Threatening to Offshore in a Search Model of the Labor Market

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Threatening to Offshore

- Motivation: “Fiat’s Gamble”
  - In September 2010, Fiat warned Italian labor unions that it would move all of its auto production to Serbia and Poland if domestic costs of production were not lowered.
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  “... it is not necessary actually to move jobs to low-wage countries in order to restrain wage increases; the mere threat of offshoring can put a damper on wages.”

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- In fact, the *threat may be more acute issue* than actual offshoring
  - Distinction between movement and mobility is important when thinking about the effects of offshoring, Leamer (2007)

How important is the threat of offshoring?

- It's hard to say how concerned we should be ...
  - Empirically, difficult to assess (threats are off equilibrium outcomes)
  - Theoretically, standard trade models ill-suited for this question
    - Rodrik (1997); Davidson and Matusz (2010)
    - Helpman and Itskhoki (2010); Helpman, Itskhoki, and Redding (2010a,b 2011)
    - Dutt, Mitra, and Ranjan (2009), Mitra and Ranjan (2010), Ranjan (2012)

What does this paper do?

1. Methodological contibution:
   - *Formalize* a channel whereby *the threat of offshoring* influences wages and labor market allocations
2. Quantitative contribution:
   - Assess the importance of this channel for the labor market
   - Which features make the threat effect more or less important?

Main Results

1. *Short run effects can be sizeable*
   - Domestic wages are lower, fewer jobs, and unemployment higher
     - Even when actual amount of offshoring is very small
   - Threat of offshoring mitigates the effect of shocks
     - Source of real rigidity; consistent with Bergin, Feenstra, and Hanson (2009, 2011) on offshoring and volatility
2. In contrast, the threat effect has *very little impact in the long run* due to free entry and adjustment of the capital stock

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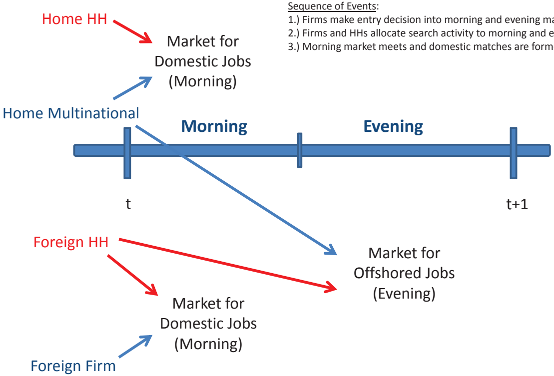
  - Plant uses capital and a unit of labor to prod. intermediate good
- *Search frictions* in labor markets
  - Sunk entry costs in job creation (as in Fujita and Ramey (2009))
  - *Sequential* labor markets

Timeline: Sequential Search



Sequence of Events:

1.) Firms make entry decision into morning and evening markets.
2.) Firms and HHs allocate search activity to morning and evening markets.
3.) Morning market meets and domestic matches are formed.

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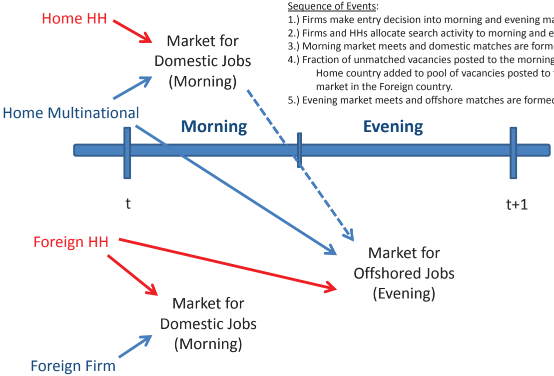

Sequence of Events:
1.) Firms make entry decision into morning and evening markets.
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3.) Morning market meets and domestic matches are formed.
4.) Fraction of unmatched vacancies posted to the morning market in the Home country added to pool of vacancies posted to the evening market in the Foreign country.
5.) Evening market meets and offshore matches are formed.

