Greenfield or Brownfield?
FDI Entry Mode and Intangible Capital

Haruka Takayama

PhD candidate in Economics
University of Virginia

July 4, 2020

Greenfield or Brownfield?

- How does foreign direct investment (FDI) affect the local economy?
- Two types of FDI:
  - Greenfield investment (GF)
    - Build a new facility from scratch
    - Typically involves with capital good purchases and new hiring
  - Brownfield investment (cross-border Mergers & Acquisitions)
    - Buy an existing firm
    - May end up being just a change in ownership
- The effect of FDI on the host country may depend on the FDI mode.

Research Questions

1. How Do Firms Choose Their FDI Modes?
   - Focus on the role of intangible capital such as local customer base, supplier network, and intellectual property.
   - Rationalize the firm's FDI decisions using a model.
2. How Does Firm's FDI Mode Choice Affect Local Economy? [work in progress]
   - Using the estimated model, consider policies: promotion of GF in target industries, restricting M&A in R&D intensive industries (e.g. restricting M&A for national security reasons), etc.

How Do Firms Choose Their FDI Modes?

- The difference between the two FDI modes is whether the investing firm acquires intangible capital.
  - Both GF and M&A involve the purchase of physical capital.
  - Only M&A involves the purchase of intangible capital (local customer base, supplier network, and intellectual property).
- Hypothesis: M&A is the preferred market entry option for firms that seek to obtain existing intangible capital.
- Test this hypothesis by exploiting heterogeneity in firms' intangible capital intensity.

Literature About Firms' FDI Mode Choices

- Nocke and Yeaple (2007, 2008):
  - Extends Helpman, Melitz, and Yeaple (2004) by incorporating cross-border M&A.
  - Consider the role of assets which are more difficult to transfer internationally.
- Davis et al.(2018):
  - Show that geographical and cultural barriers affect firms' cross-border M&A activities.
- Raff et al.(2012); Ramondo (2016); Conteduca and Kazakova (2018)
- Norback and Persson (2007); Kim (2009); Bertrand et al.(2012).
  - Predict how FDI mode choice affects welfare.

Data

US Firm-level Data

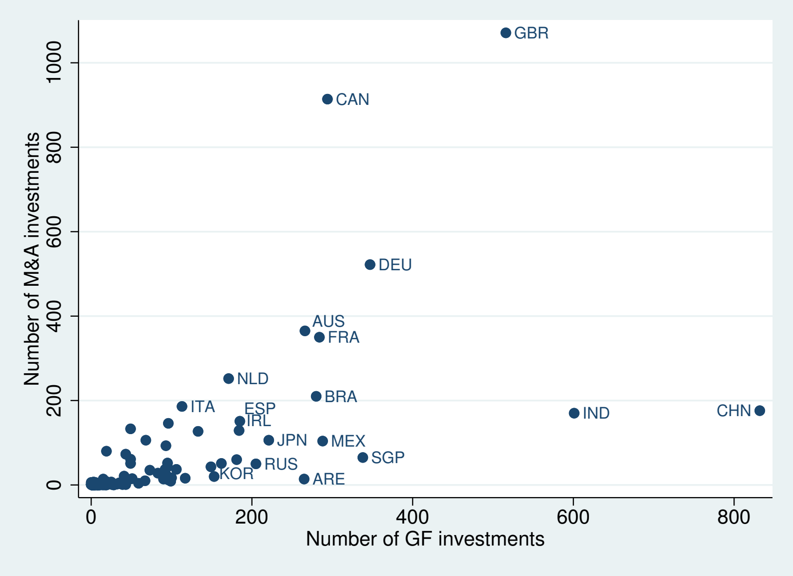
- I construct a novel dataset that link the modes of FDI activity and firm characteristics between 2003 and 2018.
  - To my best knowledge, this is the first analysis of US firms' investment mode choice using intangible capital.
- I merge the following datasets to construct the data:
  - Cross-border M&A deals: Thomson Reuters' SDC Platinum.
  - Greenfield investment projects: Financial Times' fDi Market.
  - Financial data of publicly listed US firms: Compustat.
  - Country characteristics: Penn World Table (GDP per capita, population), World Bank Database (openness to trade), and CEPII (distance).
- Merged 2675 firms (Both FDI modes: 1186 firms, Only GF: 698 firms, Only M&A: 791 firms).

Identify the Modes of FDI

- From the merged data, I extract:
  - The first FDI at the firm-by-industry-by-foreign-market level.
  - The type of investment the firm made (GF or M&A).

