Productivity, Inputs Misallocation and the Financial Crisis

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An Heterogeneous Credit Crunch

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To what extent did the Financial Crisis heterogeneously affect input misallocation across EU countries?

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In this paper, the production model accounts for TFP heterogeneity and uncertainty and a broad spectrum of distortions.

This Paper

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Model: based on Gandhi, Navarro and Rivers 2020.

- Non-parametric production function with staggered idiosyncratic productivity (TFP) shocks.
- Each input (K, L, M) allocated with some degree of productivity uncertainty.
- Unspecified allocation problem for L and K accommodate various dynamic and static distortions.

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Research Questions:

- How much of the dispersion of the marginal product *of each input* is captured by TFP volatility?

  Around 10% for all production inputs.

- How did the misallocation of resources vary among countries in the aftermath of the Financial Crisis?

  The crisis increased inputs' misallocation more in Southern and Eastern Europe compared to Northern Europe.

Literature

Marginal Products Dispersion and Misallocation

- Restuccia and Rogerson (2008), Hsieh and Klenow (2009), Asker, Collard-Wexler, De Loecker (2014).
- This paper: Dispersion of marginal products reflects *also* productivity heterogeneity and idiosyncratic productivity shocks for *any* input.

Heterogeneous Effects of Macroeconomic Shocks

- Gopinath, Kalemli-Ozcan, Karabarbounis, and Villegas-Sanchez (2017), Ben Zeev (2021).
- This paper: Estimate the heterogeneous effect of the 2008 financial crisis on TFP volatility and inputs' marginal products dispersion across European countries.

The Production Model

The Production Model

- Y_{jt}, K_{jt}, L_{jt}, and M_{jt} denote gross output, capital, labor, and material inputs.
- ν_{jt} is log TFP composed by a persistent and a shock component.

$$\nu_{jt} = \omega_{jt} + \varepsilon_{jt}$$

- ω_{jt} follows a Markov process.

$$\omega_{jt} = m(\omega_{jt-1}) + \eta_{jt}$$

- Firms are price takers in the output and input market.

Allocation Decisions Timeline

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   - Firm j now knows ω_{jt}.
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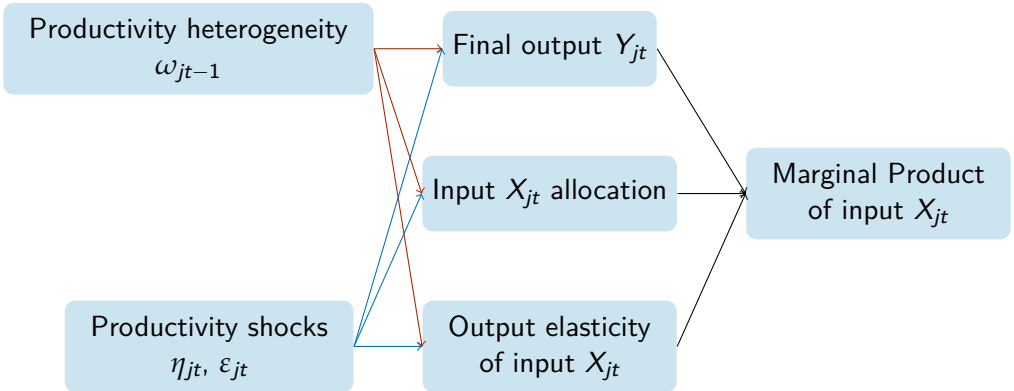
Productivity and Marginal Products



