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Market Selection in Global Value Chains

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Outline

Outline

Introduction /1

- What mechanism is behind market success in a competitive setting?
- the market selection hypothesis: competition acts as a Darwinian filter — 'fitter' actors grow (gain market shares), less fit shrink/exit
- assumed relationship: better attributes (e.g. productivity) $\Rightarrow$ superior performance
- while theoretically sound, (firm–level) empirical evidence of selection at work is scant

- possible explanations:
  - choice of irrelevant (or mismeasured) fitness indicator (e.g. a scalar)
  - wrong unit of analysis (e.g. industries vs market vs submarkets)
  - selection 'does not bite': reallocation of market shares to fitter (e.g. more productive) firms is limited, and aggregate advances depend mostly on within–firms learning processes
  - **naïve interpretation of how selection works**

Introduction /2

- We argue that actors' performance cannot be considered in isolation: production linkages along value chains (VC) influence market selection ⇒ extended selection hypothesis
- in Cantner et al. (2019) we showed that 'regressive' developments of market selection can occur in certain VC layers but selection works as expected at the VC level
- **we test this idea/theory on Global Value Chains (GVCs), using labour productivity as 'fitness'**
- expectation: a producer's productivity that incorporates the contribution of upstream suppliers will have more explanatory power on performance compared to idiosyncratic measures
- an 'eclectic' paper: unit of analysis are not firms, but country–sectors; less fine–grained, but allows to account for global markets and imported intermediates/trade

Introduction /3

Workhorse model: replicator dynamics (Metcalfe 1994; Mazzucato 1998)

- generic form:

$$\dot{s}_i = \lambda s_i \left(f_i - \bar{f}\right), \bar{f} = \sum_i s_i f_i$$

- where s is actor's i market share (and dotted its change), f is the fitness indicator (e.g. productivity, (-)unit cost, product quality, etc.), and $\bar{f}$ is the share–weighted avg fitness; lambda is a parameter (speed of selection)
- extended replicator dynamics for a VC j composed by M layers:

$$\dot{s}_j = \lambda s_j \left(F_j - \bar{F}\right)$$

- where $F_j = \sum_{m=1}^{M} f_{j,m}$ with F aggregate fitness and f layer–specific fitness

Outline

Literature

We build on (and contribute to) literature...

- ...on (firm–level) heterogeneity, market selection and industrial dynamics
  - *equilibrium models* based on Markov–perfect ID (Doraszelski and Satterthwaite 2010; Hopenhayn 1992) & *evolutionary models* based on the replicator principle (Winter et al. 2003)
  - different theories, similar empirical (non-parametric) approach: *decomposition exercises/evolutionary accounting* (Maliranta and Määttänen 2105; Metcalfe 2008)
- ...on how network structures and production linkages shape outcomes
  - at the behavioural/micro (Galeotti et al. 2010); and macro (Carvahlo and Grassi 2019) levels
  - related to innovation (Savin and Egbetokun 2016); industrial policy (Liu 2019); export (Laursen and Meliciani 2000); and corporate strategy (Wan and Wu 2017)
- ...on Global Value Chains
  - structure (Antras 2020); production stages' allocation and their geographical location (Chor 2019; Antras and De Gortari 2020); governance (Gereffi 2005); and measurement (Johnson 2018)

Outline

Data and productivity measurement

Data

- World Input Output Database (WIOD) release 2016: network panel data on global production input linkages for the period 2000–2014; 43 countries (EU+other large economies tot $\sim$ 85% world GDP in 2016) * 56 sectors $\Rightarrow$ 2408 country–sectors
- unit of observation: country–sectors in the global market (rather than firms in a given sector)
- WIOD Socio–Economic Accounts

Productivity measurement

- in general, labour productivity (in line with the lit): value added per hour of labour (labour demand/requirement computed in I/O fashion as $\mathbf{L} = l(\mathbf{I} - \mathbf{A})^{-1}\mathbf{f}$):
- two indicators (for each country–sector)
  1. idiosyncratic productivity: ratio of a country–sector's gross output minus its intermediate use over the total hours worked in this particular country-sector
  2. value–chain productivity: ratio of the sum of value added across all layers of the GVC over the sum of both direct and indirect labour demand for producing a particular final good or service

Outline

Empirical strategy

We conduct a three steps analysis

- **Step 1**. Decomposition analysis of productivity change: idiosyncratic vs value−chain
- **Step 2**. Regression analysis output growth $\leftarrow$ productivity nexus: idiosyncratic vs value−chain
- **Step 3**. Spatial regression output growth $\leftarrow$ productivity: focal producer $+$ direct suppliers $+$ indirect suppliers

Step 1: productivity decomposition /1

- **Global** labour productivity of sector j (e.g. 'manufacture of computers') aggregating prod in that sector in all countries i: $\Pi_{j,t} = \sum_{i \in j} s_{i,t} \pi_{i,t}$
- dynamic decomposition of productivity **change** (Griliches and Regev 1995):

$$\Delta \Pi_{j,t} = \sum_{i \in j} \bar{s}_i \Delta \pi_{i,t} + \sum_{i \in j} \Delta s_{i,t} \bar{\pi}_i$$

