Global Firm Dynamics, Productivity, (Mis)Allocations

Sebnem Kalemlı-Ozcan, Professor, University of Maryland
Department of Economics and Senior Policy Advisor, IMF

Real and Financial Linkages at the Firm Level: Why do we care?

Monday, August 31, 2020
REAL AND FINANCIAL LINKAGES AT THE FIRM LEVEL: WHY DO WE CARE?

Şebnem Kalemli-Özcan

August 2020
Stanford Big Data
Why do we need firm level data to answer macro questions?

1. The importance of heterogeneous agents in Macro/International Macro-Finance
Why do we need firm level data to answer macro questions?

1. The importance of heterogeneous agents in Macro/International Macro-Finance
   - Key microfoundations of macro models depend on heterogeneity
   - We need firm and household level data to test these assumptions
**Why do we need firm level data to answer macro questions?**

1. **The importance of heterogeneous agents in Macro/International Macro-Finance**
   - Key microfoundations of macro models depend on heterogeneity
   - We need firm and household level data to test these assumptions

2. **The critical role of “finance” in Macro/International Macro-Finance**
Why do we need firm level data to answer macro questions?

1. The importance of heterogeneous agents in Macro/International Macro-Finance
   - Key microfoundations of macro models depend on heterogeneity
   - We need firm and household level data to test these assumptions

2. The critical role of “finance” in Macro/International Macro-Finance
   - Role of financial frictions for policy transmission
   - Financial frictions are heterogenous (both by firms and by banks)
Why do we need firm level data to answer macro questions?

1. The importance of heterogeneous agents in Macro/International Macro-Finance
   - Key microfoundations of macro models depend on heterogeneity
   - We need firm and household level data to test these assumptions

2. The critical role of “finance” in Macro/International Macro-Finance
   - Role of financial frictions for policy transmission
   - Financial frictions are heterogenous (both by firms and by banks)

3. Identification and robust empirical evidence
Why do we need firm level data to answer macro questions?

1. The importance of heterogeneous agents in Macro/International Macro-Finance
   - Key microfoundations of macro models depend on heterogeneity
   - We need firm and household level data to test these assumptions

2. The critical role of “finance” in Macro/International Macro-Finance
   - Role of financial frictions for policy transmission
   - Financial frictions are heterogenous (both by firms and by banks)

3. Identification and robust empirical evidence
   - Hard to identify causal effects with VARs and/or with limited macro observations in reduced form regressions
   - Can have more power for identification and establish robust stylized facts using micro data
Key Research Questions Rely on Firms Real and Financial Linkages

Relevant for Business Cycles and for Growth:

1. Corporate Leverage, Debt Overhang, Recessions, Sluggish Investment, Growth

2. Role of Finance in Misallocation of Factors Between/Within Firms, Productivity Slowdowns

3. Global linkages, capital flows, foreign/local currency debt, transmission of shocks/policies through firms and banks globally
Research Question Examples

1. What causes corporate leverage to increase?

2. Can corporate leverage be an important propagator of aggregate boom-bust cycles and affect productivity?

3. How does corporate leverage relate to misallocation?

4. Does it matter if corporates borrow externally or domestically? in local currency or in foreign currency?

Need granular big data to answer these questions
CORPORATE DEBT/GDP: ADVANCED ANDEmerging COUNTRIES

Source: Data from BIS. Figure from Kalemli-Ozcan, Liu, Shim, 2019.
I will start with Europe and focus on firm leverage, misallocation, investment, productivity issues.

Then discuss the US case

Finish with EM focusing on the importance of external shocks and foreign currency (FX) debt
Corporate Debt to GDP

Source: Data from BIS. Figure from Kalemli-Ozcan, Laeven, Moreno (2019).
Corporate Investment to GDP

Source: Data from Eurostat and BEA. Figure from Kalemli-Ozcan, Laeven, Moreno (2019).
Understanding Investment Bust in Europe: Approach

- **Big Data:** Match firms to their banks and banks to their sovereigns in 8 European countries that share a common monetary policy (2m+ observations), 2000–2015

- Firm-level datasets that are nationally representative covering SMEs; mimic official size distribution where less than 250 employee firms account for 60 - 70 percent of economic activity.