Firm	Year	Country	Industry (NAICS-3 digits)	Mode of FDI
A	2004	China	335: Electrical equipment	M&A
A	2008	China	335: Electrical equipment	Greenfield
A	2012	China	335: Electrical equipment	M&A
A	2018	China	335: Electrical equipment	M&A
A	2018	China	481: Air transportation	Greenfield
B	2009	Thailand	331: Food manufacturing	M&A
B	2017	Vietnam	448: Clothing stores	Greenfield

Investment Destinations (148 countries)

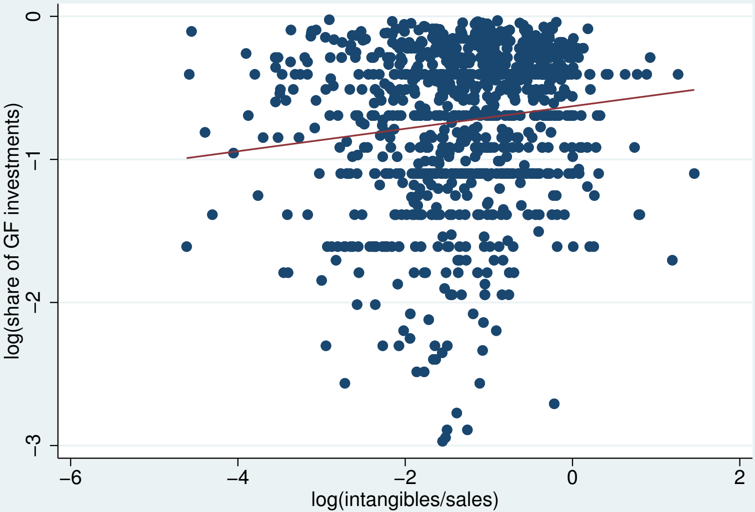


Measure Intangible Capital Using Compustat

- Measure the amount of intangibles following Peter and Taylor (2017) and Ewens et al. (2020).
- Focus on the intangible capital a firm generated internally.
- Use US firms' financial information in 1980-2018.
- Intangible capital = Knowledge capital + Organizational capital
  - Knowledge capital: cumulative R&D expenses.
    - Depreciation rate: $\delta_{know} = 0.33$.
  - Organizational capital: cumulative Sales, General, and Administrative (SG&A) expenses.
    - Depreciation rate: $\delta_{org} = 0.20$.
    - Share of SG&A: $\gamma_{org} = 0.27$.

Selling, General & Administrative (SG&A) Expenses
Manager’s Salaries
Sales personnel salaries
Marketing personnel salaries
Accounting personnel salaries
IT personnel salaries
Payroll taxes
Selling and marketing supplies
Administrative and general supplies
Rent
Utilities
Telephone, Internet, Cellphones
Repairs & Maintenance expenses
Insurance
Advertising
Commissions
Travel expenses

Intangible Intensity & Share of GF Investments



Note: Use only firms with more than one GF or M&A investments. Delete if the share of GF = 1

Descriptive Statistics

- My data: in 2003-2018/ Nocke and Yeaple (2008): in 1994-1998

	My data				Nocke & Yeaple	
	All industries		Manufacturing only			
variable	mean	s.d.	mean	s.d.	mean	s.d.
M&A	0.412	0.493	0.415	0.493	0.435	0.496
sales	21.809	2.287	22.037	2.227	15.37	1.61
SG&A/sales	−2.964	0.858	−3.055	0.814	-	-
R&D/sales	−3.100	1.407	−3.330	1.361	−0.389	1.32
gdppc	10.048	0.841	10.011	0.853	9.81	0.723
pop	17.622	1.652	17.716	1.689	16.7	1.38
open	4.262	0.559	4.259	0.555	3.94	0.648
distance	8.766	0.813	8.804	0.772	8.72	0.69
number of obs	15451		**8579**		**856**	

[a] Nocke and Yeaple's data is from 1994 to 1998. I deflate the mean of sales in Nocke and Yeaple using the CPI for all urban consumers (FRED series CPIAUCSL).

[b] All continuous variables are in logs.

regression in N&Y

Empirics

[revisit] How Do Firms Choose Their FDI Modes?

- The difference between the two FDI modes is whether the investing firm acquires intangible capital.
  - Both GF and M&A involve the purchase of physical capital.
  - Only M&A involves the purchase of intangible capital (local customer base, supplier network, and intellectual property).
- Hypothesis: M&A is the preferred market entry option for firms that seek to obtain existing intangible capital.
- Test this hypothesis by exploiting heterogeneity in firms' intangible capital intensity.

Logit Regressions

For firm i, affiliate industry j, host country h, and time t,

$$\mathbb{1}[MA_{i,h,j,t} = 1] = \alpha \times intangibles_{i,t-1} + \beta \times sales_{i,t-1} + country_h + firm\text{-}industry_i + target\text{-}industry_j + year_t + \epsilon_{i,h,j,t},$$

- $\mathbb{1}[MA_{i,h,j,t} = 1]$ is an indicator for whether firm i uses M&A for its first FDI in market h and industry j in time t.
  - It takes the value of 0 if firm i makes GF investment, and takes the value of 1 if firm i makes M&A investment.
- $intangibles_{i,t-1}$ is firm i's $\log$(intangible capital) in year $t-1$.

industry variations

Results

Dep var: $\mathbb{1}[MA_{i,h,j,t}=1]$	(1) Intangible	(2) Knowledge	(3) Organizational	(4) Physical
Capital	$\mathbf{-0.220}^{***}$	$\mathbf{-0.190}^{***}$	$\mathbf{-0.102}^{*}$	$\mathbf{-0.036}$
	(0.047)	(0.050)	(0.052)	(0.047)
Sale	0.108^{**}	0.101^{*}	0.004	−0.047
	(0.044)	(0.052)	(0.047)	(0.050)
Parent Industry FEs	Yes	Yes	Yes	Yes
Affiliates Industry FEs	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
N	14805	8783	14805	14529
$PseudoR^2$	0.291	0.288	0.289	0.287

[a] Standard errors are clustered by firm. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

[b] All explanatory variables are in logs.