- within and between components/effects: between as proxy of selection at work (if positive sign)
- we sum over the years (total effect of competition) and normalise following Dosi et al. (2015):

$$\left(\sum_t \sum_{i \in j} \Delta s_{i,t} \bar{\pi}_i \right) / \left(\sum_t \Delta \Pi_{j,t} \right) = \sum_t \left[\left(\frac{\sum_{i \in j} \Delta s_{i,t} \bar{\pi}_i}{\Delta \Pi_{j,t}} \right) \left(\frac{\Delta \Pi_{j,t}}{\sum_t \Delta \Pi_{j,t}} \right) \right]$$

Step 1: productivity decomposition /2

- **Results**: magnitude of between effect increases with the value–chain productivity measure
- **Implication**: the consideration of GVC linkages in a productivity–based fitness indicator facilitates the identification of selection effects ⇒ consistent with the extended selection hypothesis

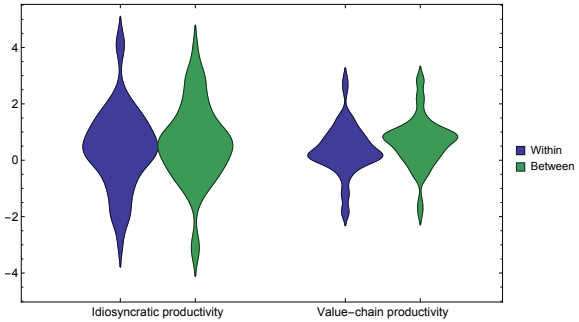

Figure: Violin plot of distribution of sectoral between and within component

Step 2: regression analysis of output growth /1

- A direct test of the performance–productivity nexus: strength of competition resulting in sales growth, rather than share growth
- for each country–sector, we estimate the growth equation (as in Bottazzi et al. 2010):

$$g_{i,t} = a + b_t + \beta_\Delta \Delta\pi_{i,t} + \beta_m \bar{\pi}_{i,t} + c_i + \epsilon_{i,t}$$

- where $g_{i,t}$ is (log) growth rate of output of country–sector i from $t-1$ to t, b_t is a time dummy, c_i is a country fixed effect, and $\Delta\pi_{i,t}$ and $\bar{\pi}_{i,t}$ are respectively (log) growth and time avg level of labour productivity
- we estimate the equation for the two productivity measures, and calculate the Shapley decomposition S^2 of the R^2 to determine the explanatory power of $\Delta\pi_{i,t}$ and $\bar{\pi}_{i,t}$

$$S^2 = \frac{\mathrm{Var}\left(\beta_\Delta \Delta\pi_{i,t} + \beta_m \bar{\pi}_{i,t}\right)}{\mathrm{Var}\left(g_{i,t}\right)}$$

- S^2 measures the share of the growth variance explained by the two productivity terms
- robustness check: include cross–sectional avgs of growth and prod variables to correct for cross–sectional dependence

Step 2: regression analysis of output growth /2

- **Results**: coefficient of $\Delta\pi_{i,t}$ is positive and statistically significant at the 0.1% level across all sectors; confirmed by S^2 decomposition: explanatory power of dynamic prod twice as higher than level for all sectors; value–chain measure provides more support for selection than idiosyncratic
- **Implication**: results of decomposition confirmed $\Rightarrow$ consistent with the extended selection hypothesis

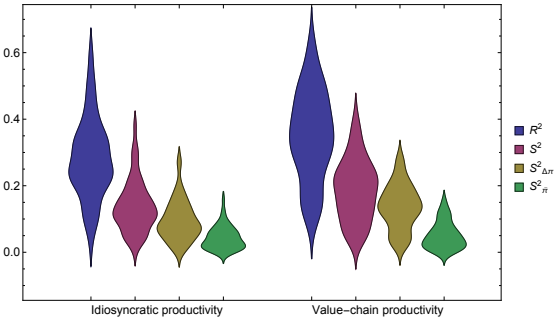

Figure: Explanatory power of idiosyncratic and value–chain productivity terms

Step 3: spatial regression analysis

- We separate the effect of idiosyncratic productivity and that of upstream linkages (suppliers)
- we estimate:

$$g_{i,t} = a + b_t + \beta_\Delta \Delta\pi_{i,t} + \beta_m \bar{\pi}_{i,t} + \gamma_\Delta SL\left(\Delta\pi_{i,t}\right) + \gamma_m SL\left(\bar{\pi}_{i,t}\right) + c_i + \epsilon_{i,t}$$

- where $SL\left(\Delta\pi_{i,t}\right)$ and $SL\left(\bar{\pi}_{i,t}\right)$ are the weighted average productivity change/level of the direct and indirect suppliers of the focal country–sector i
- weights are obtained from the matrix of labour requirements excluding intra–sector transactions
- **Results**: in the majority of sectors SL terms explain at least as much variation in growth as the individual productivity term and their importance grows linearly with the dependence on suppliers;
- **Implication**: neglecting the role of suppliers in previous studies likely led to a systematic underestimation of the strength of market selection!

Outline

Conclusions

In sum

- market selection might be a work, if ‘correctly’ captured
- we operationalised the model of Cantner et al. (2019) and tested the extended selection hypothesis on competition among country–sectors in global markets: trade–off between more aggregated data and mapping of competition/selection at global scale
- we assess both reallocation (between effect) and the growth–productivity nexus
- indirect (decomposition) and direct (regression) analyses confirm that selection has more explanatory power when fitness indicators (productivity) that include production linkages are used

Contribution

- support to the hp that production networks carry additional information to explaining focal actors’ performance
- a novel use of WIOD
- an ‘eclectic’ combination of industrial dynamics/evol econ and international trade approaches

THANK YOU FOR YOUR ATTENTION!

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