- Exploit variation in sovereign risk during the crises that affects banks’ balance sheets and hence credit supply to firms who borrowed from these banks during the boom

- Account for existing explanations for low investment in Europe
Understanding Investment Bust in Europe: Approach

- **Big Data:** Match firms to their banks and banks to their sovereigns in 8 European countries that share a common monetary policy (2m+ observations), 2000–2015

- Firm-level datasets that are nationally representative covering SMEs; mimic official size distribution where less than 250 employee firms account for 60 - 70 percent of economic activity.

- Exploit variation in **sovereign risk** during the crises that affects banks’ balance sheets and hence credit supply to firms who borrowed from these banks during the boom

- Account for existing explanations for low investment in Europe
  1. Low aggregate demand/high future uncertainty (affects all firms)
  2. Low bank credit supply (affects all firms)
  3. **Firm leverage and rollover risk** (affects firms differentially as a function of their short-term debt based leverage)
Findings for Europe

1. Investment stays low in Europe due to corporate debt overhang

2. Debt overhang works via rollover risk in the short-run and de-leveraging over the medium-run
Findings for Europe

1. Investment stays low in Europe due to corporate debt overhang

2. Debt overhang works via rollover risk in the short-run and de-leveraging over the medium-run

3. Interaction between weak banks and weak firms is important
   - Firms who entered the crisis with high leverage decrease investment more (debt overhang)
   - Firms who borrow from weak banks decrease investment more (lending channel)
     - ...and if these firms have high leverage based on short-term debt they decrease investment even more (roll-over risk)
**Findings for Europe**

1. Investment stays low in Europe due to corporate **debt overhang**

2. Debt overhang works via rollover risk in the short-run and de-leveraging over the medium-run

3. **Interaction between weak banks and weak firms is important**
   - Firms who entered the crisis with high leverage decrease investment more (debt overhang)
   - Firms who borrow from weak banks decrease investment more (lending channel)
     - ...and if these firms have high leverage based on short-term debt they decrease investment even more (roll-over risk)

4. Debt overhang and rollover risk channels explain 60 percent of the **persistence** in the actual aggregate corporate sector investment decline in Europe
Findings for Europe

1. Investment stays low in Europe due to corporate debt overhang

2. Debt overhang works via rollover risk in the short-run and de-leveraging over the medium-run

3. **Interaction between weak banks and weak firms is important**
   - Firms who entered the crisis with high leverage decrease investment more (debt overhang)
   - Firms who borrow from weak banks decrease investment more (lending channel)
     - ...and if these firms have high leverage based on short-term debt they decrease investment even more (roll-over risk)

4. Debt overhang and rollover risk channels explain 60 percent of the persistence in the actual aggregate corporate sector investment decline in Europe

**Policy Implication:** Expansionary monetary policy, bank recapitalization and dealing with legacy debt will help but not completely solve the sluggish investment problem until firm de-leveraging process is complete.
Corporate Leverage and Persistence Sluggish Investment

(a) High Leverage, Periphery
Response of Net Investment/Capital
Shock from a Post Dummy with High Leverage in the Periphery

(b) High Leverage, Center
Response of Net Investment/Capital
Shock from a Post Dummy with High Leverage in the Center

(c) Low Leverage, Periphery
Response of Net Investment/Capital
Shock from a Post Dummy with Low Leverage in the Periphery

(d) Low Leverage, Center
Response of Net Investment/Capital
Shock from a Post Dummy with Low Leverage in the Center

Figure from Kalemli-Ozcan, Laeven, Moreno (2019).
Why firms accumulated debt and increased leverage during the boom in Europe?

