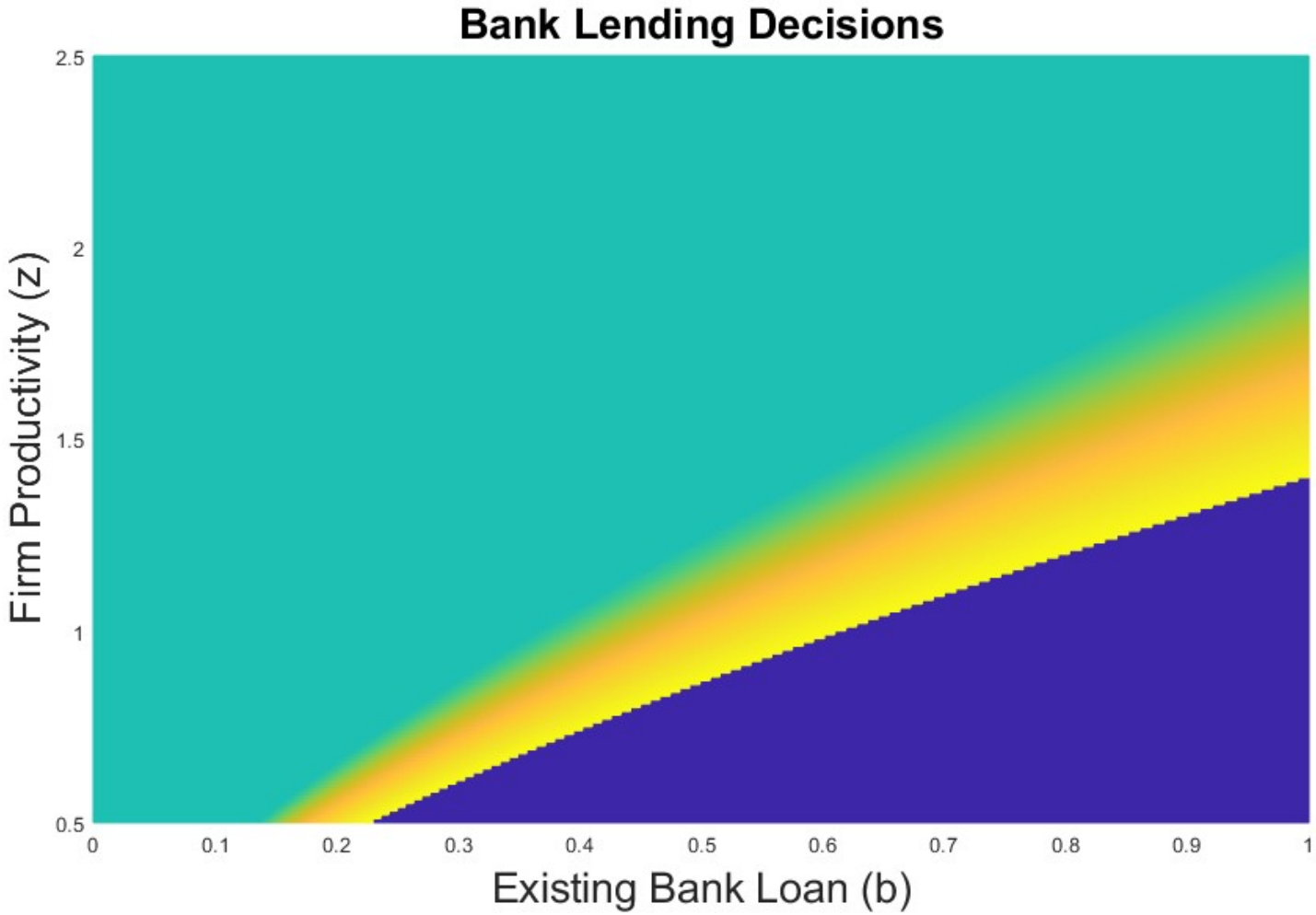
We can implicitly solve for $Q^{max}(z,b,a)$, which is the maximum Q at which the bank is willing to lend:

$$Q^{max}(z,b,a) : W(z,b,a;Q^{max}) = 0$$

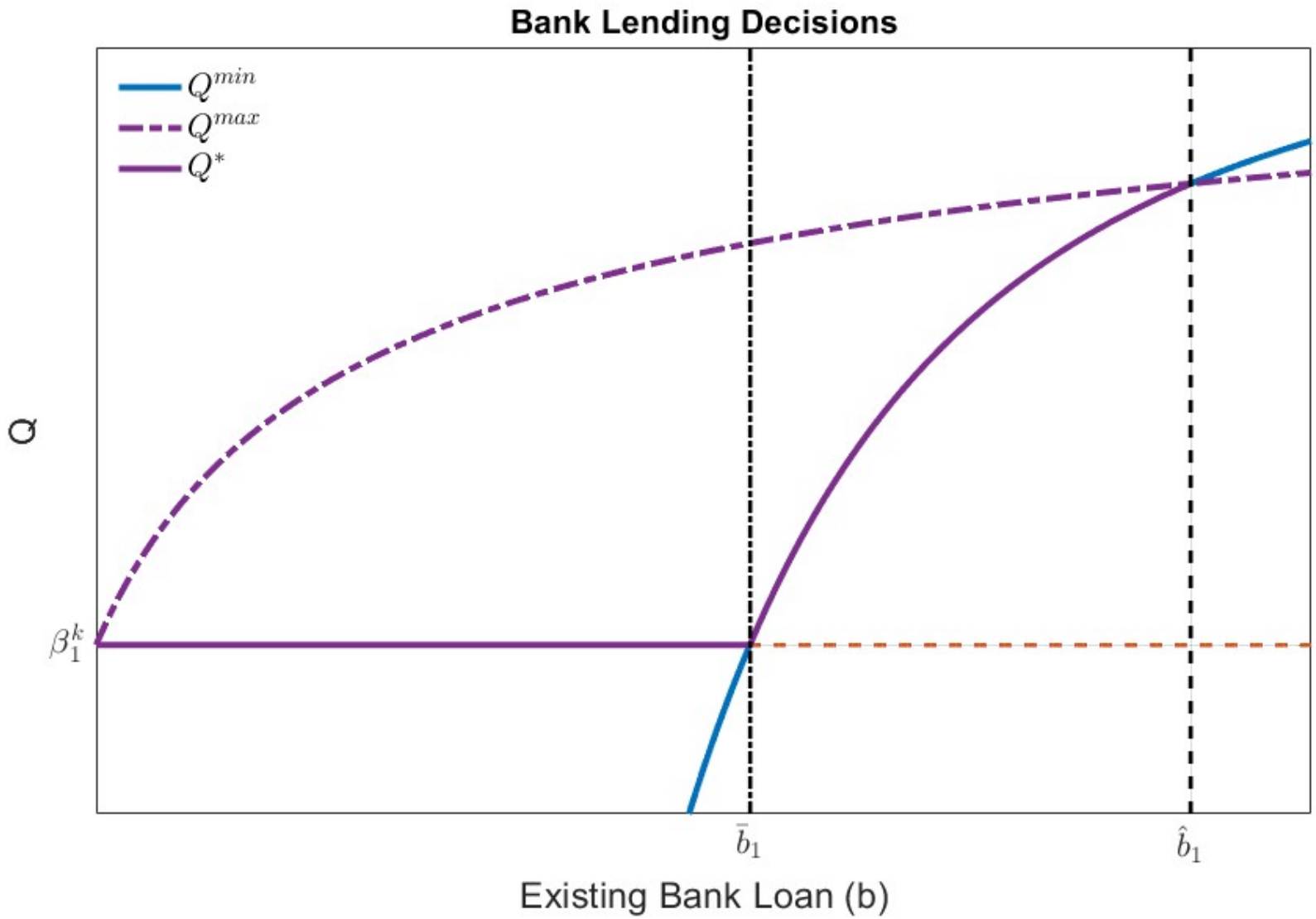
The bank's optimal policy can be written as:

$$Q^*(b,z,a) = \begin{cases} \beta^k & \text{if} \quad Q^{min}(z,b) \leq \beta^k \leq Q^{max}(z,b,a) \\ Q^{min}(z,b) & \text{if} \quad \beta^k \leq Q^{min}(z,b) \leq Q^{max}(z,b,a) \\ 0 & \text{otherwise} \end{cases}$$

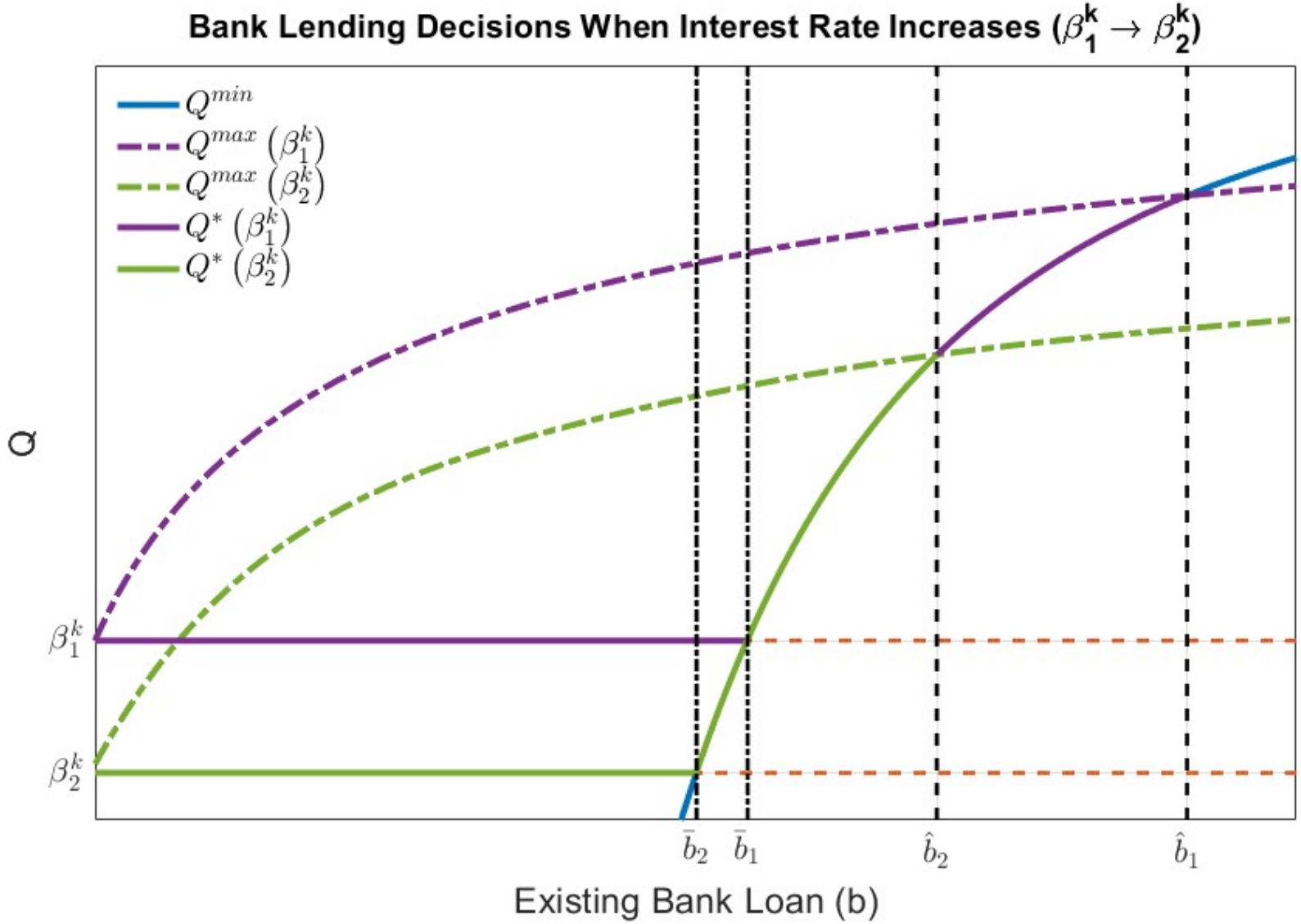
# Lenders take firms' leverage and productivity in their lending decisions