- For a firm with an average level of intangible assets, a 5% increase in its intangibles (or 20% increase in its spending on intangibles) increases the probability of making GF investment by 5 percentage points.

Results (will explain it again)

Dep var: $\mathbb{1}[MA_{i,h,j,t} = 1]$	(1) Intangibles	(2) Knowledge	(3) Organizational
Capital	-0.200^{***}	-0.159^{***}	-0.097^{*}
	(0.045)	(0.048)	(0.049)
GDPPC	0.869^{***}	0.964^{***}	0.872^{***}
	(0.027)	(0.044)	(0.027)
POP	0.003	0.002	0.006
	(0.005)	(0.009)	(0.005)
OPEN	-0.688^{***}	-0.708^{***}	-0.687^{***}
	(0.029)	(0.041)	(0.030)
DIST	-0.510^{***}	-0.664^{***}	-0.510^{***}
	(0.010)	(0.018)	(0.010)
N	15019	9039	15019
$PseudoR^2$	0.242	0.227	0.240

[a] Standard errors are clustered by firm and country. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

[b] All explanatory variables are in logs. I control for firm size using sales in addition to FEs.

Model

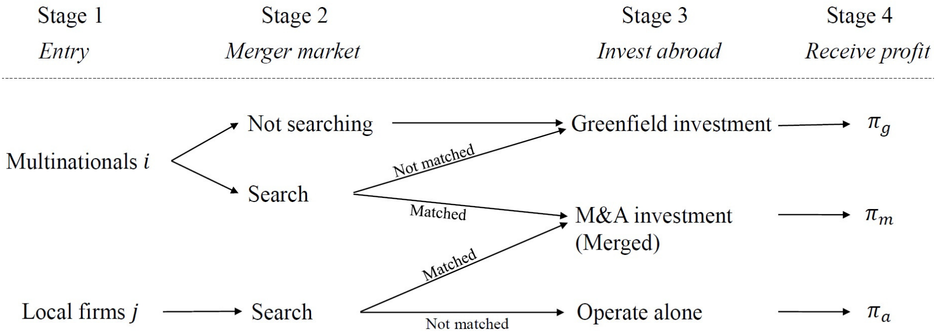
Setup

- Two types of firms in two countries: multinational firm i in source country s and local firm j in home country h.
- Home country (investment receiving country) h is a small open economy. All multinational firms in country s will invest in country h either through M&A or GF.
- Multinational firms are heterogeneous in intangible capital stock.

Timing

- The model operates over 4 stages:
  - Stage 1: Both multinationals and local firms enter. Multinationals draw intangible capital K_i and local firms receive intangible capital κ. K_i is heterogeneous, κ is homogeneous.
  - Stage 2: Firms in s and h can search for their M&A partners in the merger market.
  - Stage 3: Multinationals in s make either M&A or GF investment in h.
  - Stage 4: Firms hire workers, produce, and receive profits. Households consume.

Timing


Stage 1
Entry
Stage 2
Merger market
Stage 3
Invest abroad
Stage 4
Receive profit
Multinationals i
Not searching
Search
Not matched
Matched
Greenfield investment
π_g
M&A investment (Merged)
π_m
Local firms j
Search
Matched
Not matched
Operate alone
π_a

Household

- A representative household consumes final goods. Final goods are CES-aggregated from the differentiated goods produced by multinational and local firms.

- The household supplies labor L_h taking wage w_h as given. It maximizes the utility:
$$C_h - \delta L_h^{\xi},$$
with $\delta > 0$ and $\xi > 1$.

- The labor supply curve is:
$$w_h = \delta \xi L_h^{\xi - 1}.$$

Technology (Multinationals)

- Multinational firm i in country s produces a differentiated variety of good y_i with a Cobb-Douglas production technology,

$$y_i = \tilde{Z} K_i^{\alpha} \ell_i^{\beta},$$

where $\tilde{Z}$ is productivity, K_i is intangible capital, and ℓ_i is labor.

  - For simplicity, assume that productivity for multinational firm i is constant at the value $\tilde{Z}$.
  - A firm's level of intangible capital is independently and identically distributed with a cumulative distribution function $G(K)$ with support $[\underline{K}, \infty)$.
  - There are a mass of multinational firms, N_s, in country s.

