Uncertainty, Corporate Diversification and Misallocation

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  - freeze hiring (Leduc-Liu [16]; Schaal [17]; Ilut et al. [18])
  - cut intangible and physical investment (Bloom [07,09, 18]; Bachmann-Bayer[13])
  - increase cash and other liquidity (Bates et al. [09]; Zhou[23])

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- This (macro-finance) paper: uncertainty $\rightarrow$ corporate diversification investment $\rightarrow$ macro consequences

Corporate diversification

- Diversification investment
  - entry into new business/product lines (*extensive margin*)
  - asset spread over existing business lines (*intensive margin*)
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- Diversification investment & uncertainty
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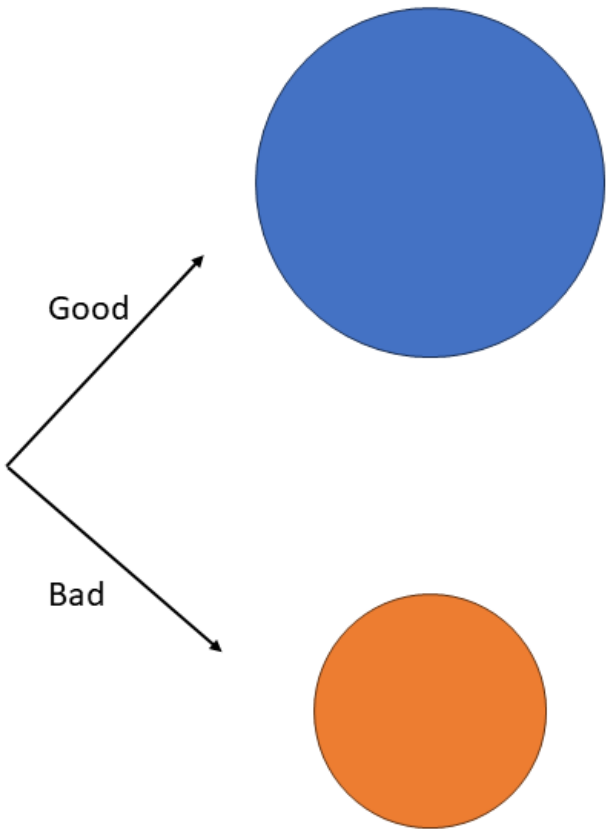
  - *"... Another key way to enhance business resilience is increased diversification, which 48% of businesses are already doing. "*
    — the Economist, 2022, *Growth Amid Uncertainty*
- This paper provides a GE framework to study the role of corporate diversification in the transmission of uncertainty shocks
  1. "Does diversification increase *individual business* resilience ? "
  2. "Does flight-to-diversification increase resilience of *aggregate economy* to uncertainty shock? "
  3. "What's the (socially) optimum degree of corporate diversification?"

If I had 90 minutes ...

