International Diversification, Reallocation and the Labor Share

Joel M. David — FRB Chicago
Romain Ranciere — USC & NBER
David Zeke — USC

Summer 2022

Motivation

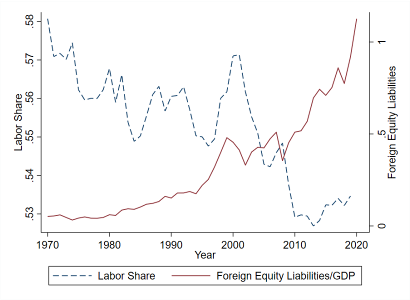
How does globalization affect labor market outcomes/income distribution?

Motivation

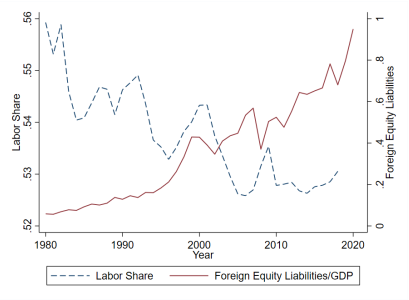
How does globalization affect labor market outcomes/income distribution?

- Recent decades: $\uparrow$ **financial** integration, $\downarrow$ labor's share of income

(a) United States



(b) GDP-Weighted Global Average



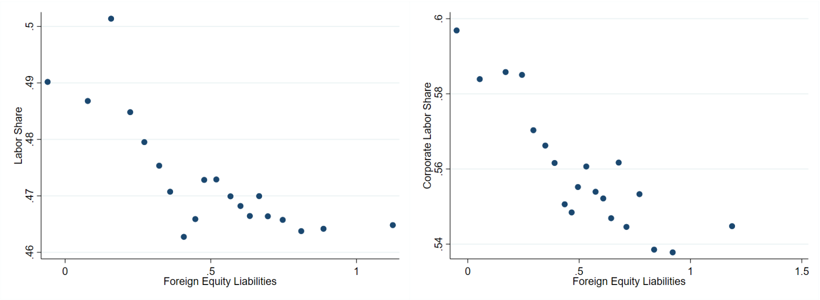
$\Rightarrow$ Links between int'l diversification and labor's share of income?

Motivation

How does globalization affect labor market outcomes/income distribution?

- Recent decades: $\uparrow$ **financial** integration, $\downarrow$ labor's share of income

(a) Total Labor Share (b) Corporate Labor Share



$\Rightarrow$ Links between int'l diversification and labor's share of income?

This paper

What we do: heterogeneous firms choose labor facing aggregate risk

- Price of risk affects allocation and micro/macro labor shares
- Int'l diversification reduces the price of risk, dual micro effects:
    1. Increases **within-firm** labor shares
    2. **Reallocation** towards risky/low labor share firms

$\Rightarrow$ Effect on agg LS depends on price x amount x heterogeneity of risk

What we find: verify key predictions using cross-country firm-level data

1. Riskier firms have lower labor shares
2. $\uparrow$ Int'l diversification $\Rightarrow$ reallocation to riskier, low LS firms

   $\Rightarrow$ Agg LS $\downarrow$, effect sizable

This paper

What we do: heterogeneous firms choose labor facing aggregate risk

- Price of risk affects allocation and micro/macro labor shares
- Int'l diversification reduces the price of risk, dual micro effects:
    1. Increases **within-firm** labor shares
    2. **Reallocation** towards risky/low labor share firms

$\Rightarrow$ Effect on agg LS depends on price x amount x heterogeneity of risk

What we find: verify key predictions using cross-country firm-level data

1. Riskier firms have lower labor shares
2. $\uparrow$ Int'l diversification $\Rightarrow$ reallocation to riskier, low LS firms

   $\Rightarrow$ Agg LS $\downarrow$, effect sizable

Related literature

1. Financial liberalization, international diversification & risk-taking

Obstfeld (1994); Thesmar & Thoenig (2011); Levchenko (2005, 2009)

2. Decline of the labor share

Karabarbounis & Neiman (2014); Hartman-Glaser et al. (2019); Kehrig & Vincent (2021); Autor et al. (2020); Lashkari et al. (2018); Acemoglu & Restrepo (2018, 2020); Autor & Salomons (2018); Elsby et al. (2013); Barkai (2020); Benmelech et al. (2020); Stansbury & Summers (2020); Grossman & Oberfield (2021)

3. Risk premia and input allocations

Donangelo, Gourio, Kehrig & Palacios (2018); David, Schmid, & Zeke (2021); David & Zeke (2022)

The model

Heterogeneous firms produce single good $Y_i = A_i K_i^{\alpha_1} L_i^{\alpha_2}$

- Choose L_i and K_i one period in advance to max market value
- Wage/rental rate cannot condition on next period shock realizations
- SDF Λ; for now, take as exogenous (endogenize later)

Firm value maximization: $\max_{L_i, K_i} \mathbb{E}\left[\Lambda\left(A_i K_i^{\alpha_1} L_i^{\alpha_2} - W L_i - R K_i\right)\right]$

Optimality condition yields micro-level (expected) labor share:

$$\frac{W L_i}{\mathbb{E}\left[Y_i\right]} = \alpha_2 \left(1 - \kappa_i\right) \quad \text{where} \quad \kappa_i = -\text{cov}\left(\frac{\Lambda}{\mathbb{E}\left[\Lambda\right]}, \frac{A_i}{\mathbb{E}\left[A_i\right]}\right)$$

$\Rightarrow$ κ_i captures firm-specific risk premium in labor choice

- If A_i procyclical, Λ countercyclical $\rightarrow$ $\kappa_i > 0$, $\downarrow$ LS_i
- More procyclical firms: $\uparrow$ κ_i, $\downarrow$ LS_i

Other production functions

The model

Heterogeneous firms produce single good $Y_i = A_i K_i^{\alpha_1} L_i^{\alpha_2}$

- Choose L_i and K_i one period in advance to max market value
- Wage/rental rate cannot condition on next period shock realizations
- SDF Λ; for now, take as exogenous (endogenize later)