Technology (Local Firms)

- Local firm j in country h produces a differentiated variety of good y_j with a Cobb-Douglas production technology,

$$y_j = \tilde{z}\kappa^{\alpha}\ell_j^{\beta},$$

  where $\tilde{z}$ is productivity, κ is intangible capital, and ℓ_j is labor.

  - The productivity for local firm j is constant at the value $\tilde{z}$ such that $\tilde{z} \leq \tilde{Z}$.
  - A firm's level of intangible capital is given as κ. (Can be extended to heterogeneous capital, can also be endogenized.)
  - There are a mass of local firms, N_h, in country h.

Merger Market

- The rate at which investing firms match with target firms is determined by a matching technology.
  - For a multinational firm, the probability of finding an M&A partner in home country h is the Poisson rate $\mu(e) \in (0,1)$ where $e = n/N_h$ and n is the measure of searching multinational firms (i.e.; congestion in search $\mu'(e) < 0$).
- The production function for merged firm m is

$$y_m = \tilde{Z}(\kappa + \eta K_i)^{\alpha} \ell_i^{\beta},$$

where $\eta \in (0,1)$ (imperfect spillover). For future notation, let $\tilde{Z}_m \equiv \tilde{Z}$ and $k_m \equiv (\kappa + \eta K_i)$.

  - The cost to search for a target firm is ψ.

Greenfield Investment

- Multinational firm i which either failed to find a target or which did not search, can decide whether to pursue a greenfield investment (GF).

- The production function for GF firm g is

$$y_g = \tilde{Z} K_i^{\alpha} \ell_i^{\beta}.$$

  Note that the "spillover" of intangibles from the multinationals to the local is perfect (K_i is used as intangibles at the local level). Let $\tilde{Z}_g \equiv \tilde{Z}$ and $k_g \equiv K_i$.

Local Firm

- If local firm j does not merge with multinational i, it operates alone.
- The production function for a local producer a is

$$y_a = \tilde{z}\kappa^{\alpha}\ell_j^{\beta}.$$

Let $\tilde{Z}_a \equiv \tilde{z}$ and $k_a \equiv \kappa$.

Solving the Problem Backwards

- Now, I solve the model backward with the following timing:
  - Stage 1: Multinationals draw a random draw of intangible capital when they enter the market. Local firms also enter.
  - Stage 2: Firms in s and h can search for their M&A partners in the merger market.
  - Stage 3: Multinationals in s who are matched to local firms decide whether to make M&A or GF investment.
  - Stage 4: Firms hire workers, produce, and receive profits. Households consume.

Stage 4: Maximize Profits

- Demand in a country is assumed to be derived from a final good sector,

$$Y = \left[\int_{\Omega} {y_{\omega}}^{\frac{\sigma-1}{\sigma}} d\omega \right]^{\frac{\sigma}{\sigma-1}},$$

  where $\sigma > 1$ is the elasticity of substitution.

  - ω is now considered to be a index of existing firms after investment such that $\omega = \{m, g, a\}$. Ω is a set of the firms.

- The final-good producer minimizes its expenditure:

$$\min_{y_{\omega}} \int_{\Omega} p_{\omega} y_{\omega} d\omega,$$

  subject to the above equation. I normalize the unit price of the final good, $\Xi \equiv [\int_{\Omega} p_{\omega}^{1-\sigma} d\omega]^{1/(1-\sigma)}$, to one.

Stage 4: Maximize Profits

- Each firm $\omega = \{m, g, a\}$ solves the maximization problem for its profits:

$$\max_{\ell_\omega, p_\omega, y_\omega} p_\omega y_\omega - w_h \ell_\omega,$$

  subject to the inverse demand function: $p_\omega = (Y/y_\omega)^{1/\sigma}$.

  - w_h is the wage in home country h.
  - I transform $\alpha = \sigma/(\sigma - 1) - \beta$, with $\beta \leq 1$. (normalization on the unit of intangibles.)

- The solution for ℓ_ω is $\ell_\omega(k_\omega; w_h, Y) = \tilde{\Theta}(w_h, Y)\tilde{Z}_\omega^{1/\alpha} k_\omega$, where $\tilde{\Theta}(w_h, Y) = \left(\frac{(1-(\sigma-1)\alpha/\sigma)Y^{1/\sigma}}{w_h}\right)^{\frac{\sigma}{(\sigma-1)\alpha}}$.

transformation of α

Stage 4: Maximize Profits

- The profits of each firm is:
  - $\pi_m(K_i; w_h, Y) = \Theta(w_h, Y)Z(\kappa + \eta K_i)$ for merged multinationals
  - $\pi_g(K_i; w_h, Y) \; = \Theta(w_h, Y)ZK_i$ for GF multinationals
  - $\pi_a(w_h, Y) \; = \Theta(w_h, Y)z\kappa$ for non-merged local firms

  I set $\Theta(w_h, Y) = \frac{w_h \sigma}{\beta(\sigma - 1)}\tilde{\Theta}(w_h, Y)$ the above. $Z = \tilde{Z}^{1/\alpha}$ and $z = \tilde{z}^{1/\alpha}$.

