Stock Returns in Global Value Chains: The Role of Upstreamness and Downstreamness

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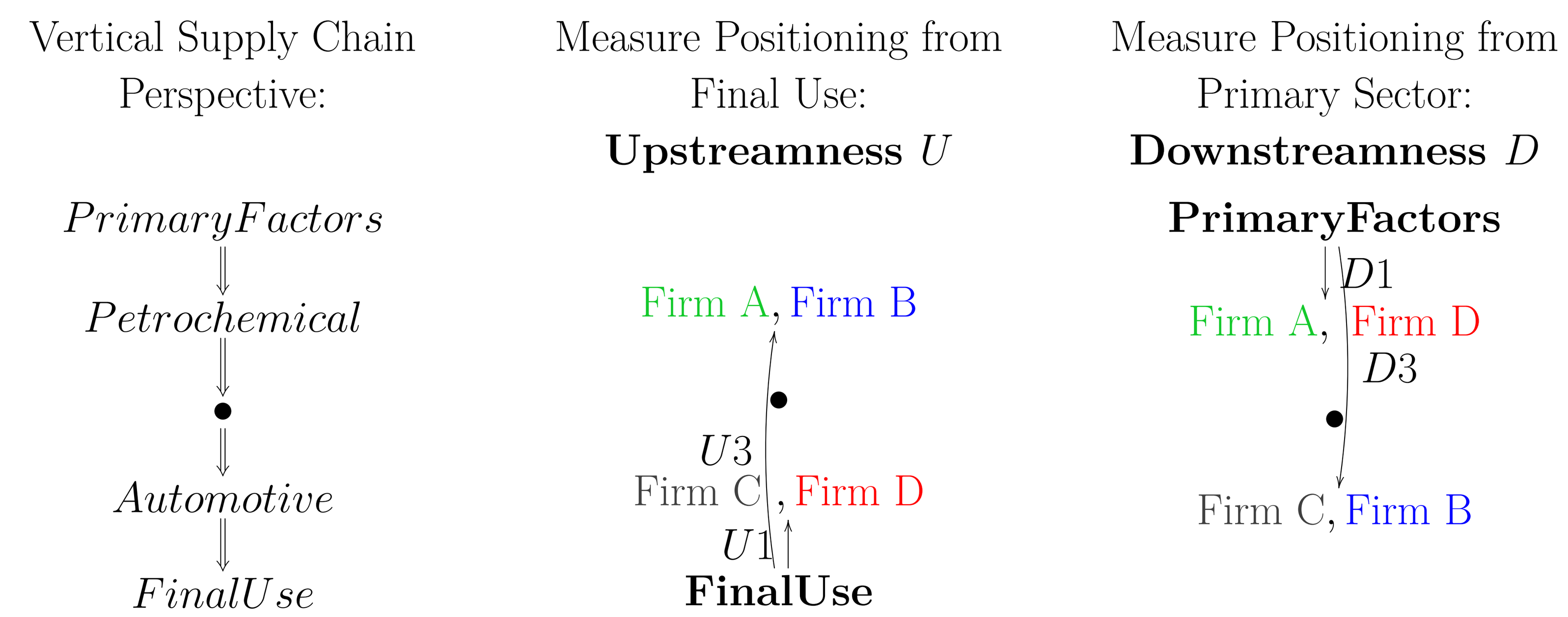
1. Motivation

— Summary —

This paper studies how **upstreamness** and **downstreamness** affect **stock returns in global value chains**. Up- and downstreamness measure **the average distance from final consumption and primary inputs**, respectively, and are computed from world input-output tables. We show that **downstreamness is a key driver of expected returns** around the globe, whereas **upstreamness is not**. Firms that are farthest away from primary inputs earn approximately 5% higher returns per year than firms that are closest. The effect is found **within and across countries** and suggests that **investors perceive supplier dependence** in global value chains as an **important source of risk**.