Firm value maximization: $\max_{L_i, K_i} \mathbb{E}\left[\Lambda \left(A_i K_i^{\alpha_1} L_i^{\alpha_2} - WL_i - RK_i\right)\right]$

Optimality condition yields micro-level (expected) labor share:

$$\frac{WL_i}{\mathbb{E}[Y_i]} = \alpha_2 (1 - \kappa_i) \quad \text{where} \quad \kappa_i = -\text{cov}\left(\frac{\Lambda}{\mathbb{E}[\Lambda]}, \frac{A_i}{\mathbb{E}[A_i]}\right)$$

$\Rightarrow$ κ_i captures firm-specific risk premium in labor choice

- If A_i procyclical, Λ countercyclical $\rightarrow$ $\kappa_i > 0$, $\downarrow$ LS_i
- More procyclical firms: $\uparrow$ κ_i, $\downarrow$ LS_i

Other production functions

The model

Heterogeneous firms produce single good $Y_i = A_i K_i^{\alpha_1} L_i^{\alpha_2}$

- Choose L_i and K_i one period in advance to max market value
- Wage/rental rate cannot condition on next period shock realizations
- SDF Λ; for now, take as exogenous (endogenize later)

Firm value maximization: $\max_{L_i, K_i} \mathbb{E}\left[\Lambda\left(A_i K_i^{\alpha_1} L_i^{\alpha_2} - WL_i - RK_i\right)\right]$

Optimality condition yields micro-level (expected) labor share:

$$\frac{WL_i}{\mathbb{E}[Y_i]} = \alpha_2 (1 - \kappa_i) \quad \text{where} \quad \kappa_i = -\text{cov}\left(\frac{\Lambda}{\mathbb{E}[\Lambda]}, \frac{A_i}{\mathbb{E}[A_i]}\right)$$

$\Rightarrow$ κ_i captures firm-specific risk premium in labor choice

- If A_i procyclical, Λ countercyclical $\rightarrow$ $\kappa_i > 0$, $\downarrow$ LS_i
- More procyclical firms: $\uparrow$ κ_i, $\downarrow$ LS_i

▸ Other production functions

Resource allocation and aggregate labor share

Aggregate expected labor share:

$$\frac{WL}{\mathbb{E}\left[Y\right]} = \sum_i \frac{\mathbb{E}\left[Y_i\right]}{\mathbb{E}\left[Y\right]} \frac{WL_i}{\mathbb{E}\left[Y_i\right]}$$

$\Rightarrow$ Depends on joint dist. of micro-level output and labor shares

Allocations:

- Inputs: $$\frac{L_i}{L} = \frac{K_i}{K} = \frac{(\mathbb{E}[A_i](1-\kappa_i))^{\frac{1}{1-\alpha_1-\alpha_2}}}{\sum_i (\mathbb{E}[A_i](1-\kappa_i))^{\frac{1}{1-\alpha_1-\alpha_2}}}$$

- Output: $$\frac{\mathbb{E}[Y_i]}{\mathbb{E}[Y]} = \frac{\mathbb{E}[A_i]^{\frac{1}{1-\alpha_1-\alpha_2}} (1-\kappa_i)^{\frac{\alpha_1+\alpha_2}{1-\alpha_1-\alpha_2}}}{\sum_i \mathbb{E}[A_i]^{\frac{1}{1-\alpha_1-\alpha_2}} (1-\kappa_i)^{\frac{\alpha_1+\alpha_2}{1-\alpha_1-\alpha_2}}}$$

$\Rightarrow$ Output and labor shares both $\downarrow$ in κ_i, effects of risk on agg LS ambiguous

Neat expression for agg LS

Resource allocation and aggregate labor share

Aggregate expected labor share:

$$\frac{WL}{\mathbb{E}[Y]} = \sum_i \frac{\mathbb{E}[Y_i]}{\mathbb{E}[Y]} \frac{WL_i}{\mathbb{E}[Y_i]}$$

$\Rightarrow$ Depends on joint dist. of micro-level output and labor shares

Allocations:

- Inputs: $$\frac{L_i}{L} = \frac{K_i}{K} = \frac{(\mathbb{E}[A_i](1-\kappa_i))^{\frac{1}{1-\alpha_1-\alpha_2}}}{\sum_i(\mathbb{E}[A_i](1-\kappa_i))^{\frac{1}{1-\alpha_1-\alpha_2}}}$$
- Output: $$\frac{\mathbb{E}[Y_i]}{\mathbb{E}[Y]} = \frac{\mathbb{E}[A_i]^{\frac{1}{1-\alpha_1-\alpha_2}}(1-\kappa_i)^{\frac{\alpha_1+\alpha_2}{1-\alpha_1-\alpha_2}}}{\sum_i \mathbb{E}[A_i]^{\frac{1}{1-\alpha_1-\alpha_2}}(1-\kappa_i)^{\frac{\alpha_1+\alpha_2}{1-\alpha_1-\alpha_2}}}$$

$\Rightarrow$ Output and labor shares both $\downarrow$ in κ_i, effects of risk on agg LS ambiguous

Neat expression for agg LS

The price of risk

Decompose the risk premium:

$$\kappa_i = \underbrace{-\frac{\text{cov}(\mathcal{E}_i, \Lambda)}{\text{std}(\Lambda)}}_{\text{quantity of risk } = \mathcal{Q}_i} \times \underbrace{\frac{\text{std}(\Lambda)}{\mathbb{E}[\Lambda]}}_{\text{price of risk } = \mathcal{P}}$$

- Quantity of risk: firm-specific, exogenous
- Price of risk: common across firms, endogenous

Consider a change (fall) in the price of risk, i.e., $\mathcal{P} \downarrow$

- **Within effect**: firm-level labor shares increase
- **Reallocation effect**: resources shift towards riskier/low LS firms
- Formally:

$$\frac{\partial \frac{WL}{\mathbb{E}[Y]}}{\partial \mathcal{P}} = \underbrace{\sum_i \frac{\partial \frac{\mathbb{E}[Y_i]}{\mathbb{E}[Y]}}{\partial \mathcal{P}} \frac{WL_i}{\mathbb{E}[Y_i]}}_{\text{reallocation effect} > 0} + \underbrace{\sum_i \frac{\mathbb{E}[Y_i]}{\mathbb{E}[Y]} \frac{\partial \frac{WL_i}{\mathbb{E}[Y_i]}}{\partial \mathcal{P}}}_{\text{within effect} < 0}$$