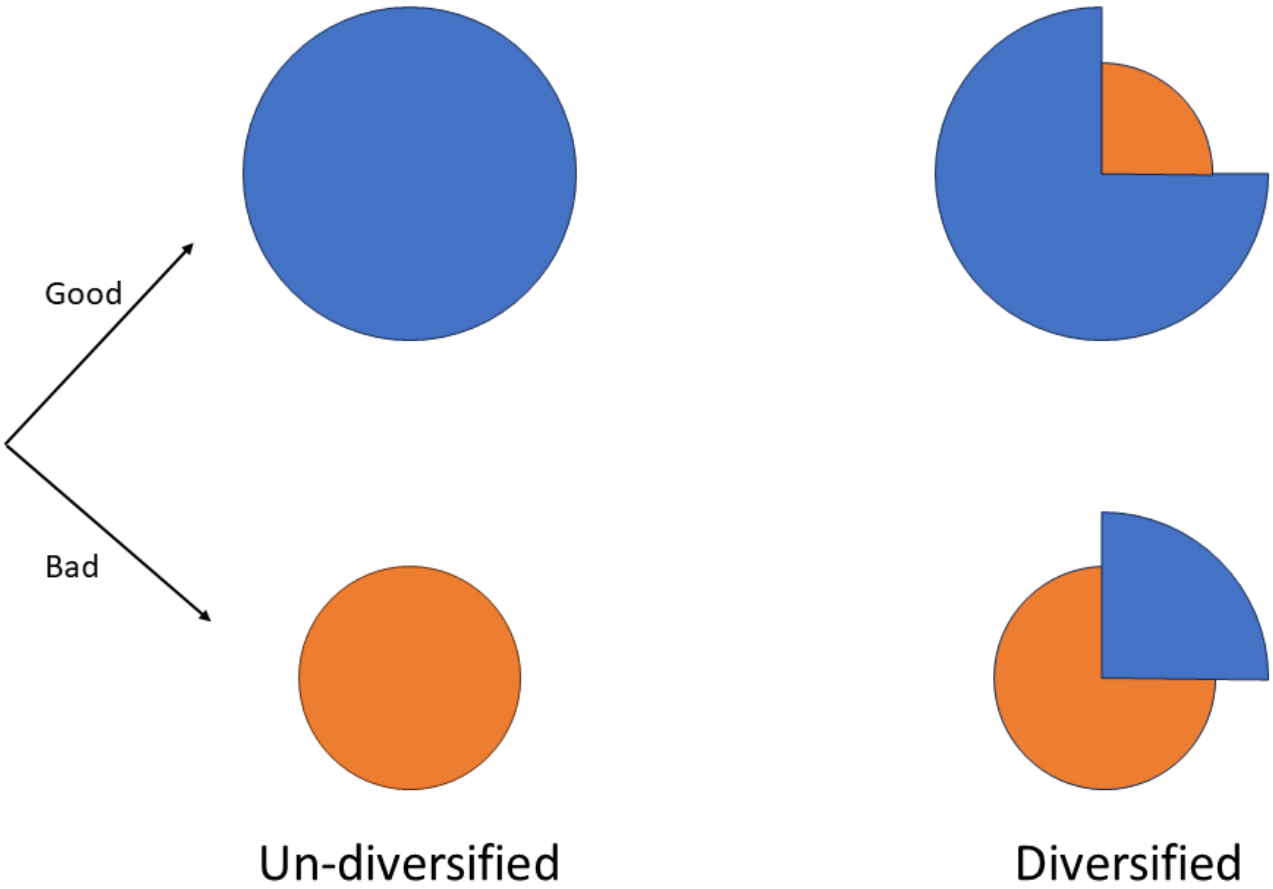
1. Empirical facts drawn from micro- and macro- data
   - Measure business uncertainty
   - Measure corporate diversification investment
   - Stylized facts: micro-level and aggregate-level
2. Theoretical model (2-period)
   - (Analytical) Mechanism: diversification $\rightarrow$ misallocation
   - (Analytical) Welfare analysis: CE vs. Second-best