A Quick Word on Notation

- Subscript X_d denotes domestic variables, while subscript X_o denotes offshore variables
- Asterisks (*) denote variables that physically reside in the Foreign country, no * means variable resides in Home country
- Job finding probabilities:
  - $\theta = v/s$
  - $k^f(\theta)$ is firm's perceived job finding probability
  - $k^h(\theta)$ is household's perceived job finding probability
- q is the real exchange rate

Home Households

- Aggregate consumption:

$$c_t \equiv \left(\lambda^{\frac{1}{\zeta}} c_{H,t}^{\frac{(\zeta-1)}{\zeta}} + (1-\lambda)^{\frac{1}{\zeta}} c_{F,t}^{\frac{(\zeta-1)}{\zeta}} \right)^{\frac{\zeta}{\zeta-1}}$$

- *Household optimization problem:*

$$MaxE_0 \sum_{t=0}^{\infty} \beta^t \left[u\left(c_t\right) - h\left(lfp_t\right) \right]$$

subject to:

$$\underset{\texttt{Participation =}}{lfp_t} = \underset{\texttt{Unemployed}}{(1 - k^h\left(\theta_{d,t}\right))s_{d,t}} + \underset{\texttt{+ Employed workers}}{n_{d,t}}$$

`Budget constraint:`

$$p_t c_t + k_{t+1} - (1-\delta)k_t + \int p_{bt,t+1} b_{t+1} =$$
$$w_{d,t} n_{d,t} + r_t^k k_t + \left(1 - k^h\left(\theta_{d,t}\right)\right) s_{d,t} \chi + b_t + d_t$$

`Law of motion for employment:`

$$n_{d,t} = (1-\rho) n_{d,t-1} + k^h\left(\theta_{d,t}\right) s_{d,t}$$

Multinational (Home) Firm: Production Structure

- Final good produced according to $y_t = z_t f(y^i_{d,t}, (1-\tau)y^{i*}_{o,t})$
  - Flexibly parameterized CES aggregate
  - Offshored production potentially subject to iceberg cost, τ

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- Intermediate good produced using capital and labor

$$y^i_{d,t} = g(n_{d,t}, K_t) \qquad y^{i*}_{o,t} = g(n^*_{o,t}, K^*_{o,t})$$

The Structure of the Multinational Firm

Home-based Multinational
(ex. Ford Motor Company)

Domestic Plants	**Offshore Plants**
Deerborn, Michigan	Nuevo Leon, Monterrey
Buffalo, New York	Chihuahua, Chihuahua
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.	.
Janesville, Wisconsin	Cuautitlan-Izcalli

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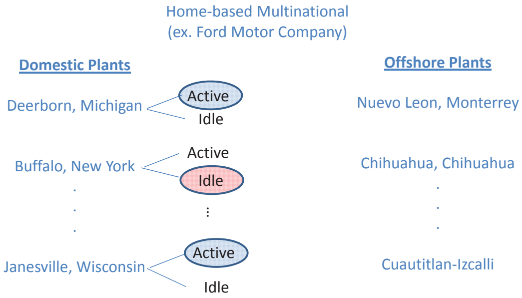

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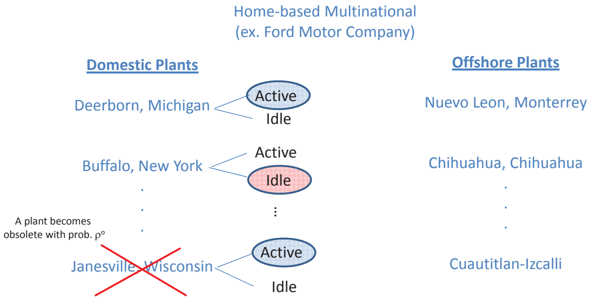