$\Rightarrow$ Net effect ambiguous, but can gain intuition from simple examples

The price of risk

Decompose the risk premium:

$$\kappa_i = \underbrace{-\frac{\text{cov}\left(\mathcal{E}_i, \Lambda\right)}{\text{std}\left(\Lambda\right)}}_{\text{quantity of risk } = \ \mathcal{Q}_i} \times \underbrace{\frac{\text{std}\left(\Lambda\right)}{\mathbb{E}\left[\Lambda\right]}}_{\text{price of risk } = \ \mathcal{P}}$$

- Quantity of risk: firm-specific, exogenous
- Price of risk: common across firms, endogenous

Consider a change (fall) in the price of risk, i.e., $\mathcal{P} \downarrow$

- **Within effect**: firm-level labor shares increase
- **Reallocation effect**: resources shift towards riskier/low LS firms
- Formally:

$$\frac{\partial \frac{WL}{\mathbb{E}[Y]}}{\partial \mathcal{P}} = \underbrace{\sum_i \frac{\partial \frac{\mathbb{E}[Y_i]}{\mathbb{E}[Y]}}{\partial \mathcal{P}} \frac{WL_i}{\mathbb{E}\left[Y_i\right]}}_{\text{reallocation effect} > 0} + \underbrace{\sum_i \frac{\mathbb{E}\left[Y_i\right]}{\mathbb{E}\left[Y\right]} \frac{\partial \frac{WL_i}{\mathbb{E}[Y_i]}}{\partial \mathcal{P}}}_{\text{within effect} < 0}$$

$\Rightarrow$ Net effect ambiguous, but can gain intuition from simple examples

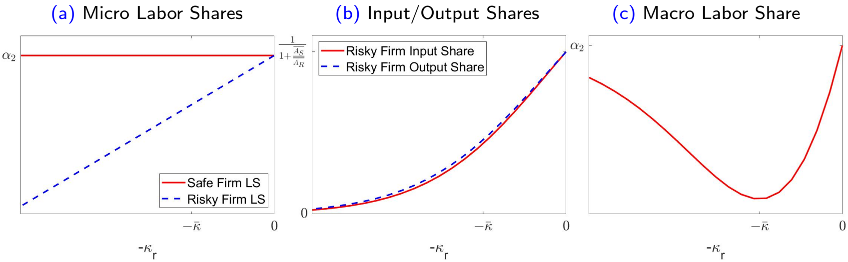
Example: two firms, one risky, one safe

Two types, risky and safe: A_r stochastic, $A_s = \mathbb{E}[A_s]$

- $\kappa_r > 0$, $\kappa_s = 0$

Fall in κ_r (i.e., $\mathcal{P}$):

- Within effect > 0; reallocation effect < 0
- **Aggregate LS** falls iff $\kappa_r > \overline{\kappa}$



▸ Gaussian Example

International diversification

Two agent types

- 'Workers': provide labor, cannot participate in asset markets
- 'Capitalists': own firms (and capital), trade financial assets, CRRA utility

Two firm types, risky and safe; continuum of mass zero countries

- Risky productivity A_j uncorrelated across countries
- Proportional cost τ_j on foreign holdings of country j assets
- Costless trade in risk-free bond

Three equilibria, depends on level of τ_j:

- $\tau_j = 0$: **Complete diversification** – risk neutral pricing
- $\tau_j \in (0, \overline{\tau}_j)$: **Interior** – risky firm held by domestic and foreign capitalists
- $\tau_j \geq \overline{\tau}_j$: **Autarky** – risky firm held only by domestic capitalist

International diversification

Two agent types

- ‘Workers’: provide labor, cannot participate in asset markets
- ‘Capitalists’: own firms (and capital), trade financial assets, CRRA utility

Two firm types, risky and safe; continuum of mass zero countries

- Risky productivity A_j uncorrelated across countries
- Proportional cost τ_j on foreign holdings of country j assets
- Costless trade in risk-free bond

Three equilibria, depends on level of τ_j:

- $\tau_j = 0$: **Complete diversification** – risk neutral pricing
- $\tau_j \in (0, \overline{\tau}_j)$: **Interior** – risky firm held by domestic and foreign capitalists
- $\tau_j \geq \overline{\tau}_j$: **Autarky** – risky firm held only by domestic capitalist

Risk premia and labor share in interior equilibria

Valuations: $P_{rj} = \mathbb{E}[\Lambda_j \Pi_{rj}] = \frac{1}{1+\tau_j}\mathbb{E}[\Lambda_h \Pi_{rj}]$

- Risk premium pinned down by τ_j:

$$-\kappa_{rj} \equiv \text{cov}\left(\frac{\Lambda_j}{\mathbb{E}[\Lambda_j]}, \frac{A_j}{\mathbb{E}[A_j]}\right) = -\frac{\tau_j(1-\alpha_1-\alpha_2)}{1+\tau_j(1-\alpha_1-\alpha_2)}$$

$\Rightarrow$ Resource allocation, micro and macro labor shares affected by τ_j

Risk premia and labor share in interior equilibria

Valuations: $P_{rj} = \mathbb{E}\left[\Lambda_j \Pi_{rj}\right] = \frac{1}{1+\tau_j}\mathbb{E}\left[\Lambda_h \Pi_{rj}\right]$

- Risk premium pinned down by τ_j:

$$-\kappa_{rj} \equiv \text{cov}\left(\frac{\Lambda_j}{\mathbb{E}\left[\Lambda_j\right]}, \frac{A_j}{\mathbb{E}\left[A_j\right]}\right) = -\frac{\tau_j\left(1-\alpha_1-\alpha_2\right)}{1+\tau_j\left(1-\alpha_1-\alpha_2\right)}$$