   - (Analytical) Decomposition: transmission channels of uncertainty
3. Quantitative model (infinite-horizon)
   - Quantify the diversification channel of uncertainty shocks
   - Counterfactual: the importance of corporate diversification
   - Policy analysis: regulation & credit policy

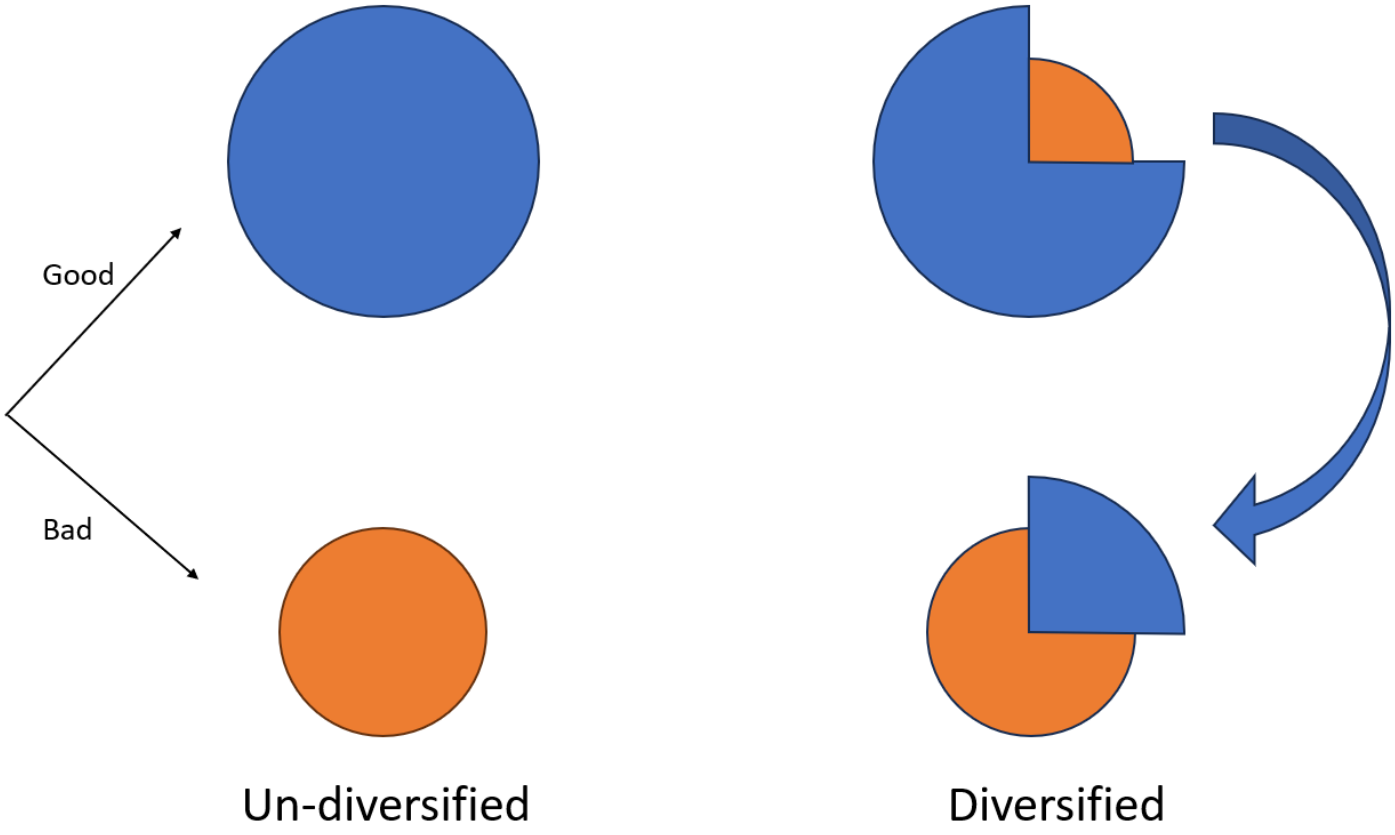
With 15 minutes left ... No Equation!