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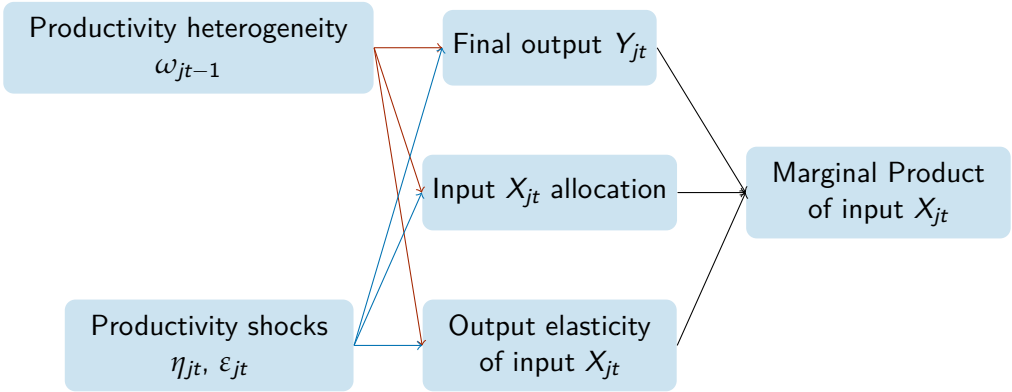

And then

$$c\left(\frac{dmp_{jt}^{X}}{d\omega_{jt-1}}, \frac{dmp_{jt}^{X}}{d\eta_{jt}}, \frac{dmp_{jt}^{X}}{d\varepsilon_{jt}}\right) = \frac{dmp_{jt}^{X}}{d\Delta\nu_{jt}}$$ where $\Delta\nu_{jt}$ denotes log TFP change.

Data and Estimation

Data and Estimation

- EU Horizon 2020 MICROPROD dataset (Altomonte and Coali 2020).
- Manufacturing firms annual balance sheet unbalanced panel data operating in
  - France (2000-2017)
  - Germany (2004-2017)
  - Italy (2000-2017)
  - Poland (2004-2017)
  - Romania (2004-2017)
  - Spain (2000-2017)
- No separate information on prices and quantities.
- 2-digit Industry deflators from EU-KLEMS.

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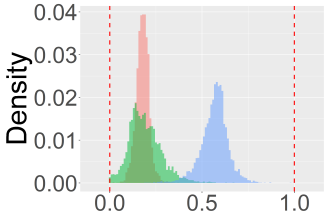
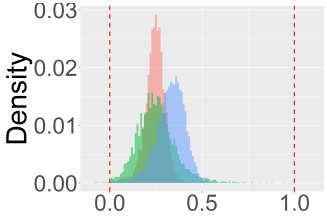
- Model consistent with the estimation approach in Gandhi, Navarro, and Rivers (2020).
- Estimator is consistent and asymptotically normal. Bootstrapped standard errors.
- Production function estimated country-by-country over their pooled manufacturing sector.

Production Function Estimates

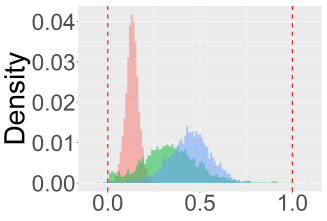
Average Output Elasticity Distributions: Capital, Materials and Labor