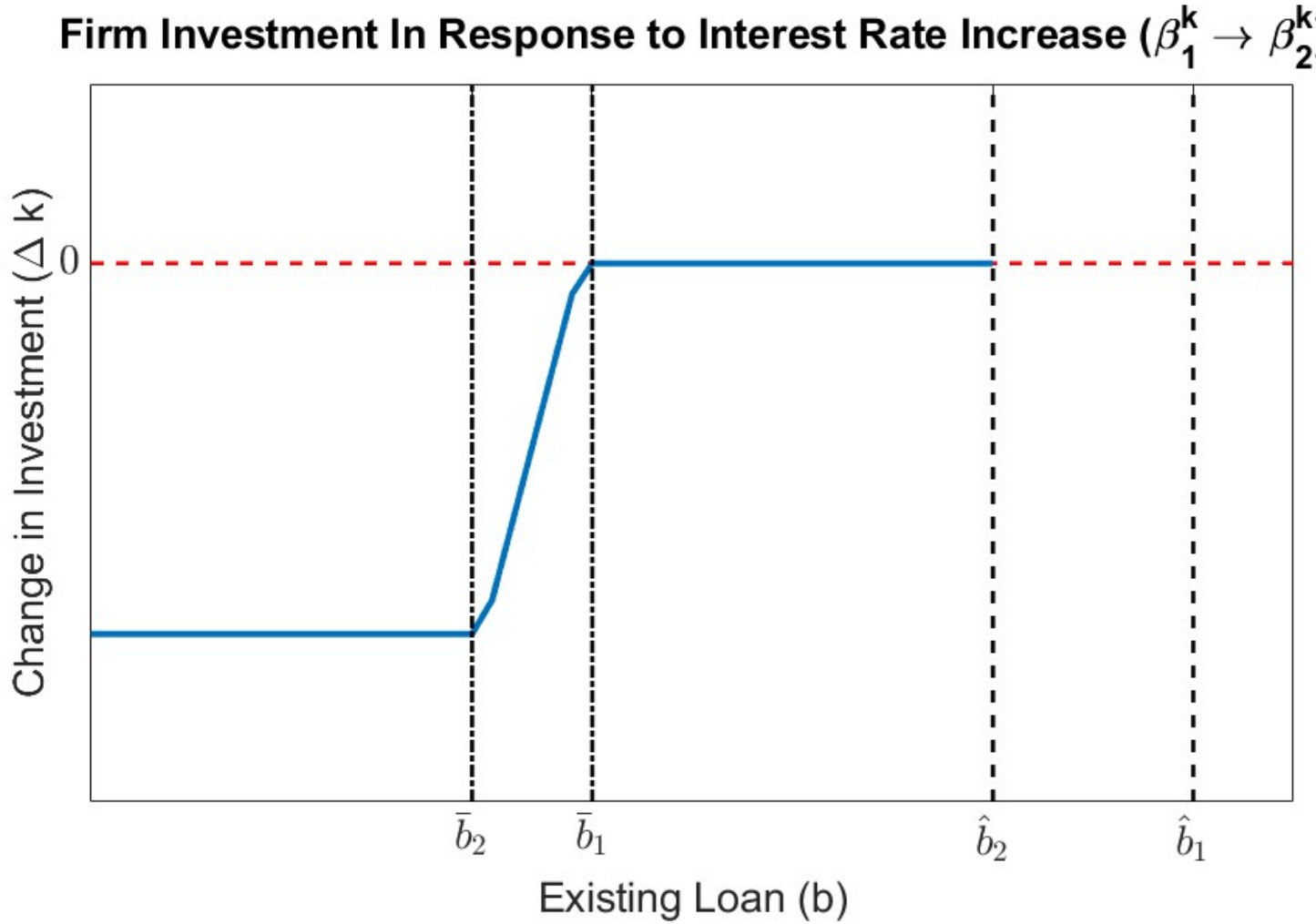
# Lenders have incentives to evergreen firms closer to default



Zombie firms enjoy relatively more favorable credit conditions when interest rates increase...



# ... and thus decrease their investment less than other firms



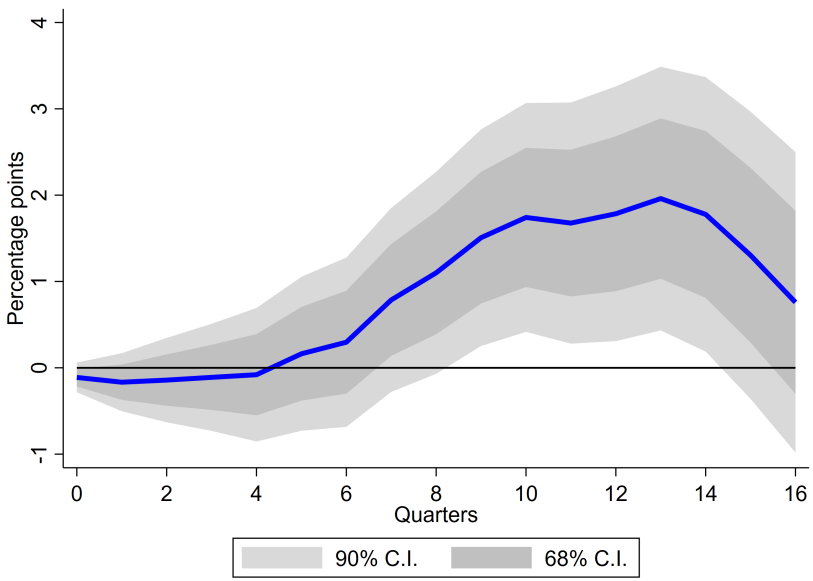
# Model predictions

1. When interest rates ↑, banks tend to offer better credit conditions to zombie firms.
2. Evergreening allows zombie firms to cut investment less, at the expense of healthy firms.
3. Stronger banks – induced by tighter macroprudential policies – face less incentives to evergreen zombies' loans. Preliminary results

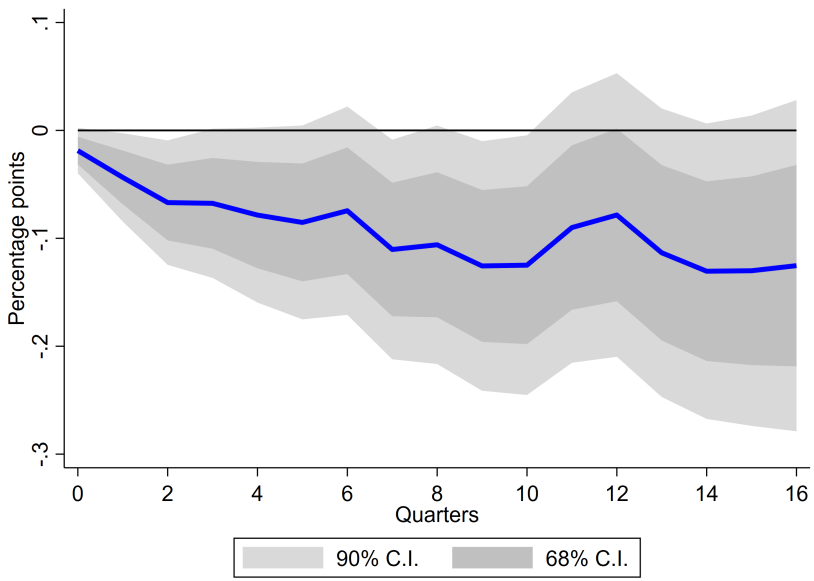
# Stronger evergreening incentives when interest rates ↑: banks offer more favorable credit conditions to zombie firms to prevent defaults

$$\Delta_h Y_{i,t+h} = \alpha_i^h + \alpha_{c,s,t}^h + \beta^h \hat{R}_{c,t} \times \text{Zom}_{i,t-1} + \Gamma_h' W_{i,t-1} + e_{i,t}$$

**Differential response of zombie firms relative to nonzombies**




Debt growth



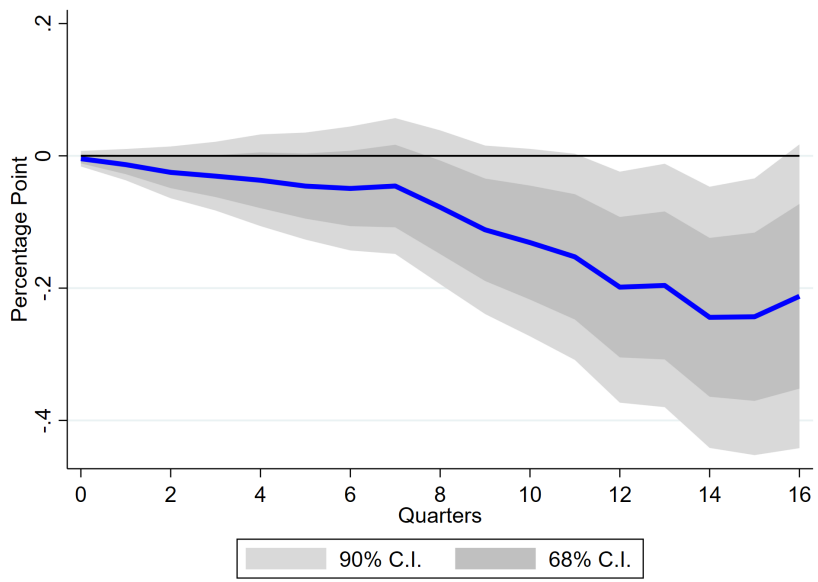

Interest rate change

# Outline

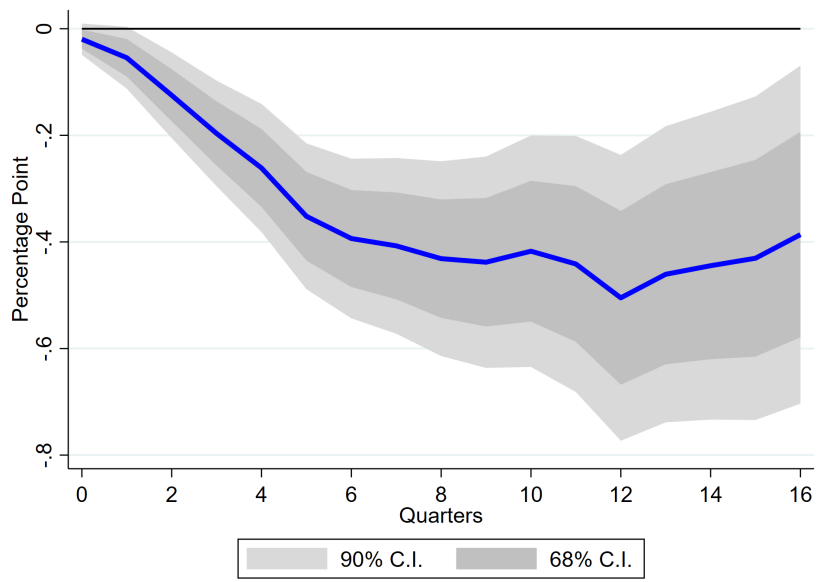
# Higher share of zombie firms affect nonzombies firms' performance through the intensive margin...