Two (*ex ante*) identical projects, but *ex post*:

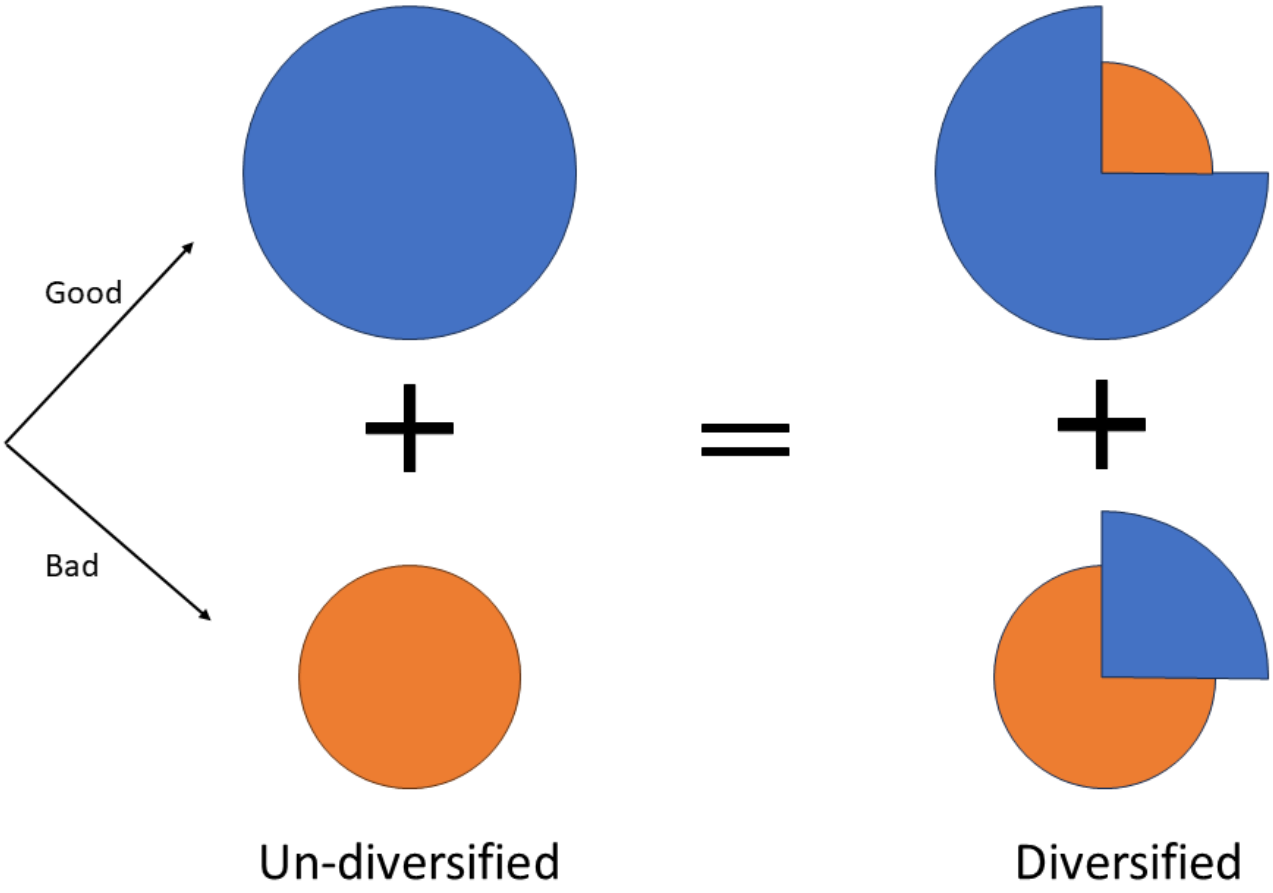


Diversification as a hedging strategy





Diversification is redistribution of cash flow from good to bad states ("insurance")



Diversification has NO aggregate implication in the complete market
("how much I can produce does not depend on my CF or net worth")

Theory: diversification under financial friction

- Incomplete market: e.g. cash flow-based credit constraint
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  - Aggregate implication:

$$\underbrace{Y}_{\downarrow} = Z_H * \underbrace{N_H}_{\downarrow} + Z_L * \underbrace{N_L}_{\uparrow}$$

  - New transmission channel of uncertainty shock: resource misallocation $\uparrow \rightarrow$ synchronized $\downarrow$ in Y, C, I, N

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- (Socially) Optimum degree of corporate diversification
  - Individual: private benefit vs. private cost
  - Planner: pecuniary externality on other firm's value (social cost)
  - Welfare: *over-diversification* in decentralized equilibrium

Micro- & Macro- Data and Stylized Facts

Stylized fact 1: flight-to-diversfication

- Fact 1: High uncertainty $\rightarrow$ flight-to-diversification
  1. $\uparrow$ entry into new business lines
  2. $\uparrow$ asset spread over non-core business segment
  3. $\downarrow$ covariance in return b/w business lines (hedging motive)

div_{jt}	$\log(No.Segment_{j,t})$	$\log(\text{Asset in Non-core Biz}_{j,t})$
	(extensive)	(intensive)
$div_{j,t-1}$	0.805***	0.097***
	(0.012)	(0.020)
unc_t	0.070***	0.166***
	(0.009)	(0.043)
unc_{t-1}	0.065***	0.240***
	(0.005)	(0.071)
Δgdp_t	0.235***	0.458**
	(0.032)	(0.199)
$anfci_t$	0.009***	0.048***
	(0.002)	(0.017)
Firm-level Controls	Yes	Yes
Observations	99,824	41,602

*Arellano-Bond estimator (Std. err. clustered by gvkey)

Robust: M&A deal-level evidence

Uncertainty Regime	0%-25%	25%-50%	50%-75%	75%-100%
Panel A				
No. of Deals	236	156	152	143
Diversification Acq (%)	47.4	50.9	51.1	53.4
Panel B: Tobin's Q of Acquirers				
Diversification Acq	1.84	1.78	1.72	1.90
Non-Diversification Acq	1.70	1.68	1.60	1.68
ΔQ	0.14	0.10	0.12	0.22
Panel C: Total Q of Acquirers				
Diversification Acq	1.25	1.10	1.02	1.31
Non-Diversification Acq	1.18	1.02	0.95	1.02
ΔQ	0.07	0.08	0.06	0.29

Summary:

1. Panel A: High uncertainty fosters diversification
2. Panel B & C: High-productivity firms are more sensitive

Stylized fact 2: "paradox" of flight-to-diversification

Can diversification enhance individual business resilience to uncertainty?

$$\Delta^h \log(x_{j,t+h}) = \beta_0^h + \beta_1^h * dum\_nseg_{j,t} + \beta_2^h * unc_t * dum\_nseg_{j,t} \quad (1)$$
$$+\beta_3^h * \Delta gdp_t * dum\_nseg_{j,t} + \beta_4^h * \Delta \log(x_{j,t-1}) + \Gamma_{j,t-1} + \mu_j + \eta_t + \epsilon_{jt}$$

Dependent Variables:

- $\Delta^h \log(x_{j,t+h}) \equiv \log(x_{j,t+h}) - \log(x_{j,t-1})$: firm-level cumulative growth rates of capital, employment, sales, equity value and credit condition from period t-1 to period t+ h

Independent Variables:

- $dum\_nseg_{jt} = 1$: firm j enters new business line in year t
- unc_t: log-level of cross-sectional uncertainty index
- Γ_{jt-1}: firm-level controls (size, cash ratio, leverage, Tobin Q)
- μ_j: firm- fixed effect
- η_t: time- fixed effect

"Paradox" of flight-to-diversification

$\Delta \log(x_{j,t})$	Labor	Capital	Sales	Value	Credit
$dum\_nseg_{j,t}$	0.089***	0.113***	0.065***	0.019	0.005***
	(0.006)	(0.008)	(0.009)	(0.012)	(0.001)
$unc_t * dum\_nseg_{j,t}$	-0.165***	-0.155***	-0.150***	-0.219***	-0.011***
	(0.029)	(0.040)	(0.041)	(0.059)	(0.002)
$\Delta gdp_t * dum\_nseg_{j,t}$	0.245	-0.022	0.050	-0.009	-0.016
	(0.167)	(0.232)	(0.239)	(0.344)	(0.014)
constant	0.065***	0.042***	0.110***	0.051**	0.007***
	(0.010)	(0.014)	(0.014)	(0.020)	(0.001)
Firm-level Controls	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	99,824	99,824	99,824	99,347	95,394

Effect of diversification investment: Persistent effects

1. ↑ firm growth (labor, capital, sales) / value/ credit
2. ↓ post-diversification performance/value if undertaken with flight-to-diversification
   (e.g.: 1 s.d. increase in uncertainty → net loss in firm value by 1.7 p.p. from diversification)

Stylized facts

- Fact 1: High uncertainty $\rightarrow$ flight-to-uncertainty
  1. $\uparrow$ entry into new business lines
  2. $\uparrow$ asset spread over non-core business segment
  3. $\downarrow$ covariance in return b/w business lines (hedging motive)
- Fact 2: "Paradox" of flight-to-diversification
  1. flight-to-diversification destroys the value of diversification and erodes firm growth/ value/ credit condition
  2. potential *externality or general equilibrium effects*

Stylized fact 3: Misallocation channel

Firm-level evidence:

1. Estimate reallocation effect

$$\Delta \log(x_{j,t}) = \beta_1 * \Delta \log(x_{j,t-1}) + \beta_2 * high\_tfp_{j,t-1} + \beta_3 * unc_t * high\_tfp_{j,t-1} + \beta_0 + \Gamma_{j,t-1} + \mu_j + \eta_t + \epsilon_{jt}, \quad (2)$$

   - $\Delta \log(x_{j,t})$: firm input growth (physical and intangible capital)
   - $high\_tfp_{j,t-1} = 1$: firm j's prod is above median at time t-1
   - If $\beta_3 < 0$: uncertainty disproportionately slows down growth of high-productivity firms $\rightarrow$ misallocation

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2. Diversification amplifies misallocation effect of uncertainty

$$\Delta \log(x_{j,t}) = (baseline) + \beta_4 * unc_t * high\_tfp_{jt-1} * dum\_nseg_{jt-1} + \beta_5 high\_tfp_{jt-1} * dum\_nseg_{jt-1} + (other\ interaction\ terms) \quad (3)$$

   - If $\beta_4 < 0$: diversification amplifies misallocation effects

Firm-level: Flight-to-Diversification → misallocation

$\Delta \log(x_{j,t})$	K^{phys}	K^{intan}	K^{phys}	K^{intan}
	(1)	(2)	(3)	(4)
$\Delta \log(x_{j,t-1})$	0.498***	0.486***	0.498***	0.486***
	(0.001)	(0.001)	(0.001)	(0.001)
$high\_tfp_{j,t-1}$	0.018***	0.018***	0.030***	0.031***
	(0.001)	(0.000)	(0.002)	(0.003)
$unc_t * high\_tfp_{j,t-1}$	-0.007**	-0.006***	-0.011***	-0.017***
	(0.003)	(0.002)	(0.004)	(0.003)
$unc_t * high\_tfp * dum\_nseg$			-0.007***	-0.006***
			(0.002)	(0.001)
$high\_tfp * dum\_nseg$			-0.005***	-0.006***
			(0.001)	(0.001)
.....	.....			
Firm-level Controls	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes
Observations	332,837	332,837	311,985	311,985
R-squared	0.474	0.456	0.474	0.458