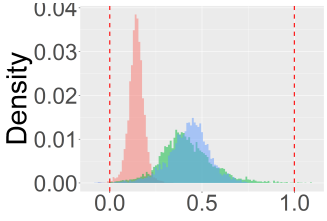
France



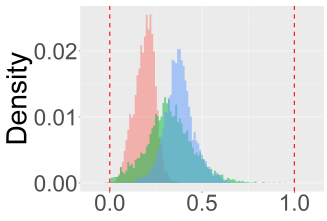
Germany



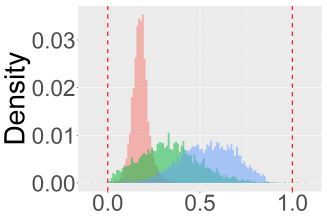
Italy



Spain



Poland



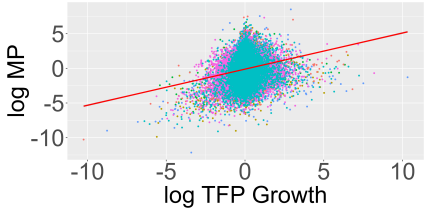
Romania

Productivity Estimates

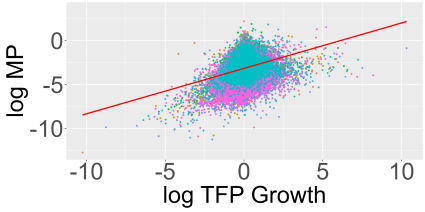
	$\omega_{jt} = \delta_0 + \delta_1\omega_{jt-1} + \delta_2\omega_{jt-1}^2 + \delta_3\omega_{jt-1}^3 + \eta_{jt}$			
	δ_0	δ_1	δ_2	δ_3
France	0.009	0.960	0.017	−0.009
	(0.006)	(0.008)	(0.020)	(0.009)
Germany	0.096	0.923	0.017	−0.009
	(0.038)	(0.024)	(0.034)	(0.016)
Italy	−0.002	0.947	0.115	−0.004
	(0.002)	(0.009)	(0.021)	(0.007)
Spain	−0.017	0.907	0.036	−0.020
	(0.003)	(0.019)	(0.038)	(0.009)
Poland	−0.041	0.908	0.036	−0.011
	(0.010)	(0.037)	(0.033)	(0.007)
Romania	−0.084	0.761	−0.009	−0.041
	(0.009)	(0.007)	(0.015)	(0.009)

Productivity and Marginal Products

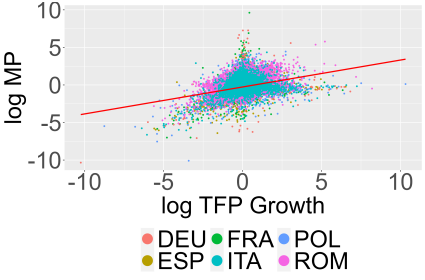
Marginal Product of All Inputs Correlates to TFP Growth



Capital (slope=0.52)



Labor (slope=0.52)



Materials (slope=0.36)

Within-Industry Dispersions

$$(mp^X_{jt} - \overline{mp}^X_{st}) = \beta_{s,dev}(\Delta\nu_{jt} - \overline{\Delta\nu}_{st}) + \zeta_{jt} \quad \Longrightarrow \quad Var_{st}(mp^X_{jt}) = \beta^2_{s,dev} \underbrace{Var_{st}(\Delta\nu_{jt})}_{Vol_{st}(\nu_{jt})} + \varphi_{st}$$

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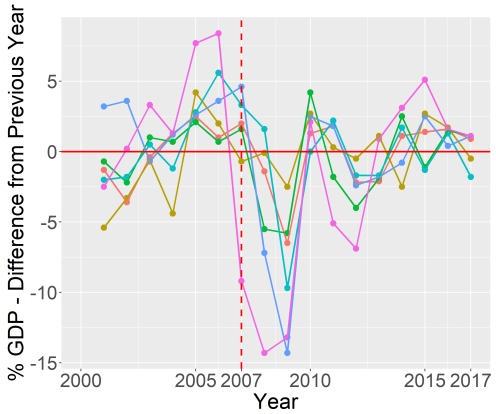
Proportion of "misallocation" captured by TFP volatility

Country	Capital	Labor	Materials
France	7.41%	11.59%	7.99%
Germany	8.05%	7.30%	13.17%
Italy	6.86%	13.33%	22.97%
Poland	6.24%	11.24%	11.77%
Romania	8.60%	17.70%	27.86%
Spain	5.51%	10.39%	9.50%
All	6.91%	11.99%	14.65%

Back to the Financial Crisis

Credit Crunch: Nonfinancial and Household Sector Net Credit Inflow



Source: Eurostat

- Spain, Romania, and Poland ↓ by 10-15% of GDP in 2008-2009.
- Italy and France ↓ by 5% of GDP in 2009.
- In 2008, Italy ↓ by 5% of GDP too.
- In 2008, France ↓ by only 1% of GDP.
- No significant change for Germany.