$\Rightarrow$ Resource allocation, micro and macro labor shares affected by τ_j

Fall in cost of foreign investment, $\tau_j \Rightarrow$ foreign investors hold more equity:

1. Price of risk, risk premium decrease
2. **Within effect** increases the aggregate labor share
3. **Reallocation effect** decreases the aggregate labor share
4. Agg labor share falls iff $\tau_j > \widehat{\tau_j}$ (price of risk high enough)

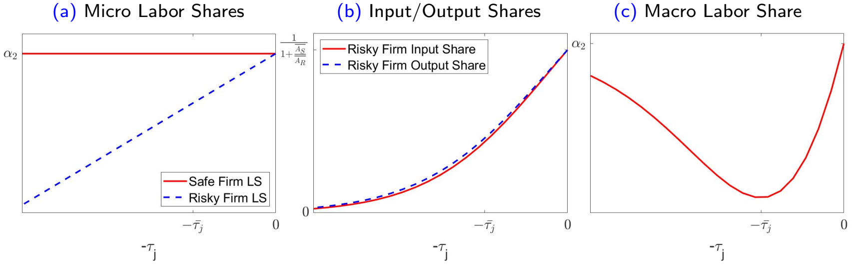
Risk premia and labor share in interior equilibria

Valuations: $P_{rj} = \mathbb{E}[\Lambda_j \Pi_{rj}] = \frac{1}{1+\tau_j}\mathbb{E}[\Lambda_h \Pi_{rj}]$

- Risk premium pinned down by τ_j:

$$-\kappa_{rj} \equiv \text{cov}\left(\frac{\Lambda_j}{\mathbb{E}[\Lambda_j]}, \frac{A_j}{\mathbb{E}[A_j]}\right) = -\frac{\tau_j(1-\alpha_1-\alpha_2)}{1+\tau_j(1-\alpha_1-\alpha_2)}$$

$\Rightarrow$ Resource allocation, micro and macro labor shares affected by τ_j



Empirical validation

Key implications of model:

1. Trends: Reallocation lowers labor share, within-firm changes raise it
    - Verified in Orbis, Compustat Countries
2. Risky firms have lower labor share
    - High market risk firms have lower labor share (Compustat Global/US)
3. Rise in foreign equity liabilities $\Rightarrow$ reallocation to riskier firms
    - Verified using data on foreign equity liabilities + Compustat Global/US

Cumulative effect of reallocation, within components

$$\text{Model: } \frac{\partial \frac{WL}{\mathbb{E}[Y]}}{\partial \mathcal{P}} = \underbrace{\sum_i \frac{\partial \frac{\mathbb{E}[Y_i]}{\mathbb{E}[Y]}}{\partial \mathcal{P}} \frac{WL_i}{\mathbb{E}[Y_i]}}_{\text{reallocation effect}>0} + \underbrace{\sum_i \frac{\mathbb{E}[Y_i]}{\mathbb{E}[Y]} \frac{\partial \frac{WL_i}{\mathbb{E}[Y_i]}}{\partial \mathcal{P}}}_{\text{within effect}<0}$$

Cumulative effect of reallocation, within components

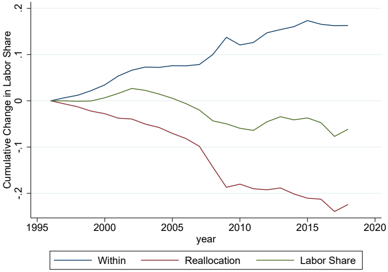
$$\text{Model: } \frac{\partial \frac{WL}{\mathbb{E}[Y]}}{\partial \mathcal{P}} = \underbrace{\sum_i \frac{\partial \frac{\mathbb{E}[Y_i]}{\mathbb{E}[Y]}}{\partial \mathcal{P}} \frac{WL_i}{\mathbb{E}[Y_i]}}_{\text{reallocation effect}>0} + \underbrace{\sum_i \frac{\mathbb{E}[Y_i]}{\mathbb{E}[Y]} \frac{\partial \frac{WL_i}{\mathbb{E}[Y_i]}}{\partial \mathcal{P}}}_{\text{within effect}<0}$$

$$\text{Data: } \Delta \frac{WL}{Y} = \underbrace{\sum_i \left(\frac{Y_{i,t+1}}{Y_{t+1}} - \frac{Y_{i,t}}{Y_t} \right) LS_{i,t+1}}_{\text{reallocation effect}} + \underbrace{\sum_i \frac{Y_{i,t}}{Y_t} \left(LS_{i,t+1} - LS_{i,t} \right)}_{\text{within effect}}$$

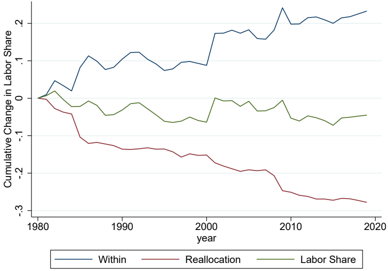
$$LS_{i,t} = \frac{\text{Labor Compensation}}{\text{Value Added}} \qquad Y_{i,t} = \text{Value Added}$$

Cumulative effect of reallocation, within components

$$\text{Data: } \Delta \frac{WL}{Y} = \underbrace{\sum_i \left(\frac{Y_{i,t+1}}{Y_{t+1}} - \frac{Y_{i,t}}{Y_t} \right) LS_{i,t+1}}_{\text{reallocation effect}} + \underbrace{\sum_i \frac{Y_{i,t}}{Y_t} \left(LS_{i,t+1} - LS_{i,t} \right)}_{\text{within effect}}$$



(a) Orbis, G7



(b) Compustat, US

More Countries
Reallocation Across vs Within Industries

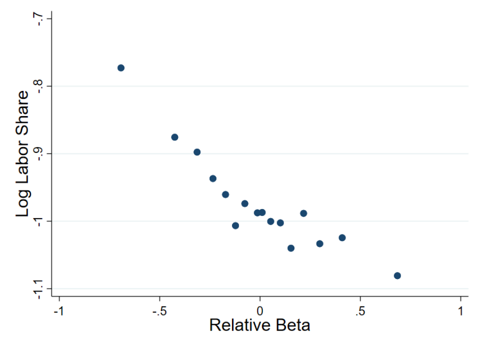
Firm-level risk and labor share: evidence from Compustat Global