Macro-level: Flight-to-Diversification → misallocation

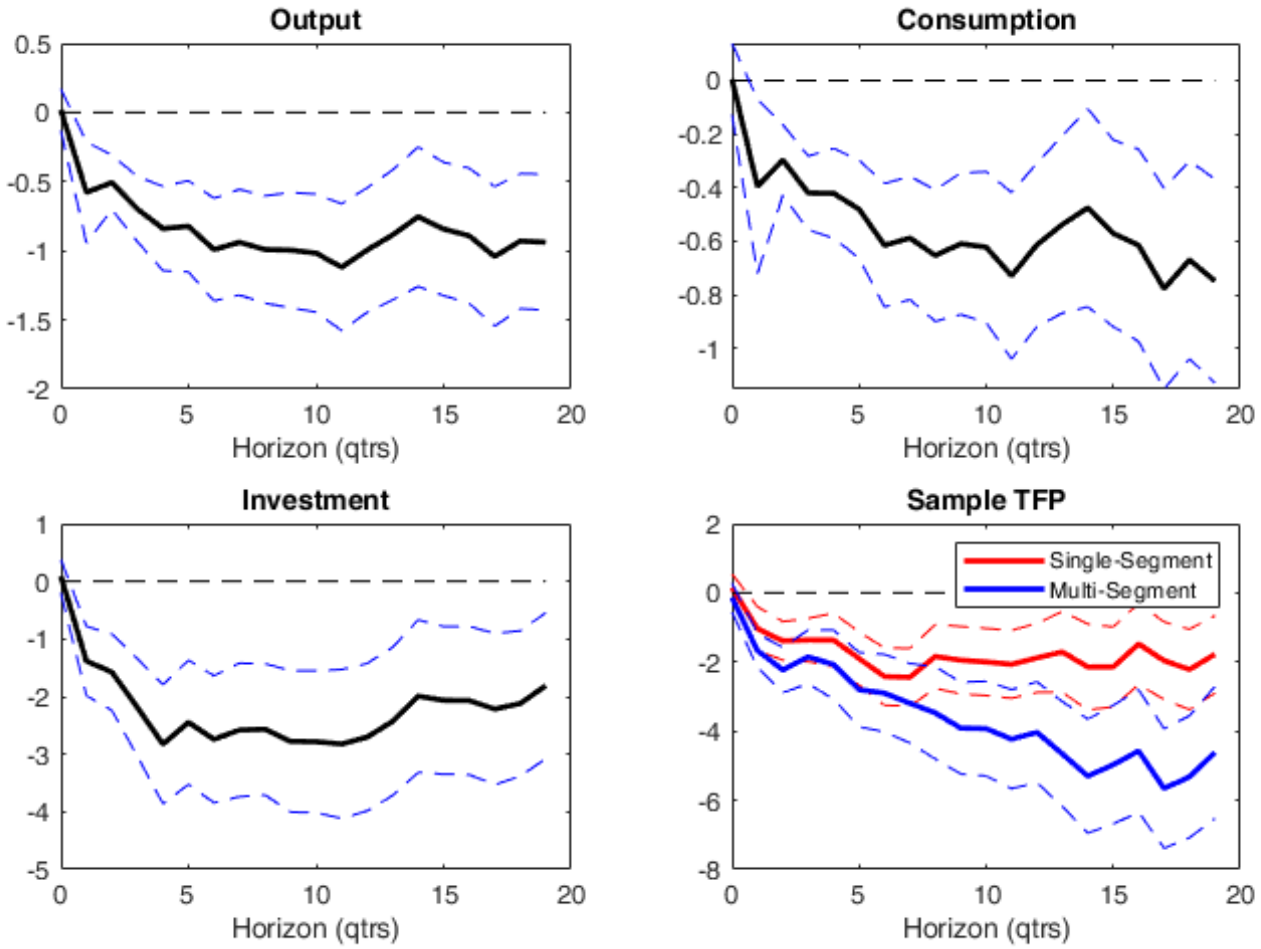

Figure: Estimated IRFs to uncertainty shock

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  2. potential *externality or general equilibrium effects*
- Fact 3: Diversification amplifies uncertainty-driven business cycles
  1. resource reallocation from high- to low- prod firms
  2. decline in aggregate TFP
  3. synchronized recession in C, I, N & Y

Quantitative Model and Conclusion

Quantitative Model

Features & results:

- Persistent industry-level shock + i.i.d. firm-level shock
  - Idiosyncratic diversification is industry-specific state variable
  - Fact: high-prod. firms are less diversified in steady state
  - Fact: high-prod. firms are more responsive to uncertainty
- Endogenous capital accumulation
  - Misallocation $\rightarrow$ factor price $\downarrow$ $\rightarrow$ crowd in low-productivity firms
  - GE channel reinforce misallocation effects
- Uncertainty shock $\rightarrow$ synchronized recessions
  - Misallocation channel dominates Oi-Hartman-Abel channel
  - First-moment effect: uncertainty shock $\rightarrow$ C, I, and N $\downarrow$
  - Third-moment effect: uncertainty shock $\rightarrow$ "skewed business cycles"