$$\Delta_h Y_{i,t+h} = \alpha_i^h + +\alpha_{c,t}^h + \alpha_{s,t}^h + \beta^h \hat{R}_{c,t} \times \text{ZShare}_{c,s,t-1} + ... + e_{i,t}$$

**Differential response of nonzombies in industries with a higher zombie share**




Investment growth



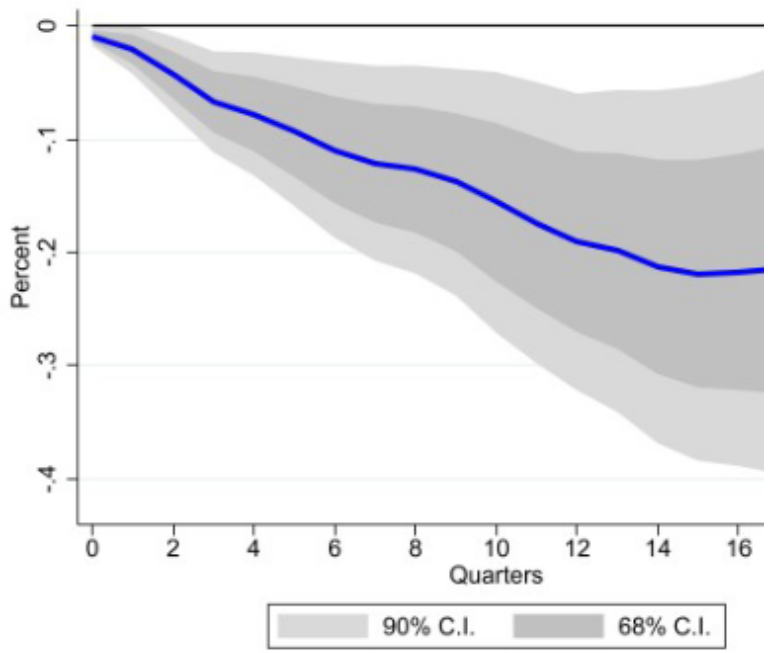

Debt growth

# ... but also constrain industries' creative destruction process (extensive margin)

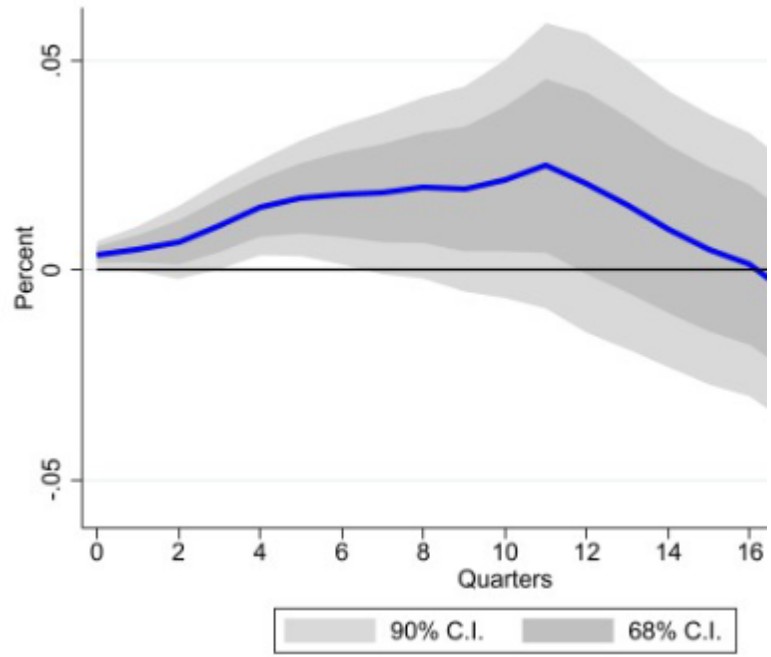
**Industry-level regression:**

$$N_{c,s,t+h} = \alpha_t^h + \alpha_{c,s}^h + \beta^h \hat{R}_{c,t} \times \text{ZShare}_{c,s,t-1} + ... + e_{c,s,t+h}$$

**Differential response of industries with a 1 p.p. higher zombie share**




Firm entry rates



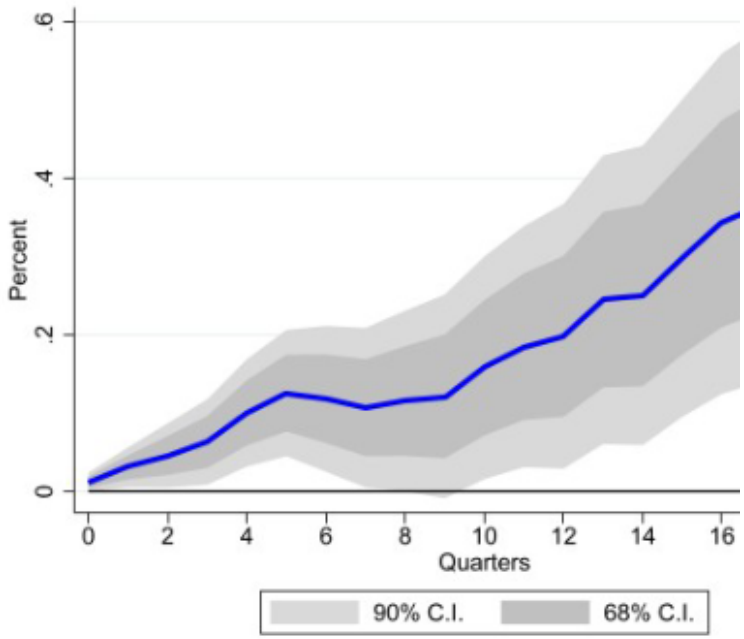

Nonzombies firms' exit rates

# Outline

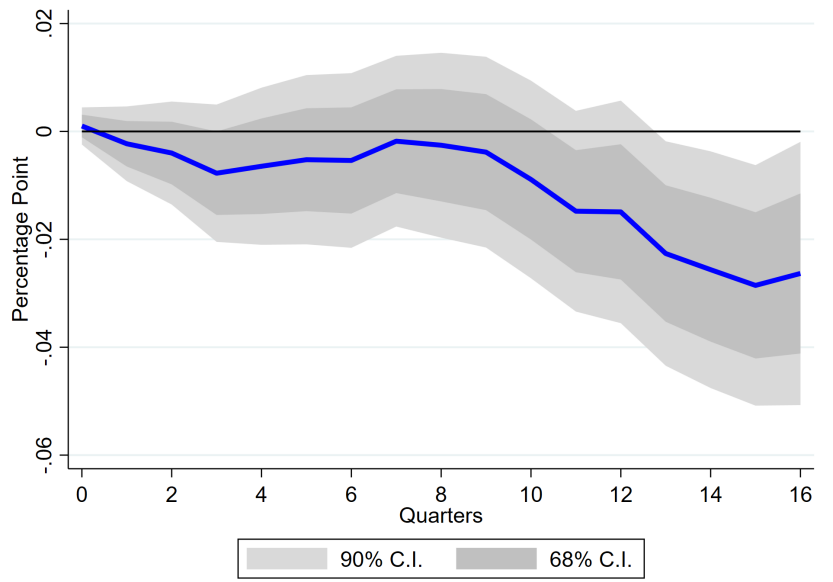
# Zombie lending channel can be mitigated by tighter macroprudential measures that restrict loan supply...

$$\Delta_h Y_{i,t+h} = \alpha_i^h + \alpha_{c,t}^h + \alpha_{s,t}^h + \eta^h \hat{R}_{c,t} \times \text{ZShare}_{c,s,t-1} \times \text{LoanSupply}_{c,t-1} + ... + e_{i,t}$$

**Differential response of nonzombies in countries with loan supply policies above the median**




Investment growth



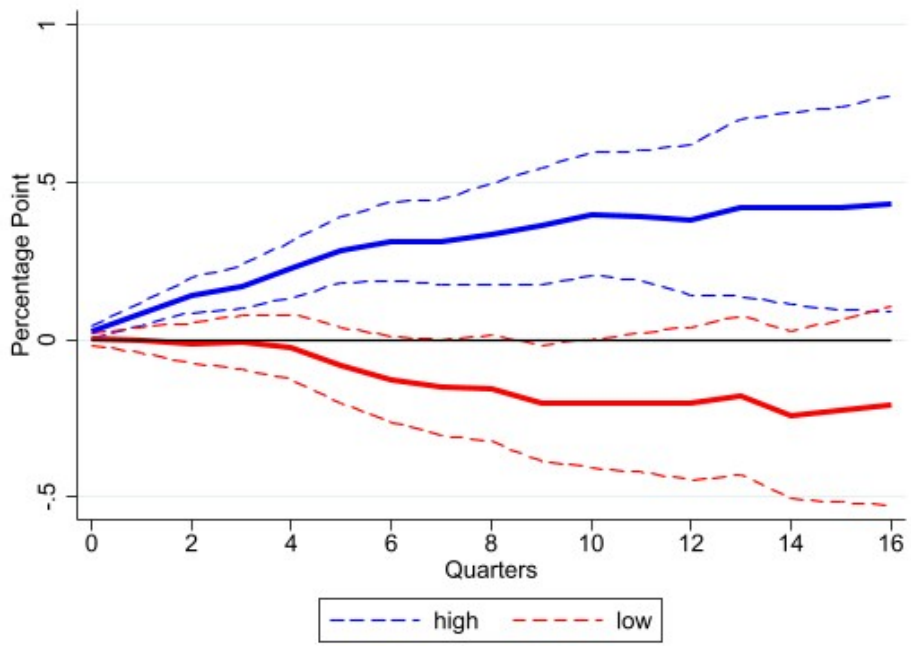

Interest rate change

Note: loan supply policies include limits to credit growth (LCG), loan loss provisions (LLP), loan restrictions (LoanR), limits to the loan-to-deposit ratio, and limits to foreign currency loans.

