



IMMIGRANTS SKILLS' AND CAPITAL DEEPENING: EVIDENCE FROM CHILE

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IMMIGRATION AND FIRMS



- ▶ There is a lot of work on the effects of immigration on destination labor markets **in equilibrium**.
 - ▶ i.e. on **equilibrium** wages & employment by groups.
 - ▶ These are the result of immigrants' effects on labor **supply and demand**.
- Literature: Many results consistent with specific patterns of complementarity/substitution in production but little direct evidence.



IMMIGRATION AND FIRMS

- ▶ **This paper** narrows focus to get at the core question about **immigrants and production** (in manufacturing).
- ▶ **Question:** How does immigrant labor enter a firm's production function?
- ▶ Read: **What are the elasticities of substitution between:**
 1. **Unskilled** immigrants and natives
 2. **Skilled** immigrants and natives
 3. Aggregate **unskilled** labor, **skilled** labor, and **capital**
- ▶ Authors estimate these with very detailed Chilean firm-level data.
 - ▶ For each firm and period, observe education and nationality of each worker, firm balance sheet with capital stock.



FRAMEWORK: CES PRODUCTION

- Start out with a CES production function that aggregates native and immigrant “varieties” of labor, and capital, into production.

$$F(K, U, S) = A \left(\left(K^{\frac{\lambda-1}{\lambda}} + U^{\frac{\lambda-1}{\lambda}} \right)^{\frac{(\epsilon-1)\lambda}{(\lambda-1)\epsilon}} + S^{\frac{\epsilon-1}{\epsilon}} \right)^{\frac{\epsilon}{\epsilon-1}} \quad (1)$$

$$U = \left(U_N^{\frac{\sigma_U-1}{\sigma_U}} + U_F^{\frac{\sigma_U-1}{\sigma_U}} \right)^{\frac{\sigma_U}{\sigma_U-1}} \quad (2)$$

$$S = \left(S_N^{\frac{\sigma_S-1}{\sigma_S}} + S_F^{\frac{\sigma_S-1}{\sigma_S}} \right)^{\frac{\sigma_S}{\sigma_S-1}} \quad (3)$$



1. IV STRATEGY: CAPITAL PER WORKER

- ▶ Use model to determine correct functional form for the relationship between capital per worker k_{it} and immigrant labor in the reduced form.
- ▶ Result is following, where $i \sim \text{firm}$, $t \sim \text{year}$

$$\begin{aligned} \ln(k_{it}) = & \beta_1 S_{F,it} + \beta_2 U_{F,it} + \beta_3 u_{it} + \\ & \beta_4 S_{F,it}^2 + \beta_5 U_{F,it}^2 + \beta_6 u_{it}^2 + \\ & \gamma X_{it} + \\ & \phi_t + \phi_{\text{industry}(i)} + \phi_{\text{location}(i)} + \phi_{\text{size}(i)} + \epsilon_{it} \end{aligned}$$

- ▶ $S_{F,it}$: Share of immigrants in skilled work
- ▶ $U_{F,it}$: Share of immigrants in unskilled work
- ▶ u_{it} : Share of unskilled in total work



1. EMPIRICAL STRATEGY & RESULTS

- ▶ Share of immigrants in each skill type ($s_{F,it}$, $u_{F,it}$) is endogenous to capital per worker - firm chooses all simultaneously.
- ▶ Use immigration shift-share **at the firm level** to estimate coefficients.



1. EMPIRICAL STRATEGY & RESULTS

- ▶ **Main result:** Capital per worker increases with share of immigrants in skilled labor (at the margin).
- ▶ Recall: Skilled labor and capital are assumed to be complementary.
- ▶ **Interpretation:** Native and foreign skilled labor are imperfectly substitutable.