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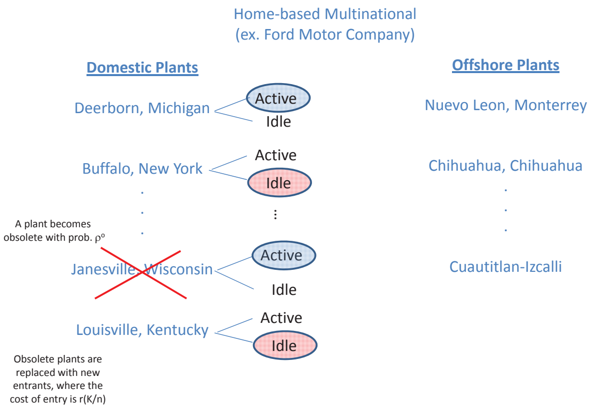

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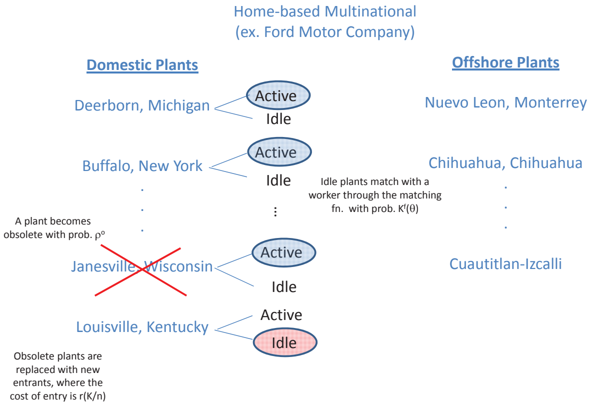

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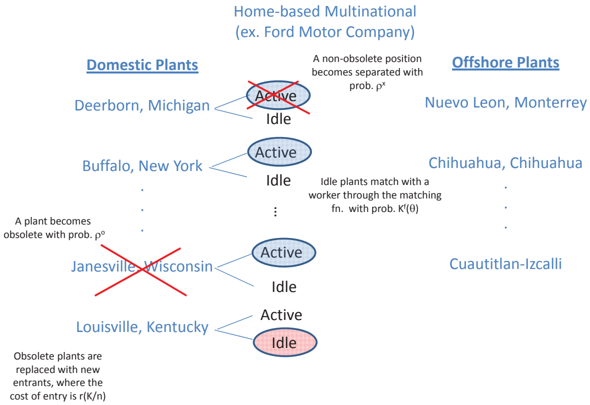

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Aggregate across plants:
$$y \quad = \mathrm{zf}\left(y^i, y^{*\,i}\right)$$

Multinational (Home) Firm: Free Entry

- Sunk cost entry (Fujita and Ramey (2009))

$$V_{d,t} = r^k \frac{K_t}{n_{d,t}}$$

$$V_{o,t} = q_t r^{k*} \frac{K_t^*}{n_{o,t}^*}$$

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$$v_{o,t} = \underbrace{(1-\rho^{o*})\rho^{x*} n_{o,t-1}^*}_{\text{Exogenously separated jobs that have not become obsolete}} + \underbrace{(1-k^f(\theta_{o,t-1}^*))v_{o,t-1}}_{\text{Vacancies that were not filled yesterday}} + \underbrace{ne_{o,t}}_{\text{New entrants}}$$

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$$v_{d,t} = (1-\rho^{o})\rho^{x} n_{d,t-1} + (1-k_f(\theta_{d,t-1}))(1-\Omega k_f(\theta_{o,t-1}^*))v_{d,t-1} + ne_{d,t}$$

Offshoreable vacancies
rolled over from morning market

Multinational (Home) Firm: Optimization

- *Multinational's optimization problem*

$$MaxE_0 \sum_{t=0}^{\infty} \beta^t \frac{\lambda_t}{\lambda_0} [y_t - w_{d,t} n_{d,t} - r_t^k K_t - \gamma_d v_{d,t}$$
$$- q_t w_{o,t}^* n_{o,t}^* - q_t r_t^{k*} K_{o,t}^* - (1 - \tau^v) \gamma_o^* \widetilde{v}_{o,t}]$$

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Subject to:

Total vacancies in offshore mkt.