Upstreamness and Downstreamness



- Vertical supply chains define firms that are far away from primary inputs (i.e., high downstreamness) simultaneously as firms that are close to the final user (i.e., low upstreamness)
- However, this approach does not take into account the network structure of worldwide trade, as up- and downstreamness may not be inversely linked
- In the above example, Firm B (Firm D) has a high (low) up- and downstreamness at the same time, contradicting the plain vertical supply chain perspective

This Paper

Economic networks and macroeconomic fluctuations

- Acemoglu, Carvalho, Ozdaglar, and Tahbaz-Salehi (2012), Atalay (2017): Productivity shocks propagate not only to first-order, but also to second- or higher-order connected downstream sectors

⇒ In sparse networks, not only first-order, but also higher-order connections should be considered; our metrics take all connections into account

Global value chain positioning

- McNerney, Savoie, Caravelli, Carvalho, and Farmer (2022): Supply shocks that originate at primary inputs accumulate while propagating downstream (i.e., to customers)

⇒ If microeconomic shocks propagate, the relative value chain position of industries could have first-order effects on their economic output

Trade linkages in asset pricing

- Gofman, Segal, and Wu (2020): U.S. firms with high upstreamness are more exposed to aggregate productivity shocks and therefore carry a risk premium

⇒ Since trade networks are global, economic analyses should be based on them

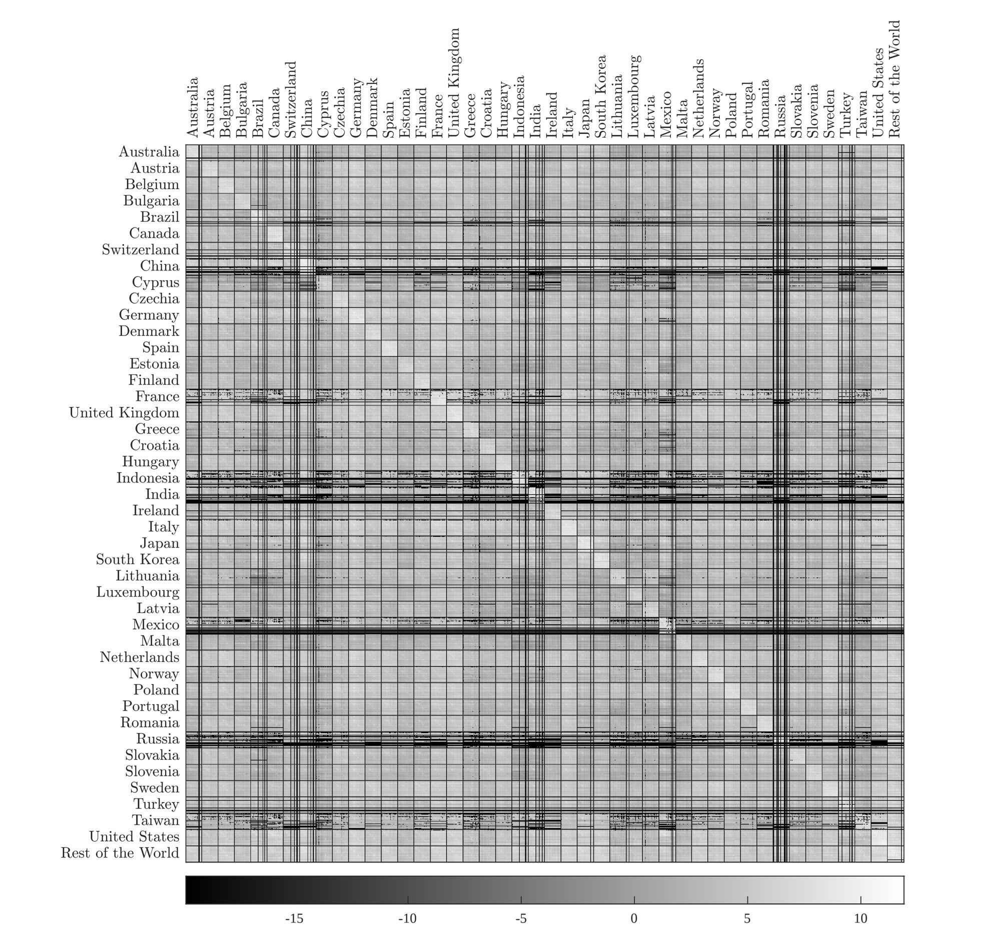
Our Approach

⇒ We study a large set of global value chains and discriminate between industries' global up- **and** downstreamness