# ... but effects stronger in jurisdictions with well-developed insolvency regimes

$$\Delta_h Y_{i,t+h} = \alpha_i^h + \alpha_{c,t}^h + \alpha_{s,t}^h + \eta^h \hat{R}_{c,t} \times \text{ZShare}_{c,s,t-1} \times \text{LoanSupply}_{c,t-1} + ... + e_{i,t}$$

**Differential response of nonzombies' investment in countries with loan supply policies above the median for well- vs less-developed insolvency regimes**




Note: High (low) insolvency regimes are based on values above (below) the median of the crisis preparedness indicator of insolvency systems from Araujo et al. (2022).

# Main findings

1. Lenders' evergreening motives benefit zombies relative to other firms when US monetary policy shocks hit $\Rightarrow$ zombie lending channel

2. Trade-off between short-term gain and long-term pain in a world of rising interest rates: lower insolvencies in the short term, but delays a necessary creative destruction process.

3. Zombie lending channel can be mitigated with macroprudential policies that restrict loan supply, and more developed corporate insolvency regimes.

# Appendix

# References I


Acharya, V. V., Eisert, T., Eufinger, C., and Hirsch, C. (2019). Whatever It Takes: The Real Effects of Unconventional Monetary Policy. *Review of Financial Studies*, 32(9):3366–3411.

Ahmed, S., Akinci, O., and Queraltó, A. (2021). U.S. Monetary Policy Spillovers to Emerging Markets: Both Shocks and Vulnerabilities Matter. International Finance Discussion Papers 1321, Board of Governors of the Federal Reserve System (U.S.).

Alam, Z., Alter, A., Eiseman, J., Gelos, G., Kang, H., Narita, M., Nier, E., and Wang, N. (2019). Digging deeper—evidence on the effects of macroprudential policies from a new database.

Albuquerque, B. and Iyer, R. (2022). The rise of the walking dead: listed and private zombie firms around the world. Mimeo.

Altman, E. I., Dai, R., and Wang, W. (2022). Global zombies. Available at https://ssrn.com/abstract=3970332, SSRN.

Araujo, J. D., Garrido, J., Kopp, E., Varghese, R., and Yao, W. (2022). Policy Options for Supporting and Restructuring Firms Hit by the COVID-19 Crisis. Departmental Paper 2022/002, International Monetary Fund.

Arbatli-Saxegaard, E., Firat, M., Furceri, D., and Verrier, J. (2022). U.S. Monetary Policy Shock Spillovers: Evidence from Firm-Level Data. IMF Working Papers 2022/191, International Monetary Fund.

Banerjee, R. N. and Hofmann, B. (2022). Corporate zombies: anatomy and life cycle. *Economic Policy*, (forthcoming).

Bauer, M. D. and Swanson, E. T. (2022). A Reassessment of Monetary Policy Surprises and High-Frequency Identification. In *NBER Macroeconomics Annual 2022, volume 37*, NBER Chapters. National Bureau of Economic Research, Inc.

Becker, B. and Ivashina, V. (2014). Cyclicality of credit supply: Firm level evidence. *Journal of Monetary Economics*, 62(C):76–93.

# References II


Bowman, D., Londono, J. M., and Sapriza, H. (2015). U.S. unconventional monetary policy and transmission to emerging market economies. *Journal of International Money and Finance*, 55:27–59.

Bräuning, F. and Ivashina, V. (2020). U.S. monetary policy and emerging market credit cycles. *Journal of Monetary Economics*, 112:57–76.

Bruno, V. and Shin, H. S. (2015). Capital flows and the risk-taking channel of monetary policy. *Journal of Monetary Economics*, 71:119–132.

Caballero, R. J., Hoshi, T., and Kashyap, A. K. (2008). Zombie Lending and Depressed Restructuring in Japan. *American Economic Review*, 98(5):1943–77.

Cesa-Bianchi, A., Ferrero, A., and Rebucci, A. (2018). International credit supply shocks. *Journal of International Economics*, 112:219–237.

Chen, J., Griffoli, T. M., and Sahay, R. (2014). Spillovers from United States Monetary Policy on Emerging Markets: Different This Time? IMF Working Papers 2014/240, International Monetary Fund.

Dedola, L., Rivolta, G., and Stracca, L. (2017). If the Fed sneezes, who catches a cold? *Journal of International Economics*, 108:S23–S41.

Faria-e-Castro, M., Paul, P., and Sanchez, J. M. (2022). Evergreening. Working Papers 2022-024, Federal Reserve Bank of St. Louis.

Fratzscher, M., Lo Duca, M., and Straub, R. (2018). On the International Spillovers of US Quantitative Easing. *The Economic Journal*, 128(608):330–377.

Gertler, M. and Karadi, P. (2015). Monetary Policy Surprises, Credit Costs, and Economic Activity. *American Economic Journal: Macroeconomics*, 7(1):44–76.

Gourinchas, P.-O., Kalemli-Özcan, S., Penciakova, V., and Sander, N. (2021). Fiscal Policy in the Age of COVID: Does it 'Get in all of the Cracks?'. *Jackson Hole Symposium Proceedings*, pages 77–180.

Guren, A. M., McKay, A., Nakamura, E., and Steinsson, J. (2021). Housing Wealth Effects: The Long View. *The Review of Economic Studies*, 88(2):669–707.

# References III


Gürkaynak, R. S., Sack, B., and Swanson, E. (2005). Do Actions Speak Louder Than Words? The Response of Asset Prices to Monetary Policy Actions and Statements. *International Journal of Central Banking*, 1(1):55–93.

Ippolito, F., Ozdagli, A. K., and Perez-Orive, A. (2018). The transmission of monetary policy through bank lending: The floating rate channel. *Journal of Monetary Economics*, 95:49–71.

Kalemli-Özcan, S. (2019). U.S. Monetary Policy and International Risk Spillovers. *Jackson Hole Symposium Proceedings*, pages 95–191.

Li, D., Magud, N. E., and Valencia, F. (2020). Financial Shocks and Corporate Investment in Emerging Markets. *Journal of Money, Credit and Banking*, 52(2-3):613–644.

McGowan, M. A., Andrews, D., and Millot, V. (2018). The walking dead? Zombie firms and productivity performance in OECD countries. *Economic Policy*, 33(96):685–736.

Miranda-Agrippino, S. and Nenova, T. (2022). A tale of two global monetary policies. *Journal of International Economics*, 136:103606.

Miranda-Agrippino, S. and Rey, H. (2020). U.S. Monetary Policy and the Global Financial Cycle. *The Review of Economic Studies*, 87(6):2754–2776.

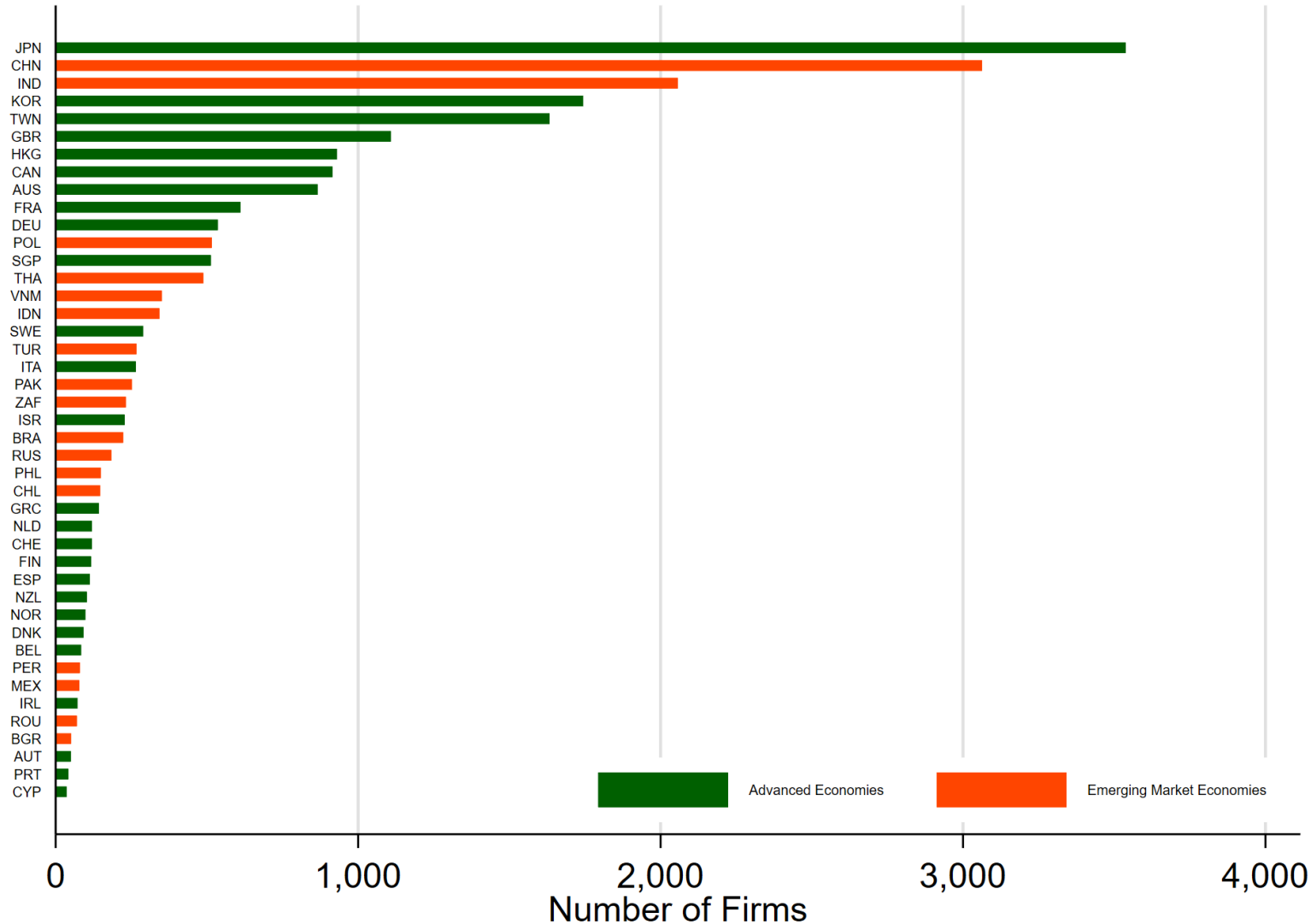
Obstfeld, M. and Rogoff, K. (2007). The Unsustainable US Current Account Position Revisited. In *G7 Current Account Imbalances: Sustainability and Adjustment*, NBER Chapters, pages 339–375. National Bureau of Economic Research, Inc.