Stage 3: Gains from Merging

- Here, all analyses are for a given (w_h, Y).
- The combined gains from the merger is:

$$\begin{aligned}\Sigma(K_i) &= \pi_m(K_i) - \pi_a - \pi_g(K_i) \\ &= \Theta\left[(Z - z)\kappa - Z(1-\eta)K_i\right].\end{aligned}$$

- The price of acquisition is determined through Nash bargaining between multinational and local firms:

$$P(K_i) = \pi_a + \chi\Sigma(K_i)$$

where $\chi \in (0, 1)$ is the local firm's bargaining power.

Stage 2: Search Decision

- A multinational firm i participates in the merger market and searches for a target if

$$\mu(e)\left[\pi_m(K_i) - P(K_i)\right] + (1 - \mu(e))\pi_g(K_i) - \psi \geq \pi_g(K_i).$$

  - Left-hand side: expected profits from searching.
  - Right-hand side: profits from making a GF investment.

Stage 2: Search Decision

- Plugging in $P(K_i)$ yields:

$$(1-\chi)\mu(e)\underbrace{\Theta\left[(Z-z)\kappa - Z(1-\eta)K_i\right]}_{\text{gains from merger } \Sigma} \geq \psi.$$

  - If a multinational firm searches (i.e.; the above inequality holds) and finds a target firm, it conducts M&A ($\because \Sigma \geq 0$).
  - For a given e, the left-hand side is decreasing in the level of multinational's intangible capital K_i. Therefore there is a threshold value of K_i, K^*, below which the multinational firm searches for a partner.

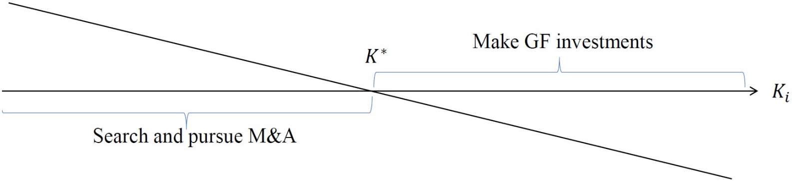
- In equilibrium, $e = n/N_h = [N_s G(K^*)]/N_h$ is a increasing function of K^*.
  - Denote it $\mu(e) = \mu(K^*)$ below.

Stage 2: Search Decision

- In equilibrium, there exists a threshold, K^*, such that a multinational firm with $K_i < K^*$ will search and pursue M&A, and one with $K_i \geq K^*$ will make GF. The threshold level of intangible capital K^* satisfies the following equation:

$$(1-\chi)\mu(K^*)\Theta\left[(Z-z)\kappa - Z(1-\eta)K^*\right] = \psi.$$

  - The left-hand side is decreasing in K^*, and thus there is a unique K^* in equilibrium (for a given w_h and Y).



- This proposition is consistent with the empirical results.

Stage 2: Search Decision

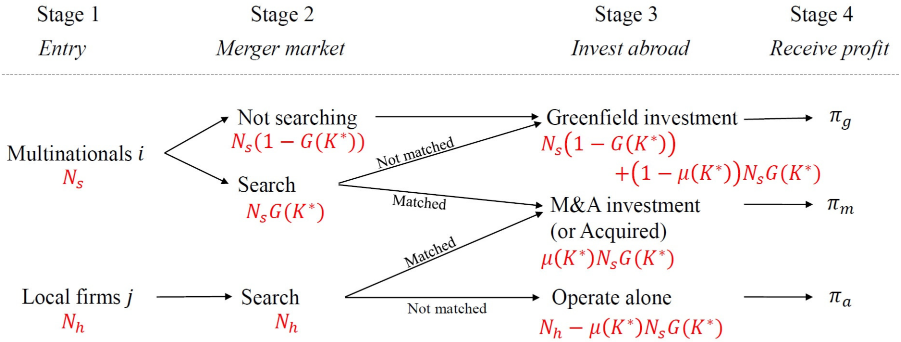
- K^* moves up and down with the parameters

$$(1-\chi)\mu(K^*)\Theta\left[(Z-z)\kappa - Z(1-\eta)K^*\right] = \psi.$$

  - GDPPC: Higher level of local firm's intangibles, κ, moves K^* up, making M&A more likely.
  - DIST: Larger search costs, ψ, and also smaller spillovers of intangibles, η, move K^* down, making GF more likely.

Dep var: $\mathbb{1}[MA_{i,h,j,t}=1]$	(1) Intangibles	(2) Knowledge	(3) Organizational
Capital	-0.200^{***}	-0.159^{***}	-0.097^{*}
	(0.045)	(0.048)	(0.049)
GDPPC	0.869^{***}	0.964^{***}	0.872^{***}
	(0.027)	(0.044)	(0.027)
DIST	-0.510^{***}	-0.664^{***}	-0.510^{***}
	(0.010)	(0.018)	(0.010)
N	15019	9039	15019
$PseudoR^2$	0.242	0.227	0.240

Measure of Firms



- Matching probability is $\mu(K^*) \equiv \mu([N_sG(K^*)]/N_h)$.
- Possibility of being acquired is $\lambda(K^*) \equiv \mu(K^*)N_sG(K^*)/N_h$.
  - Assuming that the matching function is constant returns.