Vacancies posted directly

Unfilled domestic vacancies that are offshorable

$$\widetilde{v}_{o,t} = v_{o,t} + \Omega \left(1 - k_f \left(\theta_{d,t}\right)\right) v_{d,t}$$

$$n_{o,t}^* = (1 - \rho^{o*})(1 - \rho^{x*}) n_{o,t-1}^* + \widetilde{v}_{o,t} k^f (\theta_{o,t}^*)$$
$$n_{d,t} = (1 - \rho^{o})(1 - \rho^{x}) n_{d,t-1} + v_{d,t} k_f (\theta_{d,t})$$

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Wage Determination

- Three wages, each set via Nash bargaining
  - $w_{d,t}$: Multinational and Home workers in domestic jobs
  - $w^*_{d,t}$: Foreign firm and Foreign workers in domestic jobs
  - $w^*_{o,t}$: Multinational and Foreign workers in offshored jobs
- Generalized Nash sharing rule for market i:

$$\mathbf{W_{i,t}} - \mathbf{U_{i,t}} = \frac{\eta}{1-\eta}\left(\mathbf{J_{i,t}} - \mathbf{V_{i,t}}\right)$$

Home workers' value functions

- Value of a domestic employment relationship

$$\mathbf{W_{d,t}} = w_{d,t} - \frac{h'_t}{u'_t} + \beta E_t \left(\frac{u'_{t+1}}{u'_t} \left((1-\rho)\mathbf{W_{d,t+1}} + \rho \mathbf{U_{t+1}} \right) \right)$$

- Value of unemployment

$$\mathbf{U_t} = 0$$

Outside option IS NOT directly influenced by offshoring

Multinationals' value functions

- Value of a domestic employment relationship

$$\mathbf{J_{d,t}} = f_{n_d,t} - w_{d,t} + \beta(1-\rho^o)E_t\left(\frac{u'_{t+1}}{u'_t}(\rho^x\mathbf{V_{d,t+1}} + (1-\rho^x)\mathbf{J_{d,t+1}})\right)$$

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- Value of unfilled vacancy in domestic labor market

Value of a vacancy in the short-run (prior to imposing free entry)

$$\begin{aligned}\mathbf{V_{d,t}} &= -\gamma + k^f(\theta_{d,t})\mathbf{J_{d,t}} \\ &\quad +\Omega(1-k^f(\theta_{d,t}))\left(-(1-\tau^v)\gamma_o^* + k^f(\theta_{o,t}^*)\mathbf{J_{o,t}}\right) \\ &\quad +(1-k^f(\theta_{d,t}))(1-\Omega k^f(\theta_{o,t}^*))(1-\rho^o)\beta E_t\left(\frac{u'_{t+1}}{u'_t}\mathbf{V_{d,t+1}}\right) \\ &= r_t^k \frac{K_t}{n_{d,t}}\end{aligned}$$

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Value of a vacancy in the long-run (after imposing free entry)

Domestic wage: Isolating the “threat effect”

- Short run vs. long run threat effect

Short-run wage (prior to imposing free entry)

$$
\begin{aligned}
w_{D,t} = {} & (1-\eta)\frac{h'(lfp_t)}{u'(c_t)} + \eta f_{n_{D,t}} \\
& + \eta(\gamma - k^f(\theta_{D,t})(\mathbf{J}_{D,t} - (1-\rho^o)E_t\left[\Xi_{t+1|t}\mathbf{V}_{D,t+1}\right])) \\
& + \eta\Omega(1-k^f(\theta_{D,t}))(\gamma_O^* - k^f(\theta_{O,t}^*)(\mathbf{J}_{O,t}^* \\
& \qquad - (1-\rho^o)E_t\left[\Xi_{t+1|t}\mathbf{V}_{D,t+1}\right]))
\end{aligned}
$$

$$
= (1-\eta)\frac{h'(lfp)}{u'(c)} + \eta(f_{n_d} - (1-\beta(1-\rho^o))r^k\frac{K}{n_d})
$$