Declining interest rates with the EU integration incentivized firms to finance investment with short-term debt
Decline in real interest rate in the EU

Source: Data from Eurostat. Figure from Gopinath, Kalemli-Ozcan, Karabarbounis, Villegas-Sanchez (2017).

- lending rate for ≤ 1 year loans minus expected inflation
Firm-level heterogeneity in accessing finance have implications on aggregate productivity when all firms face a lower interest rate

- ↓ in real interest rate $\implies$ ↑ in desired capital ($K$) for all firms

- firms with high net worth: ↑ $K$, face ↓ returns to $K$

- firms with low net worth: cannot expand $K$, face ↑ returns to $K$

- dispersion of capital returns ↑ within a 4-digit sector and aggregate TFP ↓

- importance of size-dependent borrowing constraint
**How do we think about financial constraints?**

In the macro-finance literature, two types of constraints for firm i:

1. \[ b_i \leq \theta \times k_i \]

2. \[ b_i \leq \theta(k_i) \times k_i \]

Data on European firms supports (2)—Gopinath et al. (2017)

COVID shock suggests of yet another type (similar to growing literature on earnings based constraints:)

\[ \Delta k_i \leq \text{cash}_i \]

This means:

\[ b_i \leq \frac{k_i}{r_i} \]

where \( r_i \) is real cost of funds. (Evidence in Giovanni et al. (2018))
Leverage and Firm Size in Europe

Source: Data from ORBIS. Figure from Gopinath, Kalemli-Ozcan, Karabarbounis, Villegas-Sanchez (2017).
Is Europe unique?

Similar picture in the US in terms of the importance of role of firm size in firm leverage.

..but one needs data on small firms to get a meaningful variation in firm size
Problem: lack of data in the US on small and young firms financial positions

- Extensive literature on employment/growth dynamics of U.S. firms
- Far less is known about how these firms finance their growth
- What is known about firms’ financing behavior derives primarily from publicly-listed firms in Compustat:
Problem: lack of data in the US on small and young firms financial positions

- Extensive literature on employment/growth dynamics of U.S. firms
- Far less is known about how these firms finance their growth
- What is known about firms’ financing behavior derives primarily from publicly-listed firms in Compustat:
  - 26 percent of domestic employment
  - 44 percent of domestic gross output
**Problem:** lack of data in the US on small and young firms financial positions

- Extensive literature on employment/growth dynamics of U.S. firms
- Far less is known about how these firms finance their growth
- **What is known about firms’ financing behavior derives primarily from publicly-listed firms in Compustat:**
  - 26 percent of domestic employment
  - 44 percent of domestic gross output
- **Non-Compustat firms’ financial conditions must have important macroeconomic implications:**
  - They account for over half of economic activity
  - Most susceptible to the effects of financial shocks

**WE BUILD:** **LOCUS Data:**
LBD from Census + Orbis from Moody’s + Compustat from S&P, US
Public firms are 36 times larger employment and 64 times higher revenue than private firms and not represent the aggregate economy

Source: Data from Census, LBD, Compustat and ORBIS. Figure from Dinlersoz, Hyatt, Kalemli-Ozcan, Penciakova (2019).
Public firms are 36 times larger employment and 64 times higher revenue than private firms and not represent the aggregate economy

Source: Data from Census, LBD, Compustat and ORBIS. Figure from Dinlersoz, Hyatt, Kalemli-Ozcan, Penciakova (2019).
Leverage and Firm Size in the US

Source: Data from Census, LBD, Compustat and ORBIS. Figure from Dinlersoz, Hyatt, Kalemli-Ozcan, Penciakova (2019).
Short Term Loans/Total Assets (quadratic in age)

Source: Data from Census, LBD, Compustat and ORBIS. Figure from Dinlersoz, Hyatt, Kalemli-Ozcan, Penciakova (2019).
LEVERAGE OF US PRIVATE FIRMS DIFFERS DRASTICALLY FROM US PUBLIC FIRMS
SUCH DIFFERENCES HAVE IMPLICATIONS FOR AGGREGATE FLUCTUATIONS

1. Leverage
   - Strong positive correlation between firm size and leverage for private firms; public firms leverage is independent of size
   - Young private firms borrow more and decrease leverage and switch to equity as they get older
Leverage of US private firms differs drastically from US public firms. Such differences have implications for aggregate fluctuations.

