Business Networks, Production Chains, and Productivity: A Theory of Input-Output Architecture

Ezra Oberfield (2013)

Networks in Economics and Finance Meetings at Tepper
Carlos Ramírez

November 8, 2013
Model

- Unit mass of entrepreneurs (each associated with production of one good)
- Each good is used either for final consumption or intermediate input by other entrepreneurs
- Representative consumer with preferences over different goods

\[
\left( \int_0^1 (c_j)^{\frac{\epsilon-1}{\epsilon}} \, dj \right)^{\frac{\epsilon}{\epsilon-1}}
\]  

(1)

- Representative consumer provides \( L \) units of labor
- To produce an entrepreneur must use a technique
- Technique: method of producing a good using labor and exactly one other entrepreneur’s good as intermediate output
- Production function:

\[
y_b = X(\alpha) x_s^\alpha l^{1-\alpha}
\]  

(2)
Network Economies

\[ \phi_0 \]

\[ C_A = 1 \]
\[ C_B = 0.5 \]
\[ C_C = 2 \]
Network Economies

\[ \phi_0 \]

\[ C_A = 1 \]
\[ C_B = 0.5 \]
\[ C_C = 2 \]
Network Economies

\[ \phi_1 \]

\[ C_A = 2 \]
\[ C_B = 1 \]
\[ C_C = 1.5 \]
Network Economies

\[ \phi_1 \]

\[ C_A = 2 \]
\[ C_B = 1 \]
\[ C_C = 1.5 \]
Model II

- Given a menu of techniques and input prices, each entrepreneur produces using the technique with the best combination input cost and productivity.

- Techniques arrive randomly.

- Number of techniques an entrepreneur has to produce her good follows a Poison with mean $M$. For each technique, the identity of supplier is random (uniformly distributed across all entrepreneurs).

- Technique productivity, $z$, is drawn from fixed distribution $H$. 
Motivation Model Results

- (Prop. 1) While individuals entrepreneur’s efficiency varies across realizations of the economy, the cross-sectional distribution of efficiencies does not.

- Market Structure: monopolistic competition in sales for consumption but bilateral two-part pricing for intermediate goods.

- Two-stage eq.:
  - An arrangement determines which techniques are used and pricing for each of those techniques
  - Given arrangement, each entrepreneur sets a price to final consumer and select the input unit

- Arrangement are pairwise stable: there are no profitable unilateral or mutually beneficial pairwise deviations
(Prop. 2) In any pairwise equilibrium:
- In any technique used in eq., price per unit of input equals supplier’s marginal costs
- Supplier, at worst, break even in sales of intermediate goods
- The eq. network (who buys from whom) depends only on which techniques deliver the lowest marginal costs of production

When the share of intermediate goods is larger (higher $\alpha$), the high-efficiency entrepreneurs capture an even larger share of customers. Thus, when $\alpha$ is higher, the eq. network feature more star suppliers

Aggregate output is increasing in the density of the network. (In an economy with more techniques, entrepreneurs tend to have larger sets of supply chains to choose from and, hence, are more likely to have found efficient techniques)