Passari, E. and Rey, H. (2015). Financial Flows and the International Monetary System. *The Economic Journal*, 125(584):675–698.

Rey, H. (2013). Dilemma not trilemma: the global cycle and monetary policy independence. *Proceedings - Economic Policy Symposium - Jackson Hole*.

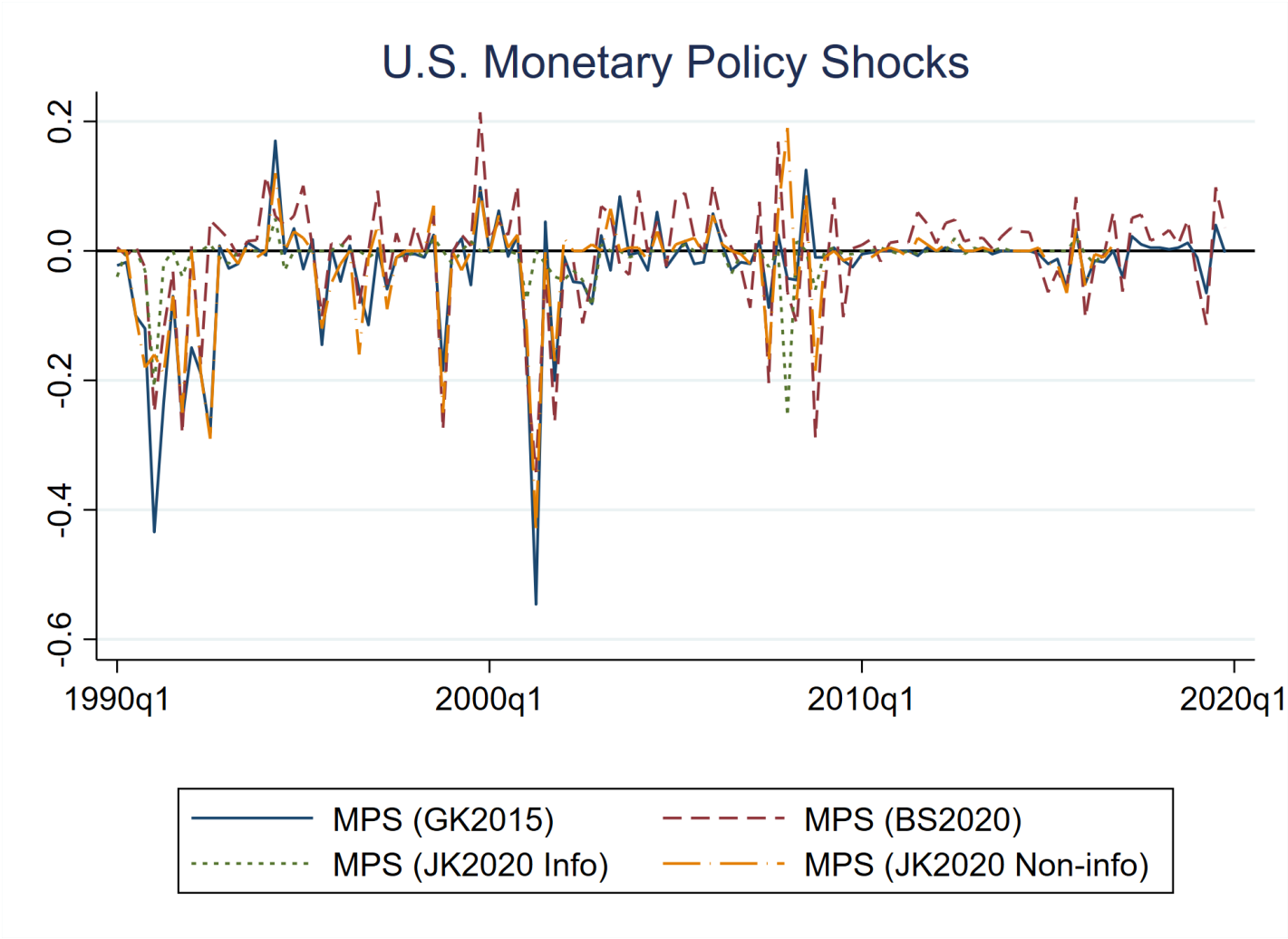
Storz, M., Koetter, M., Setzer, R., and Westphal, A. (2017). Do we want these two to tango? On zombie firms and stressed banks in Europe. Working Paper Series 2104, European Central Bank.