1. Leverage
   - Strong positive correlation between firm size and leverage for private firms; public firms leverage is independent of size.
   - Young private firms borrow more and decrease leverage and switch to equity as they get older.

2. Great recession: Credit shock
   - Public firms not constrained, small private firms constrained most of the time and large private firms become constrained during GR.
Leverage of US private firms differs drastically from US public firms. Such differences have implications for aggregate fluctuations.

1. Leverage
   - Strong positive correlation between firm size and leverage for private firms; public firms leverage is independent of size.
   - Young private firms borrow more and decrease leverage and switch to equity as they get older.

2. Great recession: Credit shock
   - Public firms not constrained, small private firms constrained most of the time and large private firms become constrained during GR.

3. Firm Growth and Aggregate Boom-Bust Cycles
   - Private firms finance growth by borrowing short-term and increasing their leverage.
   - Private firms entering GR with high leverage grew less (de-leveraging).
   - These dynamics can be linked to fluctuations in the aggregate economy: regions and sectors with higher private firm leverage, grow more during the boom and experienced a sharper contraction during the bust.
In Open Economies/Emerging Markets...

Corporate Leverage will be driven by:

- Low borrowing costs
- But also by external shocks and capital flows ⇒ affect borrowing costs and exchange rates that affect net worth
- Important role for domestic banks who intermediate capital flows
- Important role for foreign currency debt
- Emerging market corporates borrow:
  - in local and in foreign currency
  - externally and domestically
  - in bonds and loans
1. **Exchange rate/balance sheet channel:**

   Capital flows ↓ (↑) ⇒ exchange rate depreciates (appreciates)
   ⇒ Firms with FX debt face negative (positive) networth shock, cannot borrow (borrow more)
   ⇒ Banks with FX debt face negative (positive) networth shock, cannot lend (lend more)

   • Requires FX borrowing that creates balance sheet mismatch (unhedged)
1. Exchange rate/balance sheet channel:

Capital flows ↓ (↑) ⇒ exchange rate depreciates (appreciates)
⇒ Firms with FX debt face negative (positive) networth shock, cannot borrow (borrow more)
⇒ Banks with FX debt face negative (positive) networth shock, cannot lend (lend more)

- Requires FX borrowing that creates balance sheet mismatch (unhedged)

2. Interest rate/funding cost channel:

Capital flows ↓ (↑) ⇒ funding/borrowing costs ↑ (↓)

- Does not require balance sheet mismatch
  - All banks can cut (increase) lending and all firms can decrease (increase) borrowing

Need to investigate what happens to price of borrowing and quantity of borrowing for a complete picture!
Which Sector Capital Flow into? (EM)

60 percent of external liabilities is debt; 70% Loans, 30% Bonds

Both Corporates and Banks Borrow Externally in a Typical EM in Loans; Sovereign borrow in Bonds

Source: Data from BIS, IMF. Figure from Avdjiev, Hardy, Kalemli-Ozcan, Serven (2018).
Domestic Bank Credit/Corporate Debt
Firms mostly borrow from their domestic banks in EM

Average Share of Credit from Domestic Banks, 2006-2013

Source: Data from BIS. Figure from Kalemli-Ozcan, Liu, Shim (2019).
How to Link External Shocks to Domestic Credit Growth Through Micro Data?

