Discussion of “Intermediate Input Imports and Innovations: Evidence from Chinese Firms”

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Motivation

- The effects of trade liberalization in intermediate inputs on *firm innovation*.
  - China became a WTO member since Dec 2001.
  - Substantial reduction in input tariffs between pre- and post-WTO.
  - The treatment: average input tariff by industry in 2001.
  - Chinese patent data as a measure of firm innovation.

- Story: Input tariff cuts will affect firms' incentive to enhance their productivity and/or product quality.
  - Intermediate input imports and firm innovation can be complements or substitutes.
  - Substitutes: Input tariff reduction means cheaper imports of inputs, so firms do less innovation — "input price effect".
  - Complements: More imports of inputs ⇒ more embedded technology transfer ⇒ lower cost of innovation / more patents — "innovation cost effect".

Empirical model

- Use a 'quasi' difference-in-difference estimator.

$$innovation_{fit} = \beta \, InT01_i \cdot Post02_t + \mathbf{X}'_{fit}\gamma + \lambda_f + \lambda_t + \epsilon_{fit} \quad (1)$$

  - Innovation measured by firm f's patent filings (used a transformed measure to deal with zero patent filing).
  - $InT01$ is the average tariff rate of industry i's inputs in 2001 — right before WTO.
  - $Post02$ is dummy with 1 for $t \geq 2002$ and 0 otherwise — post-WTO.

- β captures the treatment effect.
  - '+' ('-'): higher input tariff ($InT01$) pre-WTO $\Rightarrow$ larger input tariff cut $\Rightarrow$ firm innovation $\uparrow$ ($\downarrow$).

Key results

The authors established two things.

1. Input tariff cut *reduces* firm innovation in China.
   - Baseline result: 1% input tariff cut $\Rightarrow$ 0.15 – 0.28% $\downarrow$ in innovation (patent filings).
   - The result is robust: placebo tests on pre-WTO period and processing trade firm, capital intensity, direct importers, distance from technology frontier, etc.
2. Input tariff cut *increases* quality of imported inputs (but reduces quantity and import value).

$$log(input)_{ijt} = \alpha Tariff01_i \cdot Post02_t + \lambda_i + \lambda_t + \lambda_j \cdot t + \epsilon_{ijt} \tag{2}$$

where $i \in$ {quality measured by price, quantity, import value}, j denotes industry, $Tariff01_i$ is for product i in 2001.

$\Rightarrow$ **Together, input imports and firm innovation are *substitutes*.**

Comments (1)

- Data suggests patents in China filed by Chinese firms increased by 22.3% on average between 2000-2006 in aggregate terms (from SIPO data).

- Lots of R&D post-WTO at the firm level?
  - Extensive margin / new entrants' R&D doesn't seem to explain this trend (in Table 3 *age* decreases with innovation).

- Not sure which variable in the regression results can help reconcile this.
  - Other controls: export status, labor, capital intensity, and foreign equity share $\Rightarrow$ don't seem to be the contributing factor at the firm level.
  - Omitted variable? E.g. firm sales (or expected sales).

- Adding pre-WTO R&D at the industry level?
  - Conditional on whether an industry is innovative or not, input tariff cut $\uparrow$ / $\downarrow$ innovation.

Comments (2)

- Both Chinese-owned and foreign-owned firms would file patents outside of China. (E.g. of Chinese firms: Huawei, BYD, Tencent, Lenovo.)
  - If only count the patents in China, we may miss out some innovation by innovative firms.
  - Missing foreign patent data may bias β downward, especially if conditional on R&D at the industry level given that patents are concentrated in high-tech sectors.
  - See the Patent Data Page for "Quid Pro Quo: Technology Capital Transfers for Market Access in China" by Holmes, McGrattan, and Prescott (2013).