IRF to Uncertainty Shock

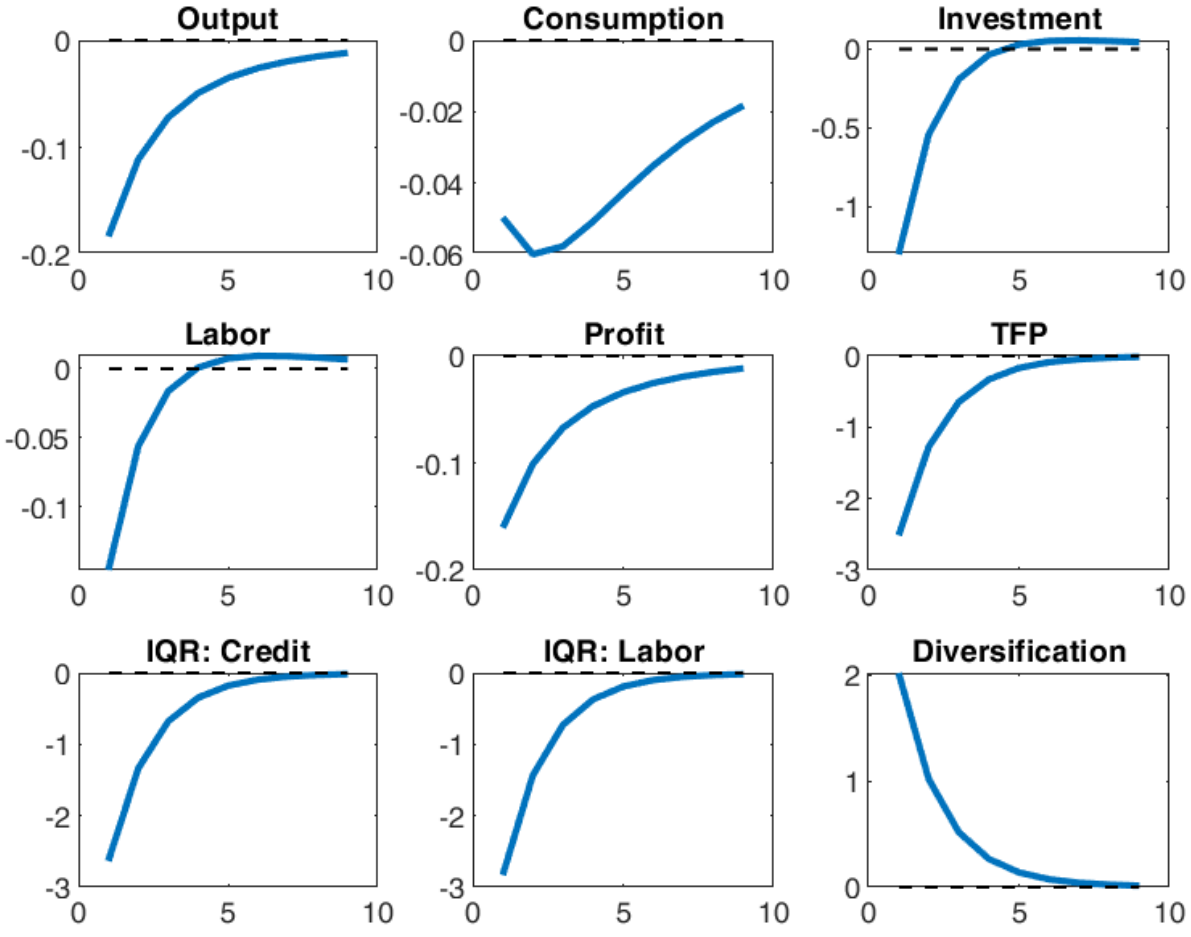

Figure: IRFs to uncertainty shock

Counter-factual economy

1. CF 1: 'fixed' diversification at $E[\rho_{ss}(z_i)]$
   - Oi-Hartman-Abel channel $\rightarrow$ expansion
2. CF 2: 'quasi-fixed' diversification at $\rho_{ss}(z_i)$
   - firms in low-productivity sectors are more diversified at s.s.
   - uncertainty shock: more firms: low-z $\rightarrow$ high-z sector
   - average diversification in high-z sectors $\uparrow$ $\rightarrow$ misallocation
3. Benchmark: endogenous diversification: $\rho_t(z_i)$
   - uncertainty shock: endogenous diversification $\uparrow$
   - high-productivity firms more responsive $\rightarrow$ misallocation