# Number of firms: AEs vs EMEs



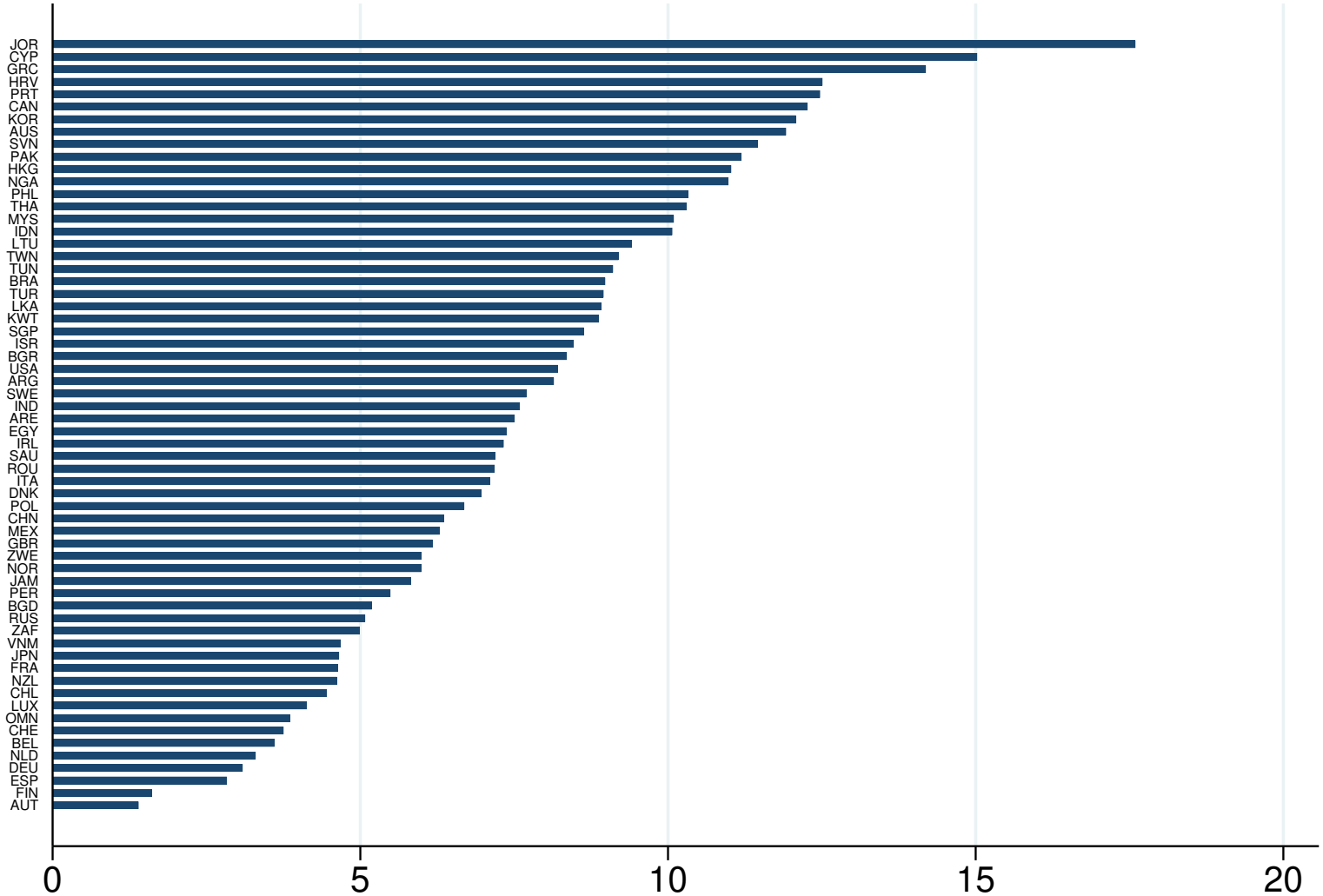

Back

# US Monetary Policy Shocks



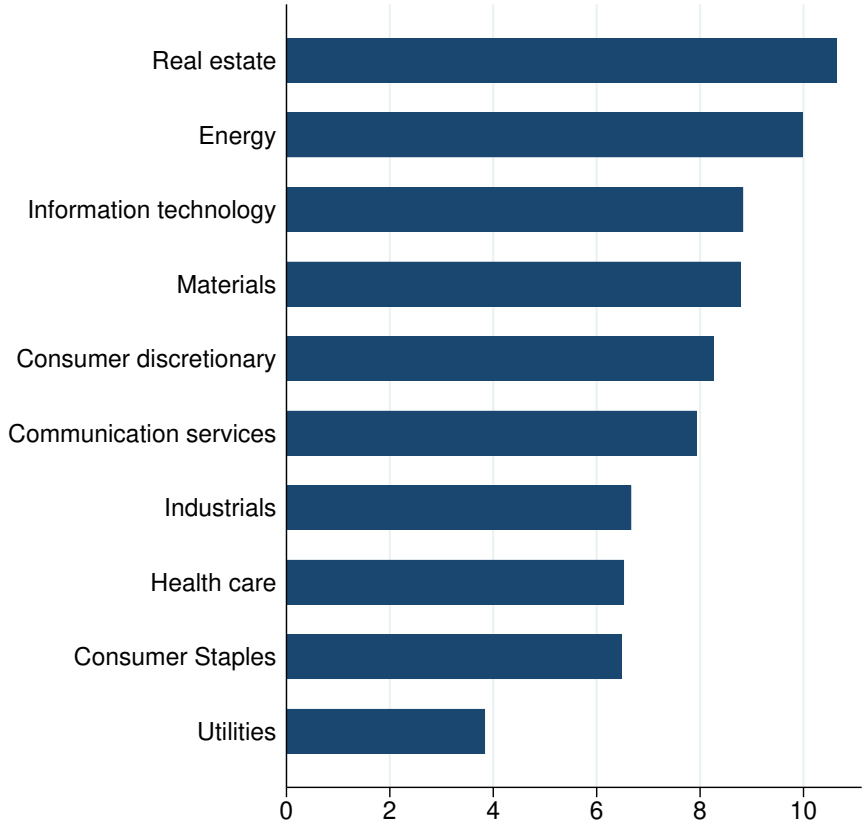

◂ Back

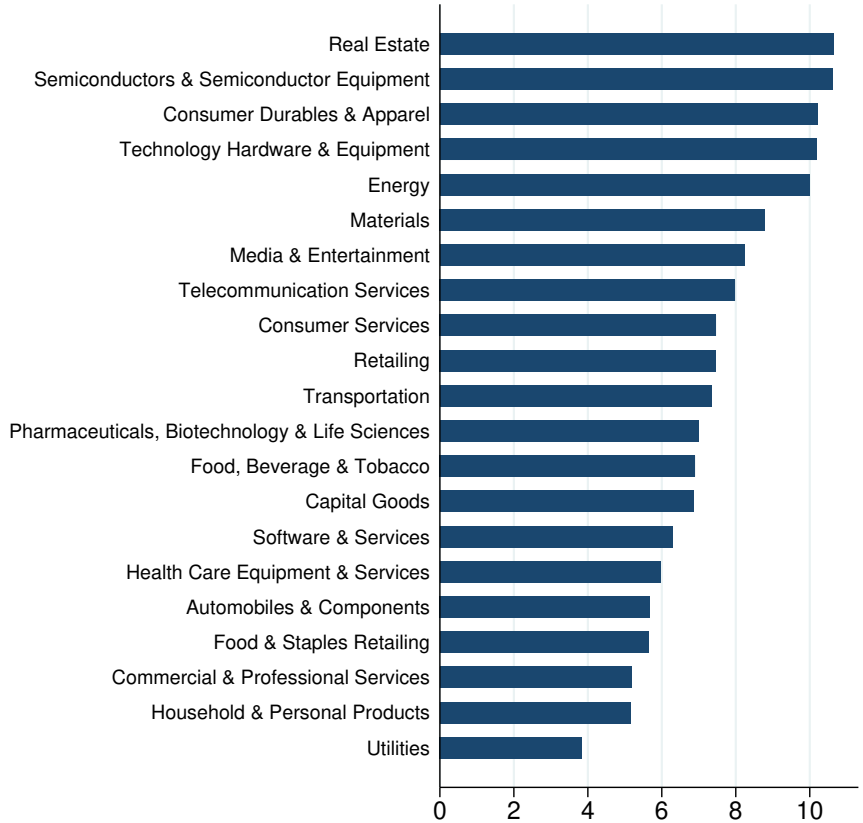
# Average share of zombie firms by country




Back

# Average share of zombie firms by industry



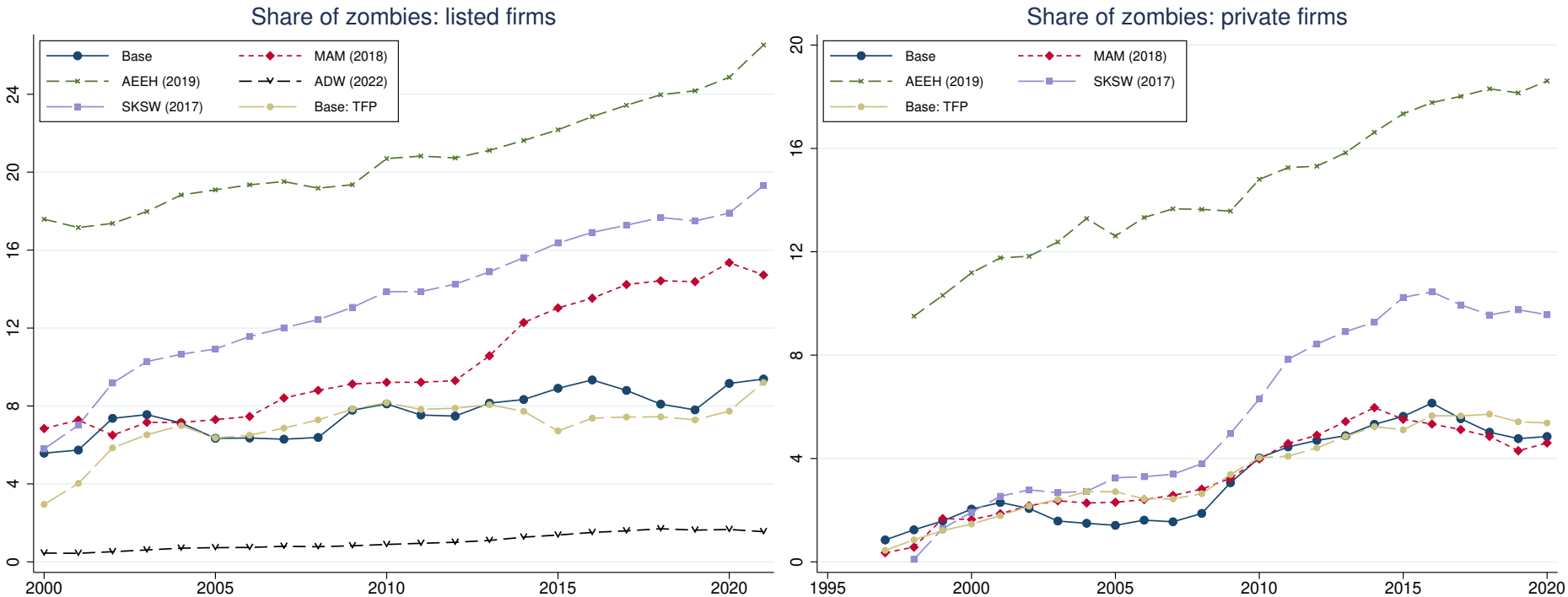

◂ Back

# Zombie status is persistent and the mean duration has increased over time


*Notes:* The probability on the left panel is computed as the number of zombie firms that remain zombies in *t+1* divided by number of zombie firms in *t*. Duration of zombie status on the right panel takes the mean of the number of years a firm remains zombie.

◂ Back

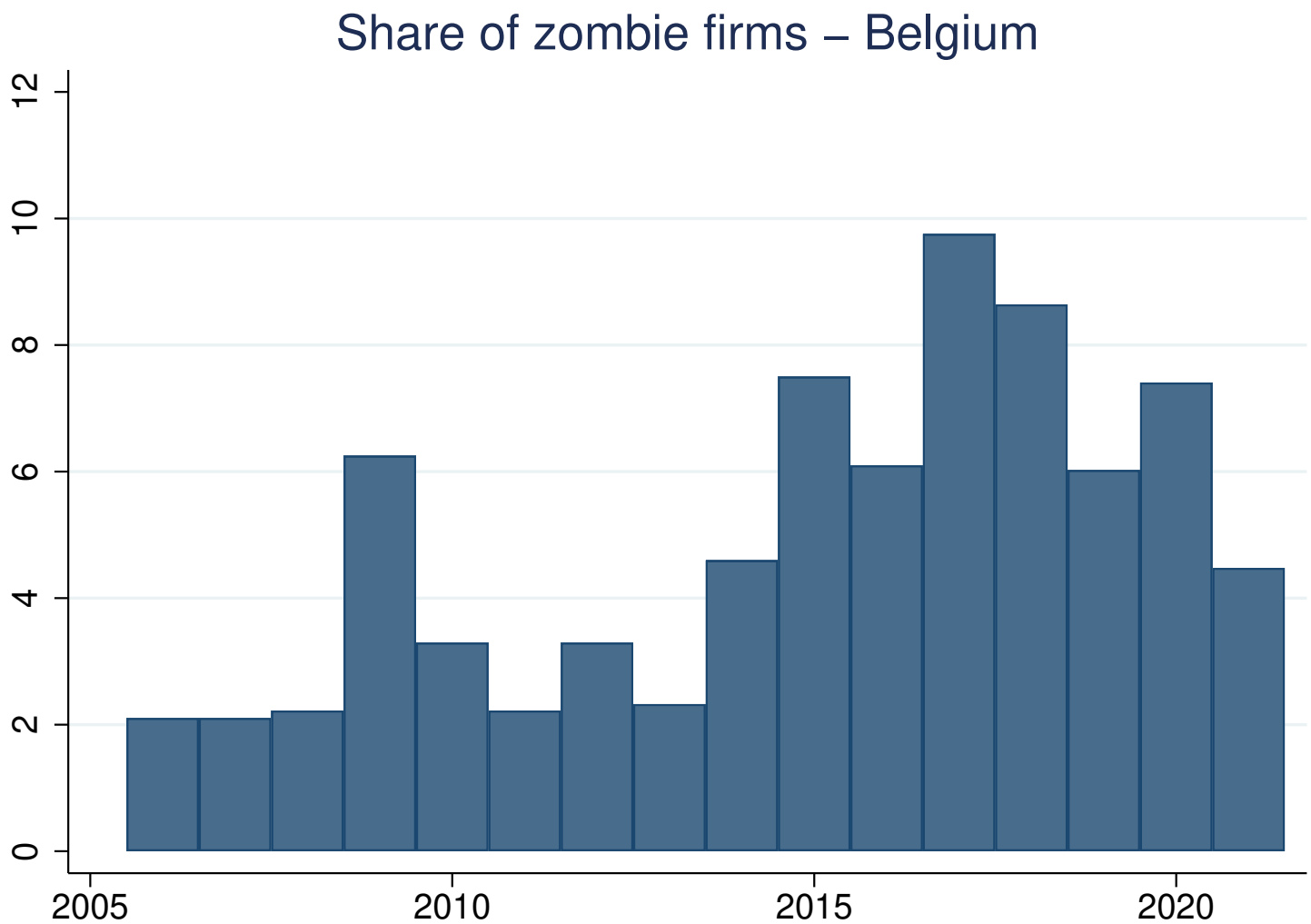
# Share of zombie firms has been rising worldwide across all definitions




*Notes: SKSW (2017)* define zombies as those that record for at least two consecutive years ROA$<$0, net investments$<$0, and debt servicing capacity$<$5% (Storz et al., 2017). *MAM (2018)* take firms with ICR$<$1 below one for three consecutive years, and aged at least ten years old (McGowan et al., 2018). *AEEH (2019)* take the three-year median ICR implied rating of BB or lower, and the ratio of interest expenses lower than highly-rated peers, i.e., AAA-rated firms (Acharya et al., 2019). *ADW (2022)* take the three-year moving average of ICR$<$1, and a Z-score or a Z"-score$<$0 (Altman et al., 2022). *Base: TFP* is the baseline measure but replacing the real sales growth indicator with TFP below the sample median.