⇒ We link these metrics to **international** stock market data

2. Data and Methodology

Data



Trade data

- World input-output tables from WIOD project
- WIOTs cover 43 countries with 56 ISIC sectors each from 2000 to 2014
- Original data comes from national bureaus, covering >85% of global GDP
- Industries are categorized by ISIC Rev. 4 code

Stock market data

- U.S.: CRSP and CRSP/Compustat Merged
- International: TR Datastream and Worldscope

Final sample

- Data overlaps with 27 countries and 53 business sectors
- Final sample (01/2001 - 12/2015):
  - 2,862,374 stock-month obs. for 36,786 firms
  - 110,699 industry-month obs. for 767 industries (incl. controls)

Computation

Upstreamness

We rewrite the input-output identities for industry i using industries' outputs (GO), output supplied to industry j (Z_{ij}), and output supplied to the final user (F_i):

$$GO_i = F_i + \sum_{j=1}^{N} Z_{ij} = F_i + \sum_{j=1}^{N} a_{ij} GO_j, \tag{1}$$

where the input coefficient $a_{i,j} = \frac{Z_{ij}}{GO_j}$ reflects the share of industry j's total inputs that are supplied by industry i. Then, we iterate over (1) at different positions:

$$GO_i = F_i + \sum_{j=1}^{N} a_{ij} F_j + \sum_{j=1}^{N}\sum_{k=1}^{N} a_{ij} a_{jk} F_k + \dots \tag{2}$$

We compute the (weighted) average position in value chains as:

$$U_i = 1 \times \frac{F_i}{GO_i} + 2 \times \sum_{j=1}^{N} \frac{a_{ij} F_j}{GO_i} + 3 \times \sum_{j=1}^{N}\sum_{k=1}^{N} \frac{a_{ij} a_{jk} F_k}{GO_i} + \dots \tag{3}$$

where $U_i \geq 1$ and larger values imply higher upstreamness of i.

Downstreamness

Accordingly, we define the output coefficient $b_{j,i} = \frac{Z_{j,i}}{GO_j}$, which gives the share of industry j's gross output that is supplied to industry i, and reformulate the input-output identity using the value-added VA_i to

$$GO_i = VA_i + \sum_{j=1}^{N} GO_j b_{j,i}. \tag{4}$$

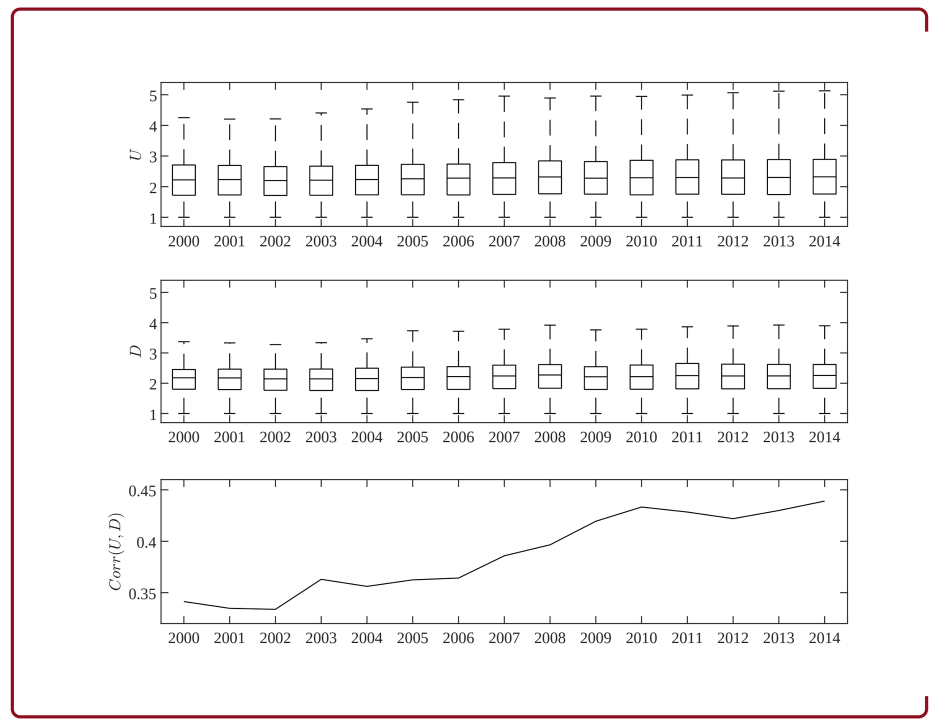
We then iterate over (4) and compute the (weighted) average position in value chains as:

