Shaking up Foreign Finance: Indonesian FDIs in a Post-Disaster World

Robert Reinhardt

UNIVERSITÉ PARIS 1 PANTHÉON SORBONNE
ÉCOLE D'ÉCONOMIE DE LA SORBONNE

Executive Summary

Question?
How do FDI inflows respond to disaster shocks (earthquakes) within country in time, space and sectors

When and Where?
In 426 Indonesian districts between 2003 and 2019

How?
Dynamic Difference-in-Difference Estimation and Province-wise sector-network regression following Acemoglu (2016)

Findings?

1. FDI inflows are reduced by approximately 90% in the year after the shock before recovery to pre-trends
2. Effects are dominant in below median risk areas, so risk expectation might matter
3. Minor role of spatial spillover effects on reduction
4. Negative effects stem mostly from upstream industry shocks

The Why

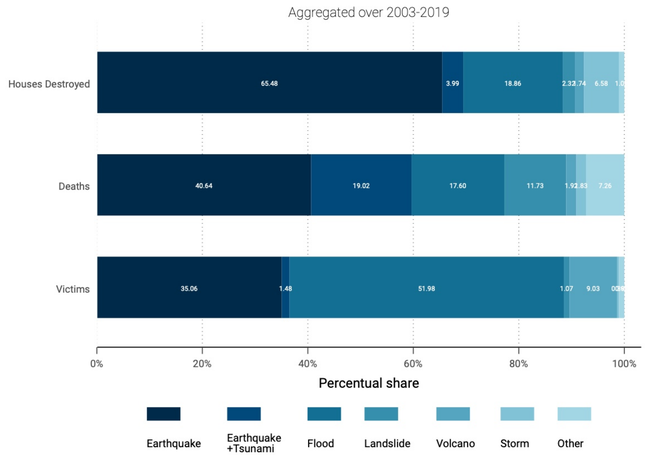
Why should we care?

- Climate change amplifies global disaster frequency and intensity, impacting countries unevenly.
- While disaster effects on growth and production are well-studied (e.g. Felbermayr, 2022 or Carvalho, 2021), the influence on foreign direct investment (FDI) within countries remains understudied.
- This paper aims to bridge this gap.

→ Paper focuses on within-country effects including sector dimension and adopting production network perspective

Why Indonesian and why earthquakes?
FDI has positive effects in Indonesia (on employment, productivity and CO_2 reduction), while earthquakes are the main threat to life and capital in the country.

Figure 1. Indonesian Disaster Environment (Shares)



Direct Effects of an Earthquake

What makes the effect direct?
Effects impact directly components of production function

How is the effect estimated?
It is estimated in dynamic DiD across districts, provinces and years:

$$f_{ijt} = \sum_{c=-4}^{4} \gamma_c D_{ij,t+c} + \Gamma X_{ijt} + \omega_i + \omega_t + \omega_{jt} + \epsilon_{ijt}$$

How is the effect identified?

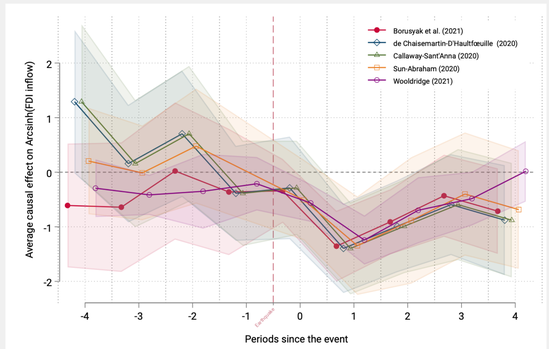
- Compares random-shock in time (D) in treated districts with non-treated
- Conditioned on economic situations (X), FEs (ω), risk and treatment history
- In extensions also considers spatial distance to shock

How is the treatment defined?
A district is treated (0/1) if

1. a share of the local population is unavailable to work (labor market shock)
2. the economic center experienced a destructive earthquake (capital shock)

What is found?

Figure 2. Dynamic Treatment Plot



Takeaway

1. FDI inflow reduces by ≈ 90% in the year following a destructive earthquake
2. Effects are only prominent in areas with below median disaster risk → anticipation matters
3. Accounting for neighboring district treatment → indication for spillover effects
4. Replications for flood shocks show similar pattern

The Data

Which data is used?

- Dependent: Monthly FDI inflow data on 426 Indonesian districts from BKPM Indonesia
- Treatment: 896 earthquake intensity maps from the US Geological Survey combined with district-wise disaster records from the UNDRR
- Controls: i.A. homogenised nighttime-light series (GDP proxy) and district-specific World Bank measures on socio-economic conditions

Indirect Effects of an Earthquake

What makes the effect indirect?
Effects impact indirectly production through supplier or demand disruptions.

How is the effect estimated?
Acemoglu (2016) approach based on a MRIO table across 32 provinces:

$$f_{jst} = \gamma f_{js,t-1} + \beta_1 D_{js,t-1} + \beta^{\text{up}} Up_{js,t-1} + \beta^{\text{do}} Down_{js,t-1} + \Gamma X_{j,t-1} + \Omega + \epsilon_{jst}$$

How is the effect identified?

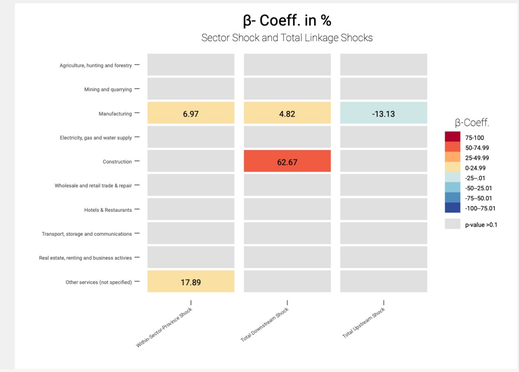
- Compares indirect shocks within (D) sectors or through linkages ($Up/Down$)
- Conditioned on economic situations (X) and FEs (Ω)
- Differs if shocks occur within same province or anywhere in country

How is the treatment defined?
In a province **sectoral** FDI treated is determined by:

1. the GDP-weighted share of production affected by a shock (e.g. 9% of potential suppliers in a sector within a province face a shock).
2. shock within or through sectoral-linked province

What is found?

Figure 3. Linkage Effects on Sectoral Level



Takeaway

1. Unlike before, shock might be positive on FDI within sector
2. Negative impact is mainly from supply-side shocks, especially in capital-intensive manufacturing
3. Construction sector, notably, shows significant positive effects on FDI due to demand-side shocks
4. Network spillovers may exist over longer distances, as seen in both intra-province and inter-province shocks

References

[1] Acemoglu, D., Akcigit, U., & Kerr, W. (2016). Networks and the macroeconomy: An empirical exploration. *Nber macroeconomics annual*, 30(1), 273-335.
[2] Carvalho, V. M., Nirei, M., Saito, Y. U., & Tahbaz-Salehi, A. (2021). Supply chain disruptions: Evidence from the great east japan earthquake. *The Quarterly Journal of Economics*, 136(2), 1255-1321.
[3] Felbermayr, G., Gröschl, J., Sanders, M., Schippers, V., & Steinwachs, T. (2022). The economic impact of weather anomalies. *World Development*, 151, 105745.
[4] Reinhardt, R. (2022). Shaking up Foreign Finance: FDI in a Post-Disaster World (No. halshs-03908250). HAL.