◂ Back

# Share of zombie firms in Belgium




Back

# First stage: transmission of US MP shocks to foreign interest rates

$$R_{c,t} = \alpha_c + \delta_c^+ Z_t^+ + \delta_c^- Z_t^- + \Theta_h' X_{c,t-1} + u_{c,t}$$

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| GK Shocks | -4.659*** | | -6.148*** | |
| | (-7.08) | | (-10.48) | |
| Positive GK Shocks | | 19.19*** | | 12.27*** |
| | | (9.36) | | (6.44) |
| Negative GK Shocks | | -8.575*** | | -9.011*** |
| | | (-11.94) | | (-14.04) |
| Aggregate Controls | No | No | Yes | Yes |
| F statistics | 50.07 | 101.3 | 49.76 | 54.34 |
| Observations | 3207 | 3207 | 2994 | 2994 |

$t$ statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

◂ Back

# First stage: US MP shocks to country-specific interest rates

$$R_{c,t} = \alpha + \delta_c^+ Z_t^+ + \delta_c^- Z_t^- + u_t$$

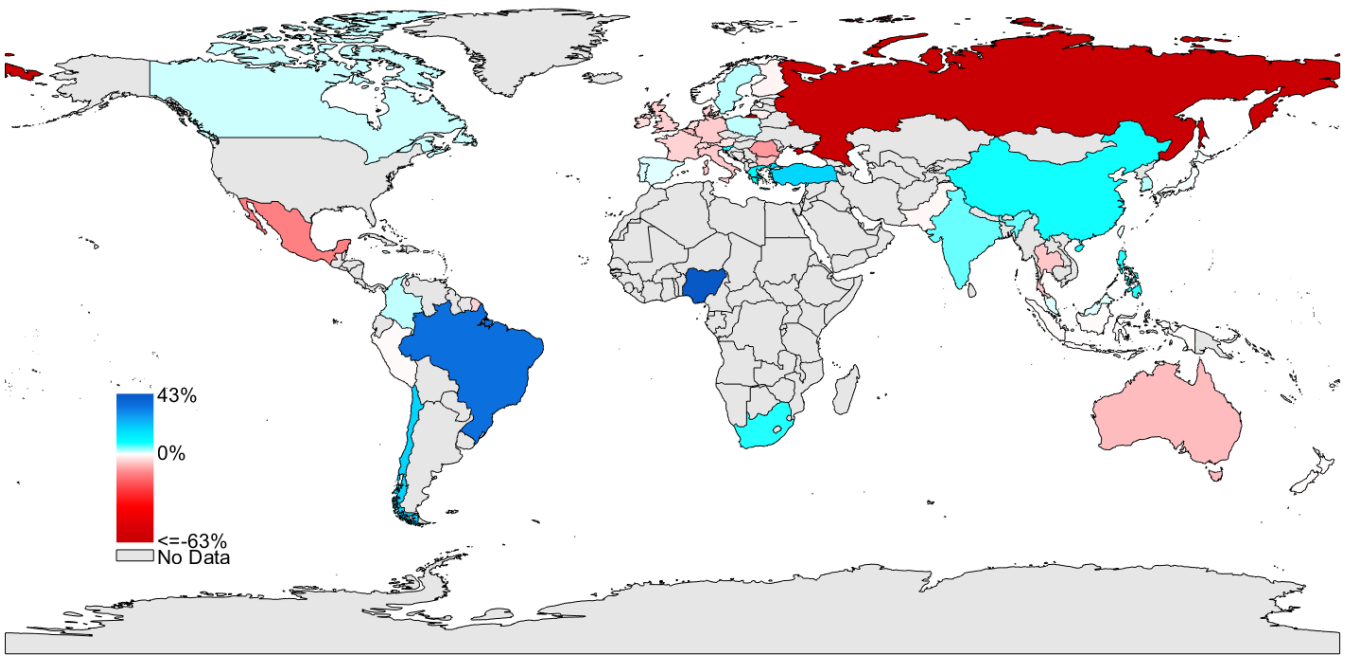



Figure: Estimated interest rate pass-through of contractionary US MP shocks

Back

# First stage: US MP shocks to country-specific interest rates

$$R_{c,t} = \alpha + \delta_c^+ Z_t^+ + \delta_c^- Z_t^- + u_t$$

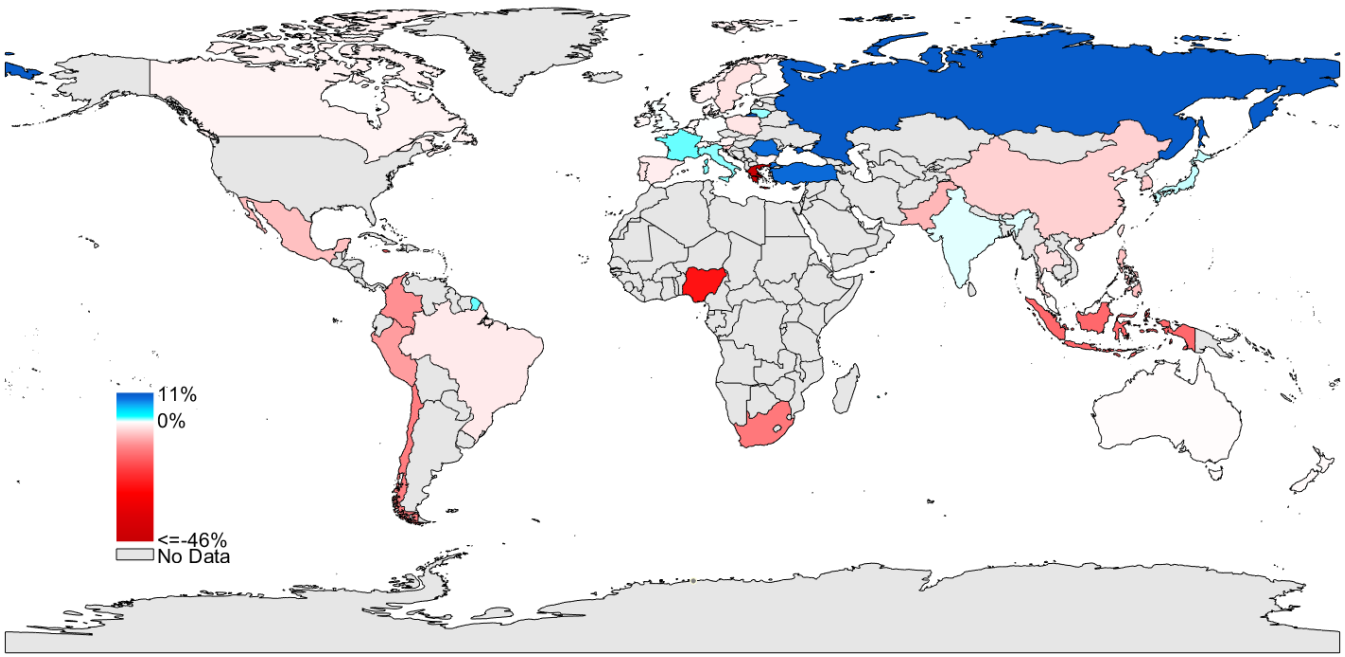



Figure: Estimated interest rate pass-through of expansionary US MP shocks

Back

# First stage: US MP shocks to country-specific interest rates

$$R_{c,t} = \alpha + \delta_c Z_t + u_t$$

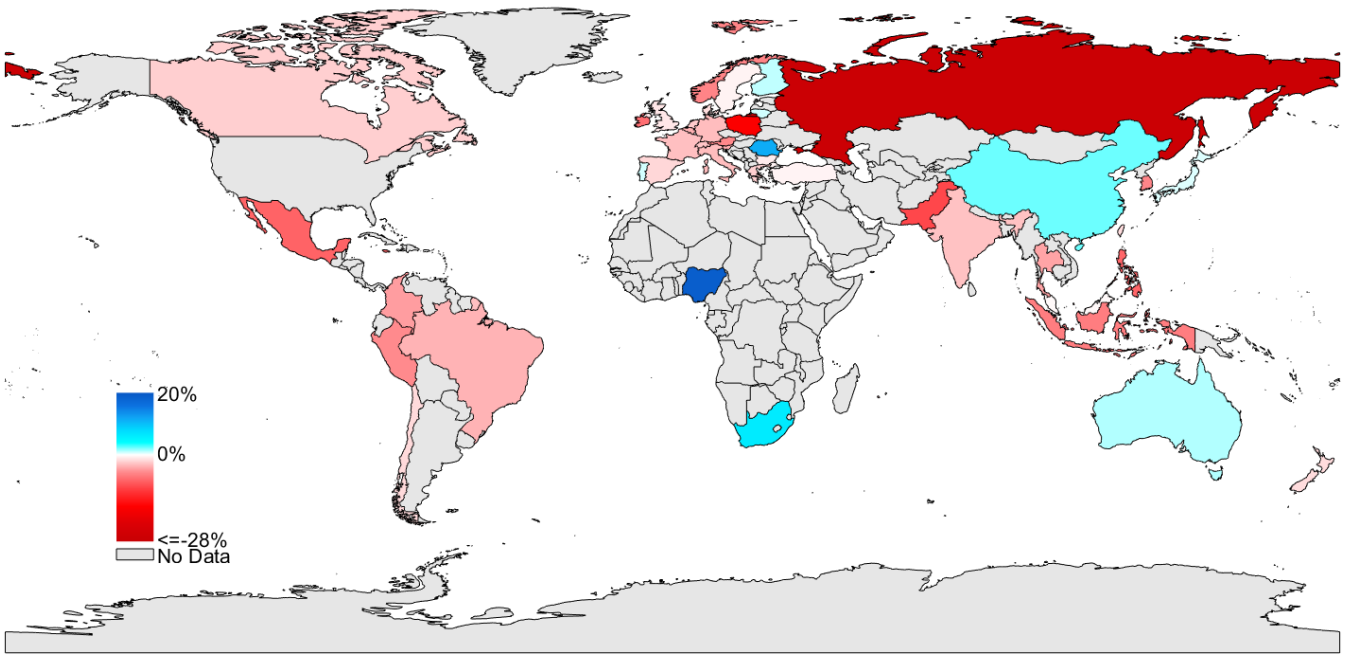
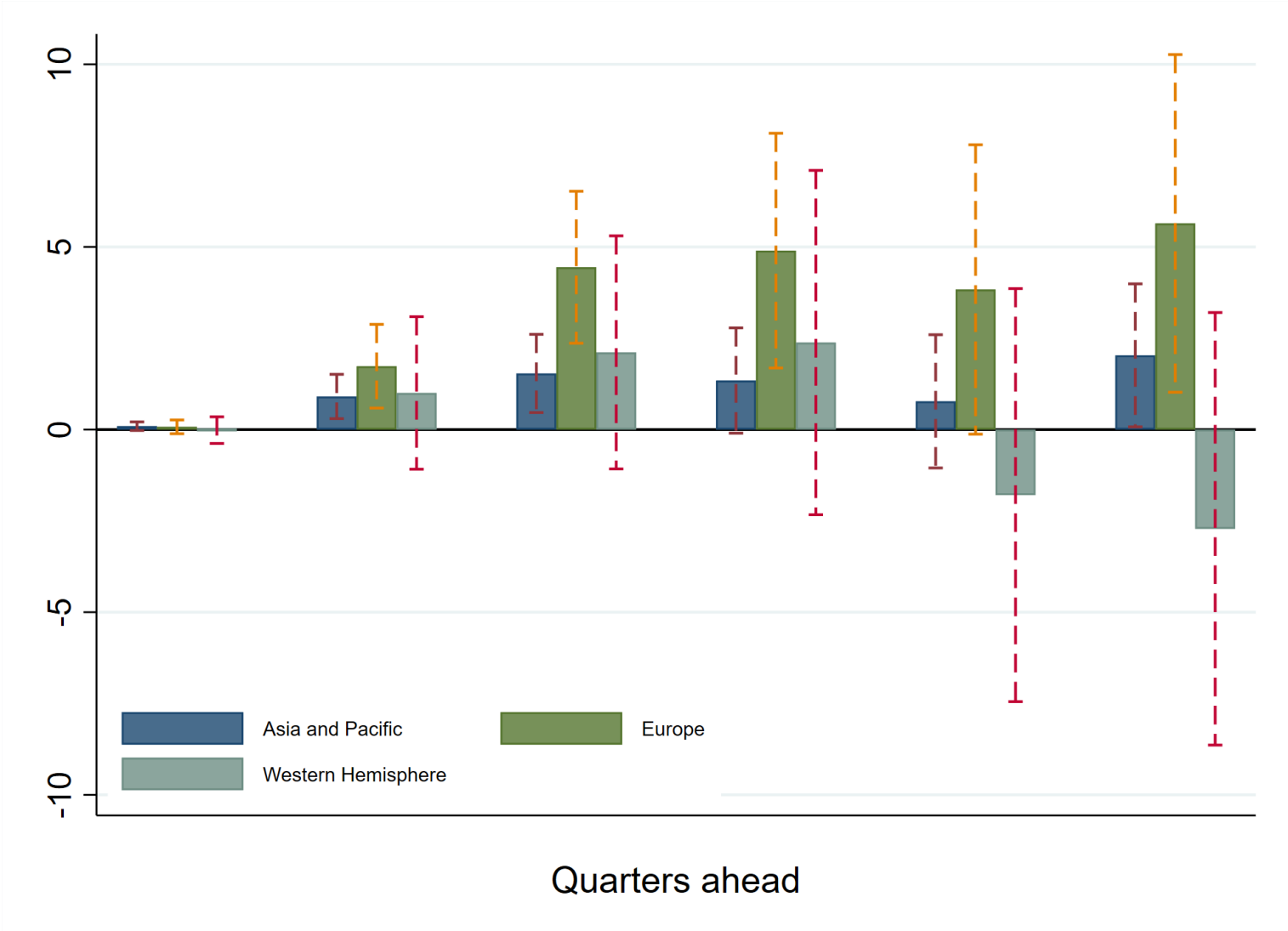