(a) GFC and Non-Core Liabilities ($\rho = -0.51$)

(b) GFC and Lending Rates ($\rho = 0.52$)

(c) GFC and UIP ($\rho = 0.61$)

(d) GFC and Collateral ($\rho = 0.01$)
Funding cost channel—Evidence from Turkey, 2000–2012

During a boom, both local currency and FX credit will increase, leaving corporates vulnerable to both exchange rate shocks and funding shocks.

Source: Data from CBRT. Figure from di Giovanni, Kalemli-Ozcan, Ulu, Baskaya (2019)
Takeaways

1. Corporate leverage is an important part of the aggregate boom-bust cycles both in advanced economies and in emerging markets.
Takeaways

1. Corporate leverage is an important part of the aggregate boom-bust cycles both in advanced economies and in emerging markets.

2. Corporate de-leveraging can lead to sluggish investment after large financial crises.
Takeaways

1. Corporate leverage is an important part of the aggregate boom-bust cycles both in advanced economies and in emerging markets.

2. Corporate de-leveraging can lead to sluggish investment after large financial crises.

3. Corporates increase leverage (risk-taking) during the booms given low borrowing costs and higher networth (more collateral).
**Takeaways**

1. Corporate leverage is an important part of the aggregate boom-bust cycles both in advanced economies and in emerging markets

2. Corporate de-leveraging can lead to sluggish investment after large financial crises

3. Corporates increase leverage (risk-taking) during the booms given low borrowing costs and higher networth (more collateral)

4. Capital flows and exchange rate fluctuations have an additional role in increasing corporate leverage in emerging markets by reducing borrowing costs and decreasing the value of FX debt on the balance sheet (higher net worth for mismatch firms)
**Takeaways**

1. Corporate leverage is an important part of the aggregate boom-bust cycles both in advanced economies and in emerging markets.

2. Corporate de-leveraging can lead to sluggish investment after large financial crises.

3. Corporates increase leverage (risk-taking) during the booms given low borrowing costs and higher networth (more collateral).

4. Capital flows and exchange rate fluctuations have an additional role in increasing corporate leverage in emerging markets by reducing borrowing costs and decreasing the value of FX debt on the balance sheet (higher net worth for mismatch firms).

5. During booms, both local currency and FX borrowing will increase, leaving corporates vulnerable to both exchange rate shocks and funding shocks.
**Takeaways**

1. Corporate leverage is an important part of the aggregate boom-bust cycles both in advanced economies and in emerging markets.

2. Corporate de-leveraging can lead to sluggish investment after large financial crises.

3. Corporates increase leverage (risk-taking) during the booms given low borrowing costs and higher networth (more collateral).

4. Capital flows and exchange rate fluctuations have an additional role in increasing corporate leverage in emerging markets by reducing borrowing costs and decreasing the value of FX debt on the balance sheet (higher net worth for mismatch firms).

5. During booms, both local currency and FX borrowing will increase, leaving corporates vulnerable to both exchange rate shocks and funding shocks.

6. Larger firms can borrow more, and such heterogeneity in access to finance has implications for aggregate productivity and growth.
**Takeaways**

1. Corporate leverage is an important part of the aggregate boom-bust cycles both in advanced economies and in emerging markets.

2. Corporate de-leveraging can lead to sluggish investment after large financial crises.

3. Corporates increase leverage (risk-taking) during the booms given low borrowing costs and higher networth (more collateral).

4. Capital flows and exchange rate fluctuations have an additional role in increasing corporate leverage in emerging markets by reducing borrowing costs and decreasing the value of FX debt on the balance sheet (higher net worth for mismatch firms).

5. During booms, both local currency and FX borrowing will increase, leaving corporates vulnerable to both exchange rate shocks and funding shocks.

6. Larger firms can borrow more, and such heterogeneity in access to finance has implications for aggregate productivity and growth.

7. To be able to identify these patterns, one needs to use firm-level data that is nationally representative and can deliver firm heterogeneity in financial constraints.