$$D_i = 1 \times \frac{VA_i}{GO_i} + 2 \times \frac{\sum_{j=1}^{N} VA_j b_{j,i}}{GO_i} + 3 \times \frac{\sum_{j=1}^{N}\sum_{k=1}^{N} VA_k b_{k,j} b_{j,i}}{GO_i} + \dots, \tag{5}$$

where $D_i \geq 1$ and larger values imply higher downstreamness of i.

3. Empirical Evidence

Evolution of Up- and Downstreamness



- We find widening ranges for both up- and downstreamness
- In line with previous research, correlations are positive and grow from 0.34 in 2000 to 0.44 in 2014 (see, e.g. Miller and Temurshoev, 2017)
- Both upstream and downstream global value chains have become longer
- Up- and downstreamness must be studied simultaneously to identify the actual individual effect of any of the two variables

Industry-Level Panel Regressions

We estimate

$$r_{i,t} = \lambda_U U_{i,t-1} + \lambda_D D_{i,t-1} + \gamma' Z_{i,t} + \epsilon_{i,t} \tag{6}$$

where $r_{i,t}$ is industry i's monthly excess return, $U_{i,t-1}$ and $D_{i,t-1}$ are industry's up- and downstreamness in the previous year, and Z_i is a set of industry controls.

	$r_{i,t} - r_{f,t}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$U_{i,t-1}$	0.012		−0.030	−0.030	−0.040	−0.013	−0.055	0.077
	(0.284)		(−0.689)	(−0.745)	(−0.929)	(−0.280)	(−1.294)	(1.043)
$D_{i,t-1}$		0.156***	0.170***	0.170***	0.152***	0.240**	0.138**	0.149
		(2.786)	(2.950)	(3.429)	(2.661)	(2.427)	(2.503)	(0.703)
Observations	110699	110699	110699	110699	110699	110699	110699	110699
Adjusted R^2	0.361	0.361	0.361	0.361	0.406	0.360	0.615	0.381
Country FE	Yes	Yes	Yes	Yes	Yes	No	No	No
Month FE	Yes	Yes	Yes	Yes	No	Yes	No	No
Country × Month FE	No	No	No	No	No	No	Yes	No
ISIC Sector × Month FE	No	No	No	No	No	No	No	Yes
Estimator	OLS	OLS	OLS	OLS	FMB	OLS	OLS	OLS
Standard Errors	Month	Month	Month	Month & Industry	FMB	Month	Month	Month

Results

Main Findings

- Downstreamness is a key driver of expected returns around the globe, whereas upstreamness is not
- The effect is found within and across countries
- Industries that are farthest away from primary inputs earn approximately 5% higher returns per year than industries that are closest

Robustness

- We validate our empirical results by including various control variables, controlling for nonlinearities, equally-weighting firms within industries, and performing firm-level panel regressions

⇒ In all our specifications, only downstreamness significantly explains international expected returns

Interpretation

- Investors perceive supplier dependence in global value chains as an important source of risk and expect higher returns on investments in firms that have longer upstream value chains than others
- The analysis suggests that supply-side shocks propagate through input demand chains and accumulate when passing suppliers, making downstream firms particularly risky for investors