Stage 1: Entry

- Multinational firms receive their intangible capital which is drawn from distribution functions $G(K)$ (with support $[\underline{K}, \infty)$). The local firms enter with intangibles κ.
- Two potentially important extensions (future work).
  - Heterogeneous local intangibles and non-random search $\rightarrow$ Sorting between multinationals and locals (a high-K multinationals may look for a high-κ local firms).
  - Endogenous K and κ $\rightarrow$ Various inefficiencies, rooms for policy.

Labor Demand

- Still for a given Y (the equilibrium condition for Y is imposed at the end).
- From the solution in profit maximization problem $\ell(w_h, k)$, I can set the labor demand by each type of firm to be a function of the wage level in home, w_h, and the level of multinationals' intangible capital K_i.
  - For a M&A multinational, $\ell_m(w_h, K_i)$ where $K_i \in [\underline{K}, K^*]$.
  - For a GF firm which failed to search, $\ell_g(w_h, K_i)$ where $K_i \in [\underline{K}, K^*]$.
  - For a GF firm which decided to make GF investment without searching, $\ell_g(w_h, K_i)$ where $K_i \in [K^*, \infty]$.
  - For a local firm which operates alone, $\ell_a(w_h)$.

Equilibrium Wage

- The labor supply curve $L_h = (w_h/\delta\xi)^{1/(\xi-1)}$.
- The equilibrium wage level is determined by equating the labor supply (left-hand side) to the labor demand (right-hand side):

$$\begin{aligned}\left(\frac{w_h}{\delta\xi}\right)^{\frac{1}{\xi-1}} = &\ \mu(K^*)N_s \int_{\underline{K}}^{K^*} \ell_m(w_h, K)dG(K) \\ &+ [1-\mu(K^*)]N_s \int_{\underline{K}}^{K^*} \ell_g(w_h, K)dG(K) \\ &+ N_s \int_{K^*}^{\infty} \ell_g(w_h, K)dG(K) \\ &+ [1-\lambda(K^*)]N_h \ell_a(w_h).\end{aligned}$$

  - The left-hand side is increasing in w_h and the right-hand side is decreasing in w_h (because ℓ is decreasing in w_h). Thus the equilibrium wage is unique (for a given K^*).
- w_h can be used as an indicator of the welfare effects on the host country.

Equilibrium Wage

- Assume the distribution of intangibles across multinationals follow a Pareto distribution $G(K)$ with support $[\underline{K}, \infty)$:

$$G(K) = 1 - K^{-\theta} \text{ for } K \geq 1 \text{ and } \theta > 1.$$

- The labor demand is now:

$$\begin{aligned} L_h = {} & \mu(K^*) N_s \tilde{\Theta} Z [\kappa(\underline{K}^{*-\theta} - K^{*-\theta}) + \eta\theta/(\theta - 1)(\underline{K}^{*1-\theta} - K^{*1-\theta})] \\ & + [1 - \mu(K^*)] N_s \tilde{\Theta} Z \theta/(\theta - 1)[\underline{K}^{*1-\theta} - K^{*1-\theta}] \\ & + N_s \tilde{\Theta} Z \theta/(\theta - 1) K^{*1-\theta} \\ & + \tilde{\Theta} z \kappa [N_h - \mu(K^*) N_s (1 - K^{*1-\theta})] \\ = {} & L_h(w_h, K^*, Y(w_h, K^*)). \end{aligned}$$

- Also, I set the matching function as $\mu = \frac{m(N_h, n)}{n}$ where $m(N_h, n) = \frac{N_h n}{(N_h^l + n^l)^{1/l}}$ and $n = N_s G(K^*)$.

Solutions

- The following system of equations determine K^* and w:

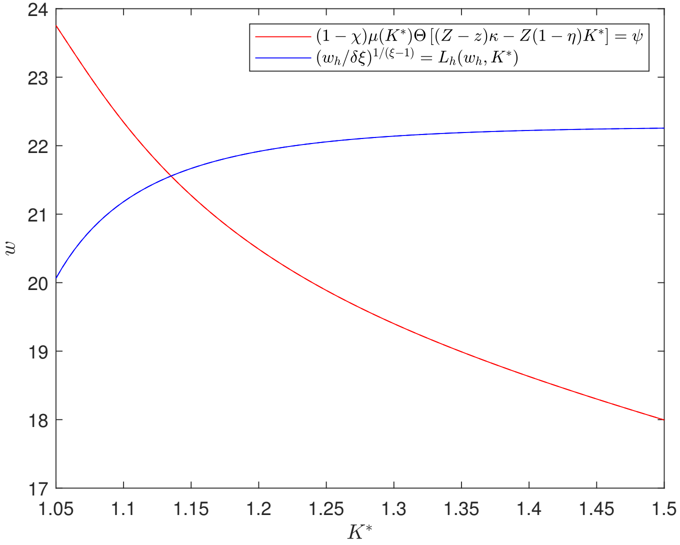
$$(1-\chi)\mu(K^*)\Theta(w_h, Y(w_h, K^*))\left[(Z-z)\kappa - Z.(1-\eta)K^*\right] = \psi.$$