Key ingredient for theory: risky firms have lower relative labor share

- Firm risk: country market beta *relative* to industry

$$r_{ijt} - r^f_{jt} = \beta_{it} \left(r^m_{jt} - r^f_{jt} \right) + \epsilon_{it},$$ residualize on country-ind-year [Details]

- Labor share $= \frac{\text{Labor Compensation}}{\text{Value Added}}$, well reported in Compustat Global [Details]



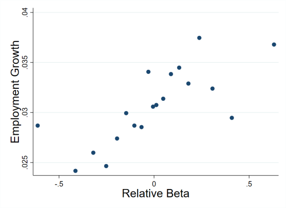
Magnitude: one std. dev. $\uparrow \ \beta_i \ \Rightarrow \ LS_i \downarrow$ 4 - 8%

[Regression] [US Compustat] [US Compustat Regression]

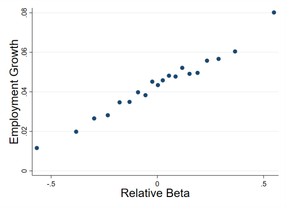
Risk, labor share, and reallocation

Model: $\uparrow$ diversification $\rightarrow$ reallocation towards risky/low LS firms

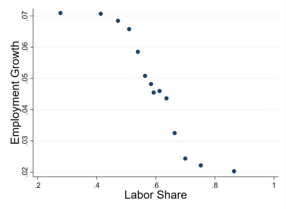
Data: Reallocation over time towards firms that are risky, have low labor share



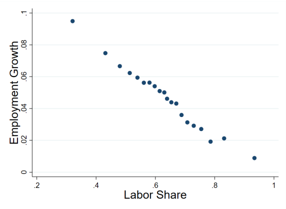
(a) Compustat Global, 1987-



(b) Compustat US, 1973-



(c) Compustat Global



(d) Compustat US

Risk, labor share, and reallocation - Compustat Global

Model: $\uparrow$ diversification $\rightarrow$ reallocation towards risky/low LS firms

$$\Delta \log \frac{Z_{ijt}}{Z_{indjt}} = \gamma_{\beta,FEL} \beta_i \Delta FEL_{jt} + \gamma_x X_{ijt} + \varepsilon_{ijt}$$

FEL = Foreign Equity Liabilities/GDP (from *External Wealth of Nations*)

	Sales		Labor	
	(1)	(2)	(1)	(2)
	OLS	IV	OLS	IV
Relative Beta $\times$ ΔFEL	0.146^{***}		0.0803^{***}	
	(4.43)		(4.21)	
Observations	73101		71288	
ind $\times$ *yr* $\times$ *cty* F.E.	X		X	
Firm-specific trend	X		X	

Magnitude: US FEL since 1980 $\uparrow$ 1.7%/year

$\Rightarrow$ One std. dev. higher beta firm grew $\approx 0.1 - 0.2\%$ faster every year

Risk, labor share, and reallocation - Compustat Global

Construct IV to address possible endogeneity of foreign equity liabilities

- Isolate variation exogenous to domestic financial conditions
- Idea: Liabilities of one country are assets of others
- Identity: $FEL_{j,t} = \sum_{s \neq j} H_{s,j,t} FEA_{s,t}$
  - $FEA_{s,t}$ = total foreign equity assets of country s
  - $FEA_{s,j,t}$ = foreign equity assets of country s from country j issuers
  - $H_{s,j,t} = \frac{FEA_{s,j,t}}{FEA_{s,t}}$ share of country j equity in country s FEA

Risk, labor share, and reallocation - Compustat Global

Construct IV to address possible endogeneity of foreign equity liabilities

- Isolate variation exogenous to domestic financial conditions
- Idea: Liabilities of one country are assets of others
- Identity: $FEL_{j,t} = \sum_{s \neq j} H_{s,j,t} FEA_{s,t}$
  - $FEA_{s,t}$ = total foreign equity assets of country s
  - $FEA_{s,j,t}$ = foreign equity assets of country s from country j issuers
  - $H_{s,j,t} = \frac{FEA_{s,j,t}}{FEA_{s,t}}$ share of country j equity in country s FEA

Instrument: lagged portfolio share, change in other countries FEA

$$\widehat{\Delta FEL}_{j,t} = \sum_{s \neq j} \underbrace{H_{s,j,t-1}}_{\text{lagged}} \Delta \left(FEA_{s,t} - \underbrace{FEA_{s,j,t}}_{\text{exclusion}} \right)$$

Variation coming from heterogeneous cross-border equity patterns

Data Source: IMF CPIS/CDIS surveys, sample 1999-

Risk, labor share, and reallocation - Compustat Global

Model: $\uparrow$ diversification $\rightarrow$ reallocation towards risky/low LS firms

$$\Delta \log \frac{Z_{ijt}}{Z_{indjt}} = \gamma_{\beta,FEL} \beta_i \Delta FEL_{jt} + \gamma_x X_{ijt} + \varepsilon_{ijt}$$

FEL = Foreign Equity Liabilities/GDP (from *External Wealth of Nations*)

	Sales		Labor	
	(1)	(2)	(1)	(2)
	OLS	IV	OLS	IV
Relative Beta × ΔFEL	0.146***	0.245***	0.0803***	0.121***
	(4.43)	(4.36)	(4.21)	(3.75)
Observations	73101	56330	71288	55220
ind × *yr* × *cty* F.E.	X	X	X	X
Firm-specific trend	X	X	X	X

Magnitude: US FEL since 1980 $\uparrow$ 1.7%/year

$\Rightarrow$ One std. dev. higher beta firm grew $\approx 0.1 - 0.2\%$ faster every year

Diversification and aggregate labor share - cross country regression

First-order approximation of model yields:

$$\Delta \log LS_j = \alpha_j + \underbrace{\gamma_{FEL}\Delta FEL_{j,t}}_{\text{Int'l diversification}} + \underbrace{\gamma_{tfp}\Delta\left(tfp_{j,t} - \mathbb{E}_{t-1}\left[tfp_{j,t}\right]\right)}_{\text{TFP shocks}} + \varepsilon_{j,t}$$

	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
ΔFEL	-0.0298***	-0.0427***		
	(-3.46)	(-3.26)		
ΔTFP shock	0.0244	-0.0359		
	(0.46)	(-0.70)		
ΔAverage hours				
ΔRel. price of investment				
Country trend F.E.	X	X		
Observations	439	302		

Magnitude: US FEL/GDP 1970 to 2020 ↑ 5% to 100% ⇒ LS ↓ 2-3 p.p.

