Comments on *The Impact of FDI in Vertically Integrated Sectors on Domestic Investment: Firm-level Evidence from South Korea*

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Aim of the Paper

- The authors use the detailed firm level data from South Korea and the Arellano–Bover GMM estimation to investigate how FDI affects the investment of domestic firms
  - Vertical FDI with forward linkage (Multinationals $\longrightarrow$ Korean firms)
  - Vertical FDI with backward linkage (Korean firms $\longrightarrow$ Multinationals)
  - Horizontal FDI (Multinationals competing with Korean firms)

Main Findings

All three types of FDI linkage increase the investment of domestic firms

- Higher vertical FDI with forward linkage (multinationals in upstream) leads to higher domestic investment through lower costs of intermediates
  - A 2% increase in FDI_j^F leads to increase of 2.29% in domestic firm investment rate
- Higher vertical FDI with backward linkage (multinational in downstream) leads to higher domestic investment through higher demand
  - A 2% increase in FDI_j^B leads to increase of 0.71% in domestic firm investment rate
- Higher horizontal FDI leads to higher domestic investment
  - Positive effect of knowledge spillover dominates the negative effect of competitions
  - A 2% increase in FDI_j^H leads to increase of 0.42% in domestic firm investment rate

Theoretical Foundation

- Firms maximize profit

$$\begin{aligned} \Pi_{it} &= x_{it} p_{it} - w_t L_{it} \\ \text{subject to } x_{it} &= F\left(K_{it-1}, L_{it}\right) \end{aligned}$$

- Marginal profitability of capital

$$\frac{\partial \Pi_{it}}{\partial K_{it-1}} = \frac{1}{K_{it-1}} \left(\frac{\theta - 1}{\theta} x_{it} p_{it} - w_t L_{it} \right)$$

under monopolistic competition, which increases with revenue $x_{it} p_{it}$ and decreases with cost of inputs $w_t L_{it}$

  - Higher vertical FDI with forward linkage implies lower $w_t L_{it}$
  - Higher vertical FDI with backward linkage implies higher $x_{it} p_{it}$
  - Higher horizontal FDI leads to higher $x_{it} p_{it}$ and higher $w_t L_{it}$

Difficulty Faced in Estimation

- Investment rate is past-dependent

$$\frac{I_{it}}{K_{it-1}} = E_t\left[\phi_0 + \phi_1 \frac{I_{it+1}}{K_{it}} + \phi_2 \frac{S_{it+1}}{K_{it}} + \phi_3 \frac{Z_{it+1}}{K_{it-1}}\right]$$

- The lagged investment rate needs to be included in the regression of the dynamic panel data
- The Arellano–Bover GMM estimator is adopted to solve for the autocorrelation problem
  - lagged values of firm-specific variables are used as IVs
  - Sargen-Hansen tests are carried to show the validity of IVs

Measurement of FDI context

- Horizontal Linkage

$$FDI_{jt}^{H} = \frac{\sum_{i \in j} ForeignShar_{it} * S_{it}}{\sum_{i \in j} S_{it}}$$

- Vertical FDI with backward linkage

$$FDI_{jt}^{B} = \sum_{k \neq j} \gamma_{jkt} FDI_{kt}^{H}$$

- Vertical FDI with forward linkage

$$FDI_{jt}^{F} = \sum_{m \neq j} \sigma_{jmt} \frac{\sum_{i \in m} ForeignShar_{it} * (S_{it} - X_{it})}{\sum_{i \in m} (S_{it} - X_{it})}$$

where γ_{ijt} and σ_{jmt} are coefficients in the Korean input-output table

Strength of the Paper

- Detailed firm-level data
  - including not only publicly traded firms, but also private firms
- Arellano–Bover GMM estimator to control for the autocorrelation of the dependent variable (investment rate)
  - Instruments are valid from the Hansen-Sargen test results
- FDI context of different industries are separated into three categories
  - horizontal FDI, vertical FDI with backward linkage and vertical FDI with forward linkage
- Several robustness check with different sample selection and extra firm characteristics are carried out

Comments and Suggestions

- Possible mismatch of model and regression equation
  - The equilibrium investment equation is forward-looking

$$\frac{I_{it}}{K_{it-1}} = E_t\left[\phi_0 + \phi_1 \frac{I_{it+1}}{K_{it}} + \phi_2 \frac{S_{it+1}}{K_{it}} - \phi_3 \frac{Z_{it+1}}{K_{it-1}}\right]$$

  - The regression equation (9) is past-dependent
  - $\phi_2 > 0$ implies that the coefficient (α_2) of sales normalized by capital stock $\frac{S_{ijt}}{K_{ijt-1}}$ should be negative, but $\widehat{\alpha}_2$ is positive and significant in all the regression results

Comments and Suggestions (Cont'd)

- The domestic input-output (IO) table of South Korea is used to construct the vertical FDI measurements
  - It will be more accurate to use the global input-output table, e.g. the WIOD (World Input-Output Database)
  - In the domestic IO tables, there is no distinction between domestic firms and foreign exporters
  - Such extra information is available in the global input-output table
- Exporting and FDI are substitution to each other in general (e.g. Helpman, Melitz & Yeaple (2004))
  - Only the FDI context are controlled in the regressions
  - The trade context (direct foreign supply and demand) can be controlled as well if using the global input-output table instead

Reference

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