Figure: Estimated interest rate pass-through of US MP shocks

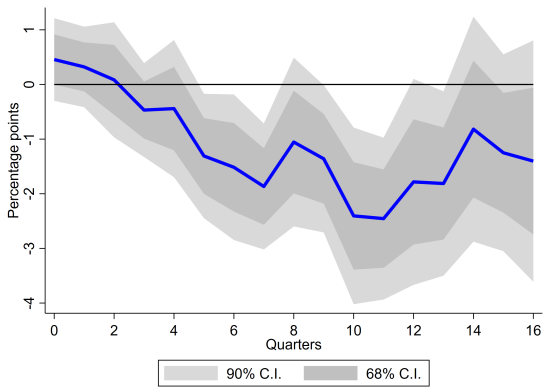
Back

# Response of zombie firms' investment relative to nonzombies by region

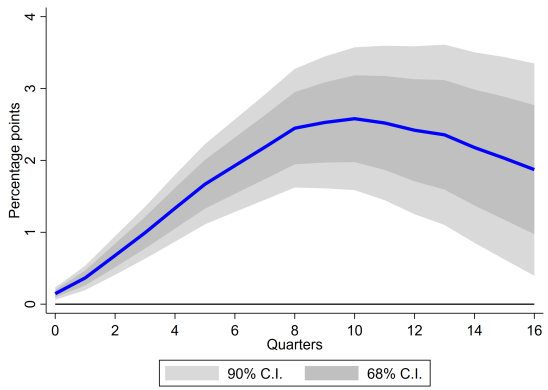



Back

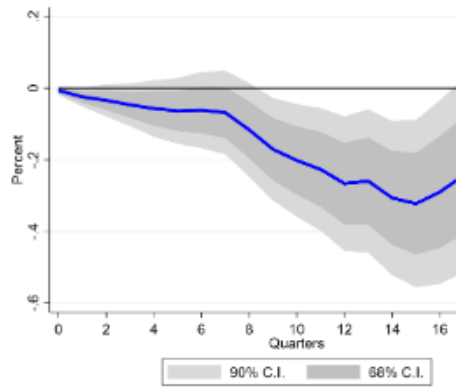
# Alternative MP shocks: Bauer and Swanson (2022)




(a) Avg. effect



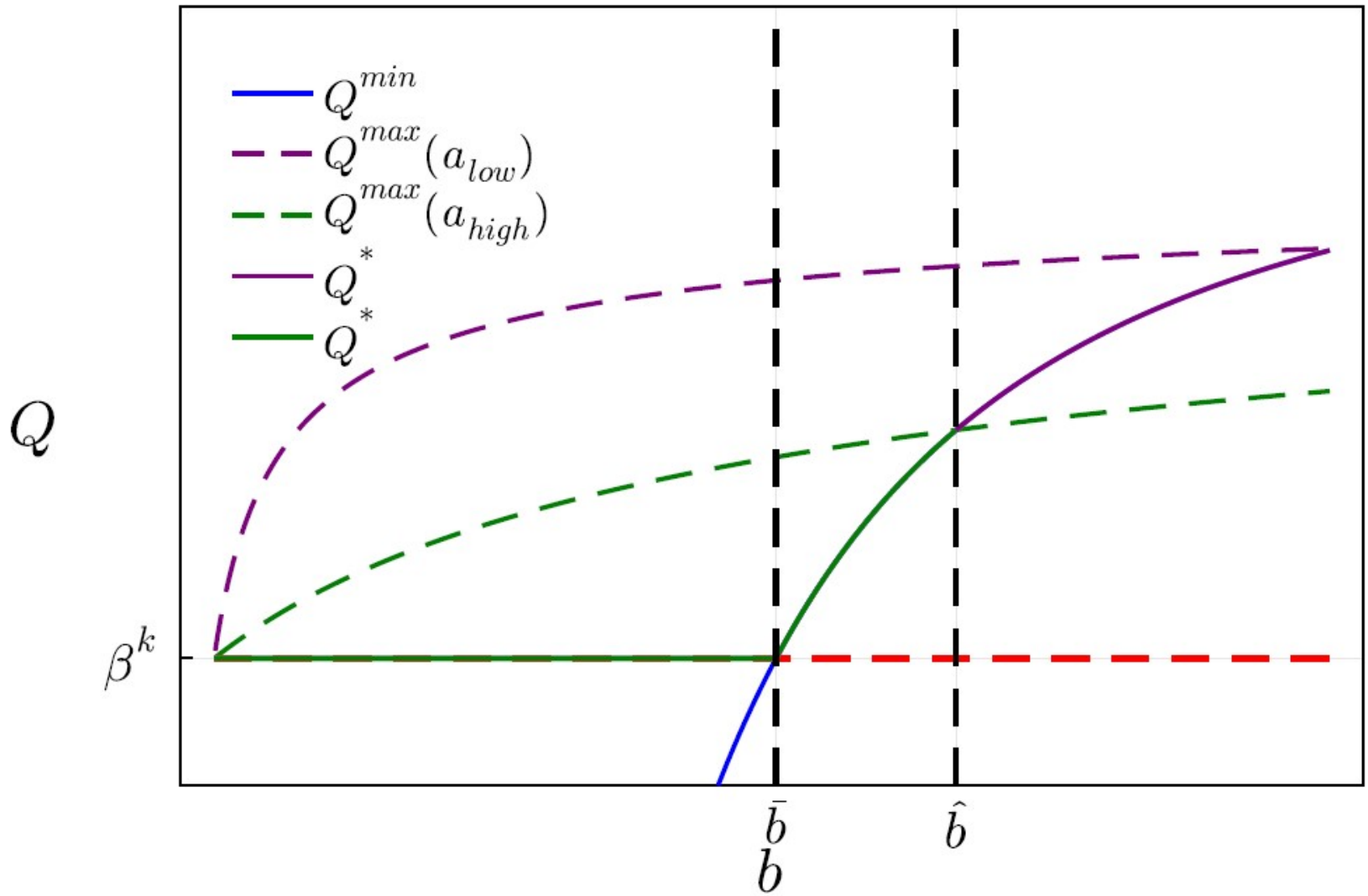

(b) Zombie dif. effect




(c) Congestion effect

Back

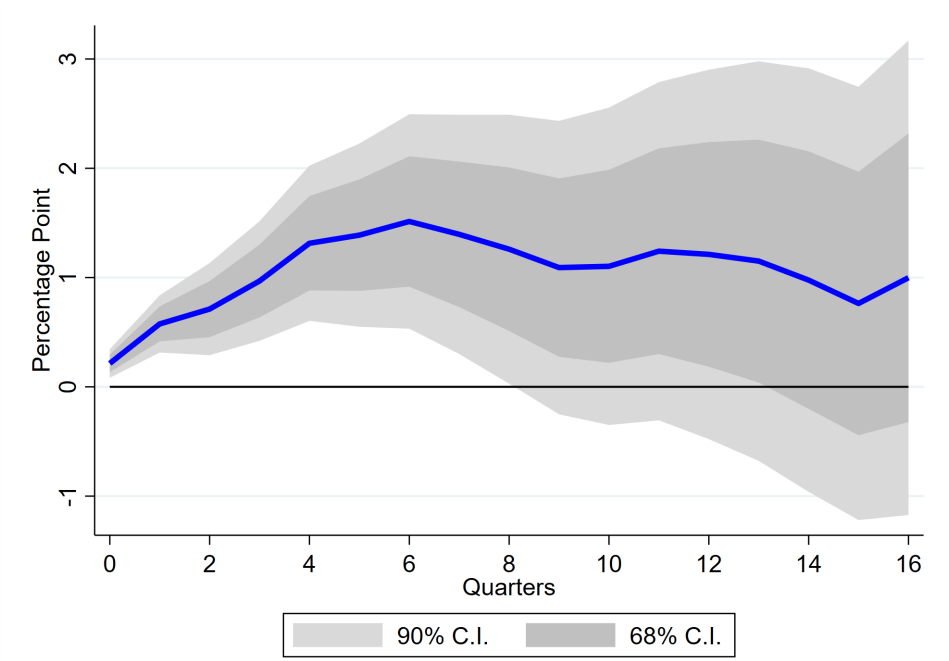
# High-capitalized banks face less incentives to evergreen




Back

# Work in progress: the evergreening motive is stronger in a low-interest rate environment

$$\Delta_h Y_{i,t+h} = \alpha_i^h + \alpha_{c,s,t}^h + \beta_1^h \hat{R}_{c,t} \times \text{Zom}_{i,t-1} \times \text{LowR}_{c,t} + \ldots + e_{i,t}$$




Low - high interest rate