$$\left(\frac{w_h}{\delta\xi}\right)^{1/(\xi-1)} = L_h(w_h, K^*, Y(w_h, K^*))$$

- In equilibrium, Y has to satisfy $Y = \left[\int_\Omega y_\omega^{\frac{\sigma-1}{\sigma}} d\omega\right]^{\frac{\sigma}{\sigma-1}}$.
  - The right hand side is a function of (w_h, K^*, Y), so $Y(w_h, K^*)$.

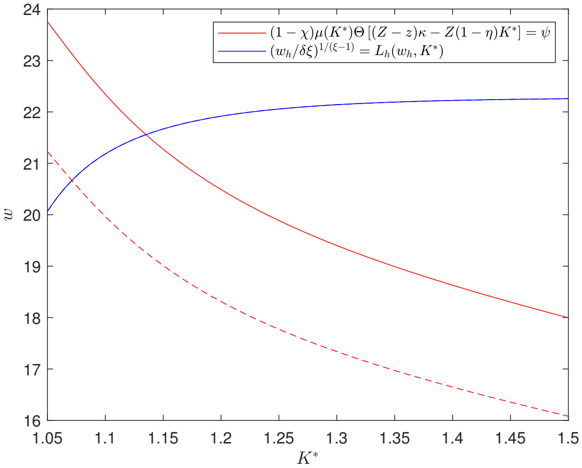
solution of Y

Solutions for Two Endogenous Variables, w_h and K^*



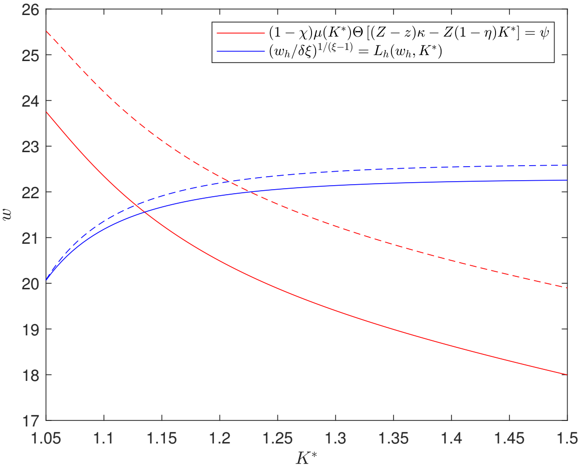
parameters

Increase ψ (e.g. restrictive M&A policy)



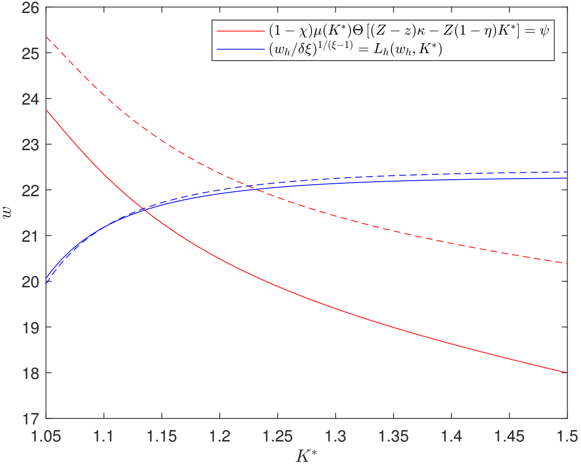
- 1% increase in ψ
  $\Rightarrow w \downarrow$ by 0.14%, $L \downarrow$ by 0.17%, household's utility $\downarrow$ by 0.30%.

Increase κ



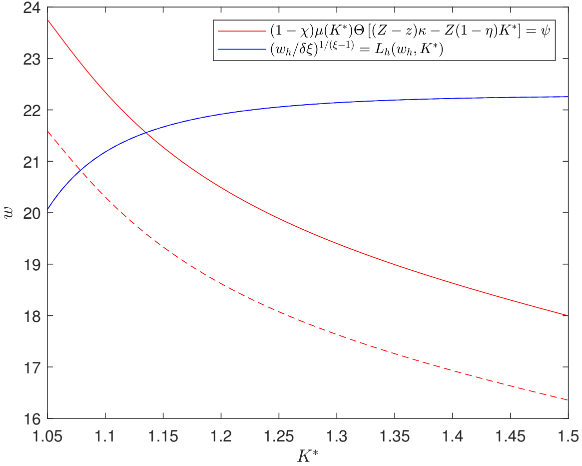
- 1% increase in κ
  $\Rightarrow$ w $\uparrow$ by 2.58% $L \uparrow$ by 3.33%, household's utility $\uparrow$ by 5.83%.