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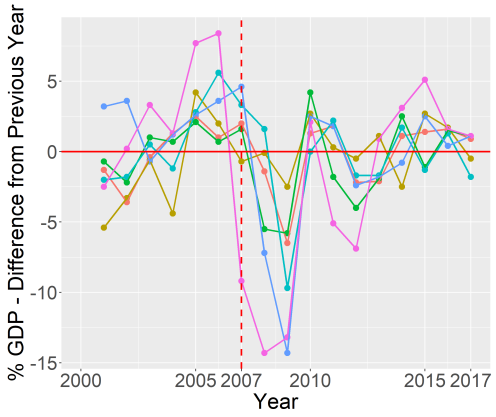

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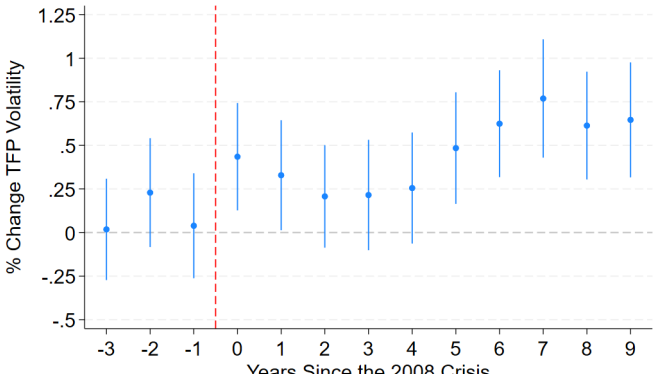
Milder crunch in $\overbrace{\text{France and Germany}}^{\textit{North}}$

Stronger crunch in $\underbrace{\text{Spain, Romania, Italy, Poland}}_{\textit{South}-\textit{East}}$

TFP Volatility Increased More in the South-East

$$\log(Vol_{cst}(\nu_{jt})) = \alpha_{sc} + \alpha_t + \sum_{l=-1}^{-3} \tau_l B_{cl} + \sum_{k=0}^{9} \phi_k A_{ck} + \epsilon_{st}$$

- A_{ck} (B_{cl}) is an indicator variable if the country belongs to the "South-East" group and the year is k after (l before) 2008.
- -4 years to the crisis (2004) is the reference category.



MPs Dispersion Increased More in the South-East

	$\text{Var}(mp^K)$			$\text{Var}(mp^L)$			$\text{Var}(mp^M)$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DiD Crisis dummy	0.396***	0.362***	0.369***	0.193***	0.166**	0.166**	0.237***	0.191**	0.196**
	(0.065)	(0.067)	(0.067)	(0.070)	(0.066)	(0.067)	(0.086)	(0.081)	(0.081)
N	6,809	6,514	6,514	6,809	6,514	6,514	6,809	6,514	6,514
Controls:									
Vol(TFP)	NO	YES	YES	NO	YES	YES	NO	YES	YES
HHI	NO	NO	YES	NO	NO	YES	NO	NO	YES

- Event study coefficients show that pre-crisis effects are small and insignificant.
- Post-crisis effect starts with a lag and increases over time.

Conclusions

TFP Volatility:

- Captures 7% of MPK dispersion, 12% for MPL and 15% for MPM.

Financial Crisis Impact:

- Increased MPK dispersion by 40% more in the South-East vs. North, 19% for MPL and 24% for MPM.
- 3% reduction with TFP volatility control.

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Model Limitations:

- Silent on the mechanism behind effects.
- Is the effect due to misallocative features (e.g., financial frictions) or other factors like adjustment costs?
- Cannot account for market power or measurement errors.
- These factors can cause dispersion but aren't misallocative *per se*.

Looking Ahead

- The Crisis enters the model only through the productivity shocks draws and through the unspecified allocation problem for K and L
- I can estimate the unrestricted time-specific variance of the productivity shocks from the micro-estimates
- But productivity shocks are assumed to be uncorrelated over time...
- Modeling the Markov Process for ω_{jt} to be time-inhomogeneous ($\omega_{jt} = m_t(\omega_{jt-1}) + \eta_{jt}$)
- Having now more flexibility on the productivity distributions, I can think of some counterfactuals
- What would have happened to the MPX distributions if the Crisis did not affect productivity distributions?...