Diversification and aggregate labor share - cross country regression

Extension to CES:

$$\Delta \log LS_j = \alpha_j + \underbrace{\gamma_{FEL} \Delta FEL_{j,t}}_{\text{Int'l diversification}} + \underbrace{\gamma_{tfp} \Delta \left(tfp_{j,t} - \mathbb{E}_{t-1}\left[tfp_{j,t} \right] \right)}_{\text{Productivity shocks}} + \underbrace{\gamma_{KL} \Delta \log(K_{j,t}/L_{j,t})}_{\text{K/L determinants}} + \varepsilon_{j,t}$$

	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
ΔFEL	-0.0298***	-0.0427***	-0.0136	-0.0316**
	(-3.46)	(-3.26)	(-1.48)	(-2.43)
ΔTFP shock	0.0244	-0.0359	0.0556	-0.00770
	(0.46)	(-0.70)	(1.04)	(-0.15)
ΔAverage hours			-0.0609	0.00175
			(-0.52)	(0.01)
ΔRel. price of investment			0.0391***	0.0243*
			(3.08)	(1.86)
Country trend F.E.	X	X	X	X
Observations	439	302	382	248

Magnitude: US FEL/GDP 1970 to 2020 $\uparrow$ 5% to 100% $\Rightarrow$ LS $\downarrow$ 2-3 p.p.

Conclusion

Theory linking int'l diversification to the aggregate labor share

- Increasing diversification can reduce the labor share
- Consistent with **within** and **reallocation** effects observed in micro-data
- Economic magnitudes significant

Grossman & Oberfield (2021) – will labor share stabilize...?

- Our mechanism suggests it may!

▸ Orbis Industry Regressions

Thank you!

Country selection

ORBIS country components:

- G7 countries in years with $>=$ 500 obs to compute components
- UK, Germany, France, Italy, Japan (US, Canada have too few)
- Results qualitatively unchanged if we include other advanced countries

Compustat Global

- Advanced countries with $>=$ 500 obs in at least one year
- Australia, Germany, France, UK, Singapore, Sweden, Taiwan
- Australia, & European Countries have $>$ 50% report labor comp.

Back

Measuring firm exposure to aggregate risk

1. Compute firm market beta: $r_{ijt} - r^f_{jt} = \beta_{it} \left(r^m_{jt} - r^f_{jt} \right) + \epsilon_{it}$
2. Residualize on industry-year fixed effects, compute avg over firm life
3. Results in measure of *relative* exposure to risk vs other firms in industry

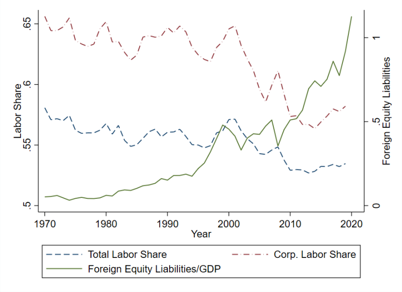
Why this procedure?

- If systematic reallocation, market portfolio changes, so do measured betas
- By definition, **mkt cap weighted avg beta = 1**
- Reallocation towards riskier firms doesn't mean average mkt beta increases
- Our measure corrects for this - time invariant firm beta, relative to industry

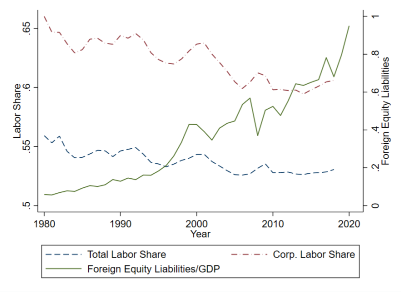
Back

Corporate sector labor share

(a) United States



(b) GDP-Weighted Global Average



More general production functions

CES Production: $Y_i = A_i\left((1-\theta)K_i^{\rho} + \theta L_i^{\rho}\right)^{\frac{\nu}{\rho}}$

Firm-level labor share:

$$\frac{WL_i}{\mathbb{E}\left[Y_i\right]} = \frac{\nu\theta}{\left(\frac{K}{L}\right)^{\rho}(1-\theta)+\theta}\left(1-\kappa_i\right)$$

More generally:

$$\frac{WL_i}{\mathbb{E}\left[Y_i\right]} = \frac{\mathbb{E}\left[MRPL_i\right]L_i}{\mathbb{E}\left[Y_i\right]}\left(1\ \underbrace{+\ \mathrm{cov}\left(\frac{\Lambda}{\mathbb{E}\left[\Lambda\right]},\frac{MRPL_i}{\mathbb{E}\left[MRPL_i\right]}\right)}_{\text{Risk adjustment}}\right)$$

▸ Back

Expression for aggregate labor share

Aggregate labor share:

$$\frac{WL}{E[Y]} = \alpha_2 \frac{\sum_i A_i^{\frac{1}{1-\alpha_1-\alpha_2}} (1-\kappa_i)^{\frac{1}{1-\alpha_1-\alpha_2}}}{\sum_i A_i^{\frac{1}{1-\alpha_1-\alpha_2}} (1-\kappa_i)^{\frac{\alpha_1+\alpha_2}{1-\alpha_1-\alpha_2}}}$$