Increase η (more spillovers from multinational's K)



- 1% increase in η
  $\Rightarrow$ w $\uparrow$ by 0.28%, L $\uparrow$ by 0.35%, household's utility $\uparrow$ by 0.64%.

Increase χ (more bargaining power with local firms)



- 1% increase in χ
  $\Rightarrow w \downarrow$ by 0.17%, $L \downarrow$ by 0.21%, household's utility $\downarrow$ by 0.37%.

Conclusion

- Using a newly constructed dataset, I showed that a firm with lower intangible capital intensity tends to choose M&A investments more often, compared to a firm with higher intangible capital intensity.
- This result is consistent with a model in which multinationals make M&A search decisions based on their own intangibles.
- The resulting equilibrium wage will allow me to assess welfare effects of FDI policies in an investment-receiving country: promotion of GF in target industries, restricting M&A in R&D intensive industries (e.g. restricting M&A for national security reasons), etc.

Appendix

Adding Both Parent and Affiliate Industry FEs

	Inter-industry		Intra-industry	
	All	(US manufacturing)	All	(US manufacturing)
M&A	4030	(2336)	2419	(1474)
GF	4632	(2645)	4394	(2590)
Total	8662	(4981)	6813	(4604)

go back

Regressions in Nocke and Yeaple (2008)

Dep var:	(1)	(2)	(3)	(4)	(5)
MA= 1 vs GF = 0	SALE	VADDPW	SALE	VADDPW	SALE
efficiency	-0.083***	-0.212***	-0.104***	-0.195***	-0.685***
	(0.020)	(0.077)	(0.020)	(0.040)	(0.117)
emp		-0.079***		-0.103***	
		(0.024)		(0.023)	
gdppc			0.877***	0.890***	0.879***
			(0.164)	(0.165)	(0.164)
pop			0.009	0.011	0.012
			(0.069)	(0.071)	(0.069)
open			-0.685***	-0.684***	-0.682***
			(0.173)	(0.174)	(0.172)
dist			-0.509***	-0.507***	-1.932***
			(0.100)	(0.100)	(0.296)
sale×dist					0.066***
					(0.014)
FE: Parent Ind	Yes	Yes	Yes	Yes	Yes
FE: Affiliate Ind	Yes	Yes	Yes	Yes	Yes
FE: Year	Yes	Yes	Yes	Yes	Yes
FE: Country	Yes	Yes	No	No	No
N	14805	14479	15019	14690	15019

go back

Unit of K

$y_i = \tilde{Z} K_i^{\alpha} \ell_i^{\beta}$, and I set $\alpha = \sigma/(\sigma - 1) - \beta$ with $\beta \leq 1$.

- I can monotonically transform K_i without loss of generality.
    - This will change ow K_i is measured $(G(K)$ is for the transformed $K_i)$.
    - Will not be innocuous if choose K_i (the cost has to be transformed).
- Suppose $y_i = \tilde{Z} K_i^{\alpha} \ell_i^{\beta}$ when K is measured in one unit.
    - Let $X \equiv K^{\alpha/\gamma}$ be the new measurement of K, where $\gamma = \sigma/(\sigma - 1) - \beta$.
    - $y_i = \tilde{Z} X_i^{\gamma} \ell_i^{\beta}$ and we can use X as the new measurement of capital.

go back

Y is a Function of w_h and K^*

$$
\begin{aligned}
Y^{\frac{\sigma-1}{\sigma}} &= \int_{\Omega} y_{\omega}^{\frac{\sigma-1}{\sigma}} d\omega \\
&= \mu(K^*) N_s \int_{\underline{K}}^{K^*} y_m(w_h, K, Y)^{\frac{\sigma-1}{\sigma}} dG(K) \\
&\quad + (1-\mu(K^*)) N_s \int_{\underline{K}}^{K^*} y_g(w_h, K, Y)^{\frac{\sigma-1}{\sigma}} dG(K) \\
&\quad + N_s \int_{K^*}^{\infty} y_g(w_h, K, Y)^{\frac{\sigma-1}{\sigma}} dG(K) \\
&\quad + (1-\lambda(K^*)) N_s \; y_a(w_h, K, Y)^{\frac{\sigma-1}{\sigma}} \\
\leftrightarrow Y &= \left(\frac{\sigma - (\sigma-1)\alpha}{\sigma w_h} \right)^{\frac{\beta}{1-\beta}} \tilde{L}_h(K^*)
\end{aligned}
$$

go back

Parameters

- $\kappa = 1.25, \underline{K} = 1.1$
- $\chi = 0.5, \eta = 0.8, \psi = 0.1$
- $Z = 8, z = 4$
- $\alpha = \sigma/(\sigma - 1) - \beta, \beta = 0.7, \sigma = 6$
- $N_h = 10^3, N_s = 20^3$
- $l = 1.27$
- $\theta = 7.5$
- $\xi = 1.8, \delta = 0.6$

go back