Counter-factuals: The role of endogenous diversification

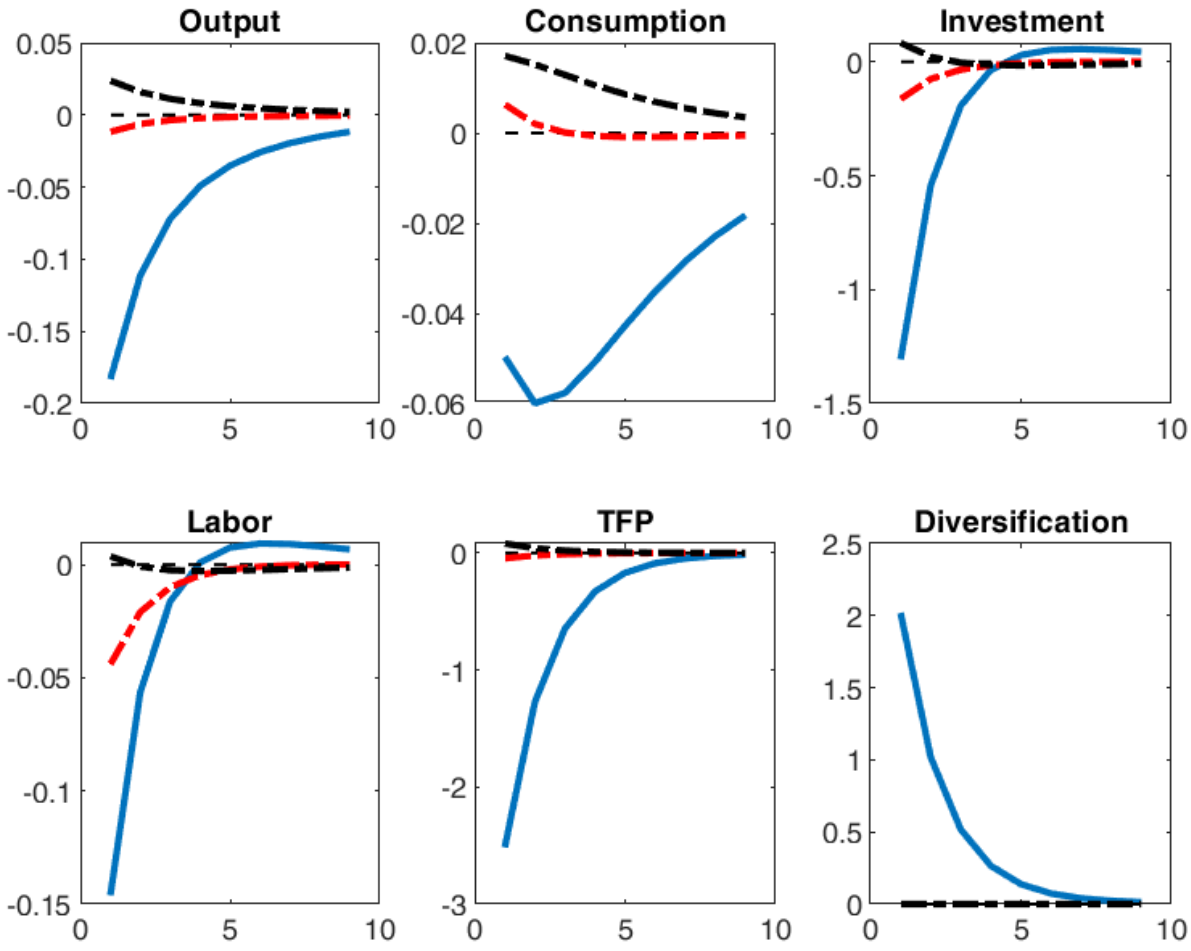

Figure: IRFs in baseline and counterfactual economies

Conclusion

- New stylized facts: corporate diversification & uncertainty
  1. flight-to-diversification
  2. paradox of flight-to-diversification
  3. misallocation effects of flight-to-diversification
- General equilibrium framework of corporate diversification
  - diversification $\rightarrow$ redistribution of cash flow
  - financial friction: redistribution of cash flow misallocation $\rightarrow$ misallocation of resources
  - welfare implication: over-diversification in CE
- Novel transmission channel of uncertainty shocks
  - $\rightarrow$ diversification $\uparrow \rightarrow$ misallocation $\uparrow \rightarrow$ productivity $\downarrow \rightarrow$ recession