▸ Back

Example 2

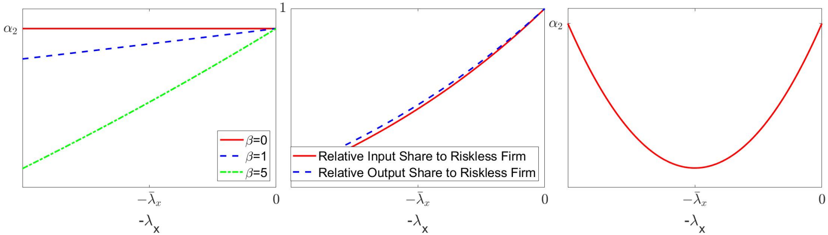
Gaussian distributed firm types: $\log A_i = \log \overline{A}_i + \beta_i \log X$

- SDF: $\log \Lambda = \log \overline{\Lambda} - \lambda_x \log X$
- $\mathcal{Q}_i = \beta_i \sigma(x)\,, \quad \mathcal{P} \approx \lambda_x \sigma(x)$

Fall in λ_x (i.e., $\mathcal{P}$):

- Aggregate LS falls iff $\lambda_x > \overline{\lambda}_x = \frac{1}{\sigma_\beta^2 \sigma_x^2} \frac{1-\alpha_1-\alpha_2}{1-(\alpha_1+\alpha_2)^2}$

(a) Micro Labor Shares (b) Input/Output Shares (c) Macro Labor Share



Back

Firm-level risk and labor share – data

Compustat data – publicly traded US firms, 1973-2020

Firm-level risk exposure

- Proxy for risk exposure using stock market (CAPM) beta
- Compute using daily returns
- Residualize on industry-year FE to calculate *relative* beta

Firm-level labor share

- Challenge: only small subset of firms report labor expense
- Use labor intensity (L/Y) and measures from Donangelo et al. (2018)
- ELS uses avg. industry-year wage

Details Back

Labor share measures in Compustat

Measures following Donangelo, Kehrig, Gourio, Palacios (2018 JFE):

Labor share (LS) $= \frac{\text{Labor Expense}}{\text{Operating Income before Dep.} + \Delta(\text{Inventories} - \text{Finished Goods}) + \text{Labor Expense}}$

- Well reported in Compustat Global
- Only a fraction of firms in Compustat US report this

Extended labor share (ELS)

- Set equal to LS for firms who report labor expense
- For firms who don't, Labor expense = Employees x avg. $\left(\frac{\text{Labor expense}}{\text{Employees}}\right)$

Back

Diversification and industry heterogeneity

Extend model to multiple industries

- More heterogeneity in risk/LS $\Rightarrow$ larger reallocation effect
- Higher average risk/(lower) average LS $\Rightarrow$ larger within effect

Cross-country firm-level data from Orbis

- Measure industry-country-year mean and std. dev. of firm labor shares
- No measures of risk exposure

Back

Diversification and industry heterogeneity

Extend model to multiple industries

- More heterogeneity in risk/LS $\Rightarrow$ larger reallocation effect
- Higher average risk/(lower) average LS $\Rightarrow$ larger within effect

Cross-country firm-level data from Orbis

- Measure industry-country-year mean and std. dev. of firm labor shares
- No measures of risk exposure

▸ Back

Diversification and industry heterogeneity – results

To first-order approximation:

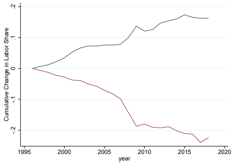
$$\log LS_{s,j,t} = \underbrace{\gamma_\sigma}_{<0} \sigma^{LS}_{s,j,t-1} FEQ_{j,t} + \underbrace{\gamma_\mu}_{<0} \mu^{LS}_{s,j,t-1} FEQ_{j,t} + controls + \varepsilon_{i,t}$$

	(1)	(2)	(3)
Foreign Equity Liabilities × L.stdev log(LS)	-0.0983*	-0.0513**	-0.0592**
	(-1.95)	(-2.40)	(-2.26)
Foreign Equity Liabilities × L.mean log(LS)	-0.127*	-0.0869**	-0.0940**
	(-1.86)	(-2.74)	(-2.62)
Foreign Equity Liabilities × L.stdev log(sales)			-0.00992
			(-1.22)
Foreign Equity Liabilities × L.mean log(sales)			-0.00471
			(-1.07)
Industry-year,industry-country, country-year F.E.	no	yes	yes
R^2	0.485	0.791	0.804
Observations	71346	69431	57325

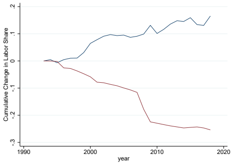
More dispersion/higher mean LS → larger response to ↑ diversification

Back

Effect of Reallocation, Within Components

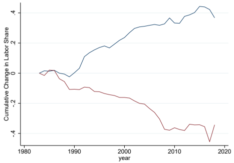


(a) G7

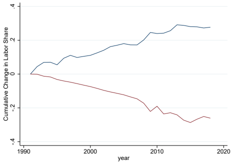


(b) Germany

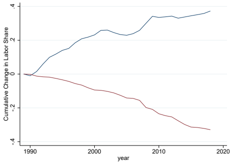
(c) France



(d) UK



(e) Italy

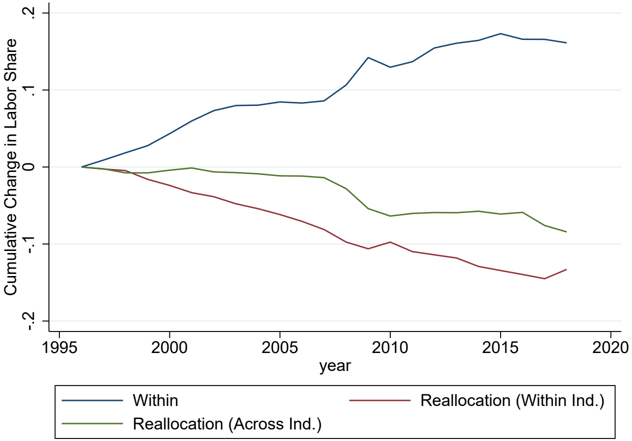


(f) Japan

Back

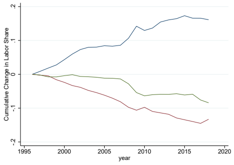
Effect of Reallocation, Within Components - ORBIS, G7