⇒ When share of foreign increases, the aggregate of skilled labor increases and so do the returns to capital.

$$\uparrow S = \left(\downarrow S_N^{\frac{\sigma_S - 1}{\sigma_S}} + \uparrow S_F^{\frac{\sigma_S - 1}{\sigma_S}} \right)^{\frac{\sigma_S}{\sigma_S - 1}}$$

$$F(K, U, S) = A \left(\left(\uparrow K^{\frac{\lambda - 1}{\lambda}} + U^{\frac{\lambda - 1}{\lambda}} \right)^{\frac{(\epsilon - 1)\lambda}{(\lambda - 1)\epsilon}} + \uparrow S^{\frac{\epsilon - 1}{\epsilon}} \right)^{\frac{\epsilon}{\epsilon - 1}}$$



1. COMMENTS

- ▶ Data & empirical strategy are great.
- ▶ Empirical strategy is careful and goes through all the state-of-the-art empirical checks.
- ▶ Results are intuitive and insightful.
- ▶ Main comments are about:
 1. Connection to model
 2. Empirical specification



1. COMMENTS: CONNECTION TO MODEL

$$\begin{aligned} \ln(k_{it}) = & \beta_1 s_{F,it} + \beta_2 u_{F,it} + \beta_3 u_{it} + \\ & \beta_4 s_{F,it}^2 + \beta_5 u_{F,it}^2 + \beta_6 u_{it}^2 + \\ & \gamma X_{it} + \\ & \phi_t + \phi_{industry(i)} + \phi_{location(i)} + \phi_{size(i)} + \epsilon_{it} \end{aligned}$$

- ▶ Concern: u_{it} , share of unskilled to total labor, is determined jointly with other inputs.
 - ▶ In fact, model predictions about unskilled labor are identical to those about capital, because they enter the production function in the exact same way.
- ▶ Then it seems more like an **outcome** in the firms' problem, i.e. looks like a **bad control**.
- ▶ **Suggestion:** Use model to argue k_{it} is a function of $s_{F,it}$, $s_{N,it}$ and squares, and target “best linear prediction” with IV strategy.



1. COMMENTS: CONNECTION TO MODEL

- ▶ If native and immigrant skilled labor are really imperfect substitutes, then why do the majority of firms not hire any skilled immigrants?
- ▶ This is a prediction of the model that clearly does not hold in the data.
- ▶ Is it because supply of skilled immigrants is not available to many firms?
- ▶ **Suggestion:** Help the reader square model with basic descriptives.



2. ELASTICITIES OF SUBSTITUTION

- ▶ Since production function has **constant elasticities of substitution**, model implies that these can be **recovered directly from data**.
- ▶ Regress ratios of input prices on ratios of quantities (i.e. use the definition of elasticity of substitution).

$$\log \left(\frac{w_{UF}(it)}{w_{UN}(it)} \right) = \gamma_1 \log \left(\frac{U_F(it)}{U_N(it)} \right) + \phi_i + \phi_t + \epsilon_{i,t} \quad (1)$$

$$\gamma_1 = \frac{1}{\sigma_U} \quad (2)$$

2. RESULTS: ELASTICITIES



- ▶ Simple but fundamental results:
- ▶ Natives and immigrants are substitutes, but imperfect.
 - ▶ Both skilled and unskilled.
- ▶ Capital and skilled labor are complementary.



2. COMMENTS

- ▶ Direct CES estimation is very elegant.
- ▶ But it relies strongly on all input markets being perfectly competitive.
- ▶ Otherwise, marginal rate of technical substitution is not necessarily equal to ratio of input prices.



2. COMMENTS

- ▶ We know labor markets are not competitive.
 - ▶ Large literature after Manning (2003).
- ▶ Immigrants are plausibly more inelastic in their labor supply - so unskilled wages might be more marked down among migrants than natives. (Naidu *et al.*, JPE, 2016).
- ▶ If immigration affects markdowns, it would influence wage ratios and employment simultaneously.
- ▶ Current IV does not correct this bias.
- ▶ Suggestion: Study if markdowns are changing in response to immigration.
- ▶ Are data matched employer-employee? if so can test directly if labor supply elasticities change.

CONCLUSION



- ▶ Really good, clear-minded immigration paper.
- ▶ Exceptional data.
- ▶ Transmits consistent results across different exercises.
- ▶ I'd aim to make exercises consistent with each other so paper is easier to digest and takeaways feel stronger.
- ▶ Also run some checks to appease the methodological-minded referees.