Can also separate reallocation into within, across industry

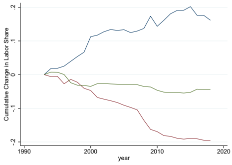


Back

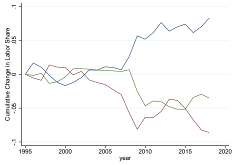
Effect of Reallocation, Within Components



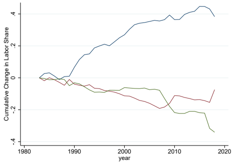
(a) G7



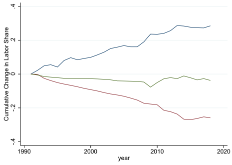
(b) Germany



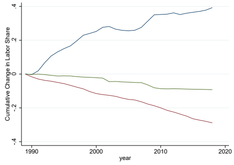
(c) France



(d) UK



(e) Italy



(f) Japan

Back

Firm-level risk and labor share – regression

Model: firms more exposed to aggregate risk have lower LS

$$\log LS_{i,t+1} = \gamma_{s,t} + \gamma_\beta \beta_i + \gamma_X X_{i,t} + \varepsilon_{i,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
Relative Beta	-0.171***	-0.166***	-0.196***	-0.131***	-0.118***	-0.127***
	(-5.96)	(-7.07)	(-11.49)	(-7.42)	(-5.93)	(-5.73)
F.E.	*yr*	*cty* × *yr*	*ind* × *cty* × *yr*	*yr*	*cty* × *yr*	*ind* × *cty* × *yr*
Controls				yes	yes	yes
Observations	51223	51214	38486	35534	35522	25839

Magnitude: one std. dev. $\uparrow$ β_i $\Rightarrow$ $LS_i \downarrow$ 4 - 8%

Controls: age and size

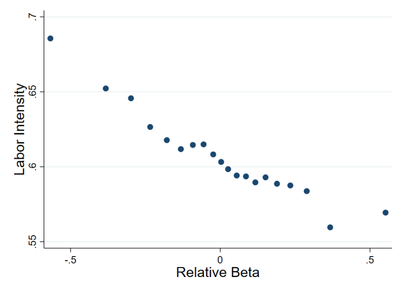
Robust to inclusion of global relative beta (Ken French developed mkt factor)

Back

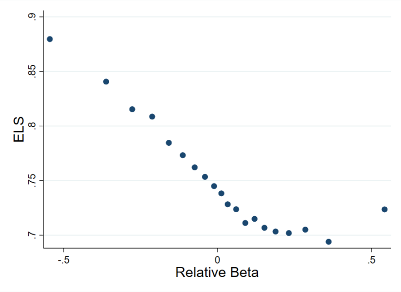
Firm-level risk and labor share – evidence

Model: firms more exposed to aggregate risk have lower LS

(a) Labor Intensity



(b) Labor Share



⇒ Risky/high beta firms have lower labor shares ▸ Back

Firm-level risk and labor share – results

Model: firms more exposed to aggregate risk have lower LS

$$\log LS_{i,t+1} = \gamma_{s,t} + \gamma_\beta \beta_i + \gamma_X X_{i,t} + \varepsilon_{i,t}$$

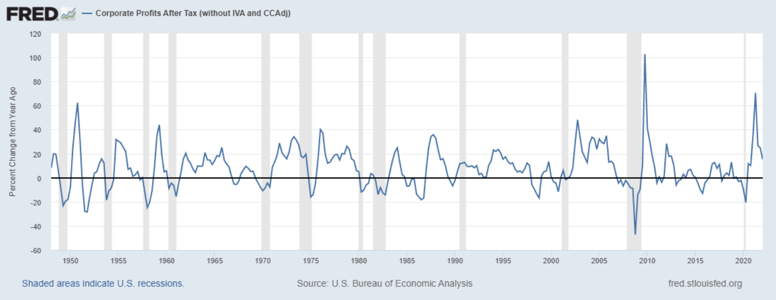
	(1) $\log\left(\frac{L}{Y}\right)$	(2) $\log(ELS)$	(3) $\log(LS)$	(4) $\log\left(\frac{L}{Y}\right)$	(5) $\log(ELS)$	(6) $\log(LS)$
γ_β	-0.238***	-0.241***	-0.105***	-0.336***	-0.176***	-0.166***
	(-12.57)	(-16.24)	(-3.16)	(-16.35)	(-14.62)	(-5.77)
Industry-year F.E.	yes	yes	yes	yes	yes	yes
Firm Controls	no	no	no	yes	yes	yes
R^2	0.677	0.405	0.718	0.716	0.510	0.797
Observations	153676	126730	11536	142760	118455	10039

Magnitude: one std. dev. $\uparrow$ β_i $\Rightarrow$ $LS_i \downarrow$ 3-10%

Controls: age and size

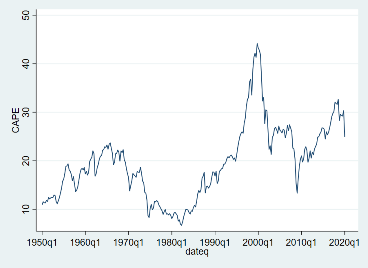
Back

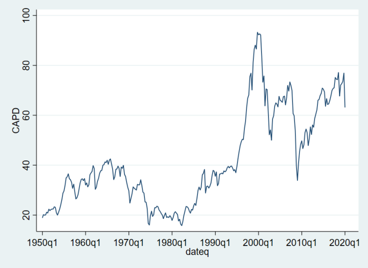
No great moderation in profits



Price of risk: price/earnings and price/dividend ratios:

Cyclically adjusted P/E and P/D proxies for the (inverse) of the price of risk:





Both have risen meaningfully in the past half century