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Long-run wage (after imposing free entry)

Domestic wage: Isolating the “threat effect”

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$$

- If $\Omega = 0$ and, in absence of fixed cost, $\mathbf{V}_{D,t+1} \rightarrow 0$

$$
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Calibration to US and Mexican Data

- Final goods production:

Offshoring is a tiny fraction
of total final production!

$$y_t = z_t \left(\alpha^{\frac{1}{\vartheta}} y_{d,t}^{i\,\frac{\vartheta-1}{\vartheta}} + (1-\alpha)^{\frac{1}{\vartheta}} y_{o,t}^{i\,\frac{\vartheta-1}{\vartheta}} \right)^{\frac{\vartheta}{\vartheta-1}}; \alpha = 0.98, \vartheta = 1$$

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- Intermediate goods production:

$$y_{d,t}^{i} = z_{d,t} n_{d,t}^{\alpha} k_{d,t}^{1-\alpha}; \alpha = 0.7$$

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  - Repetitive task occupations account for roughly 40% of US employment Acemoglu and Autor (2011)

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  - Repetitive task occupations account for roughly 40% of US employment Acemoglu and Autor (2011)

- Foreign workers have less bargaining power

$$\eta = 0.5 \text{ vs. } \eta^* = 0.25$$

Quantitative Assessment of the Threat Effect

Two approaches:

1. Measurement
   - Offshorability increases from $\Omega = 0$ to $\Omega = 0.2$
2. How does the threat effect influence response to shocks?
   - Domestic technology shock, $z_{d,t}$
   - Trade liberalization shock, τ
   - Compare response with threat effect $(\Omega = 0.2)$ to response without $(\Omega = 0)$ threat effect

Measuring the Threat Effect

Table 2: The threat effect in response to a shock of offshorability,

	Free Entry		Fixed Entry	
	Home Country	Foreign Country	Home Country	Foreign Country
	Labor Market Aggregates			
w	-0.01	~ 0	-6.54	1.50
n	-0.02	~ 0	-1.65	0.42
UE	0.01	~ 0	0.60	-0.06
lfp	~ 0	~ 0	-0.67	0.20
ne	6.46	-7.48	$--$	$--$
	Macroeconomic Aggregates			
c	-0.01	~ 0	-0.67	-0.18
k	-0.02	~ 0	-1.09	-0.03
y	-0.02	~ 0	-1.15	-0.03
q	-0.01		-0.99	

† Results reported as % change in allocation from steady state in which no domestic jobs are offshorable ($\Omega = 0$) to one in which 20% of domestic jobs are offshorable ($\Omega = 0.2$).

Threat effect on wages: Technology shock

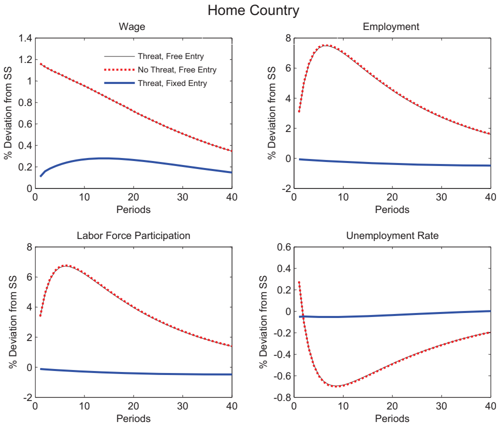

Figure 2: Impact of threat effect on the Home labor market in response to a temporary technology shock to Home intermediate goods production.

Conclusion

- *Methodological contribution:*
  - Tractable formalization of the threat of offshoring
- *Main Results:*
  - Threat of offshoring has *sizeable effects in the short run* even when offshoring is small fraction of total final production
    - Depresses domestic wage by as much as 7 percent
    - Dampens responsiveness of wage and labor market aggregates to fundamental shocks
  - *Minimal effects in the long run* when entry is free to adjust.

Threat effect on wages: Trade shock

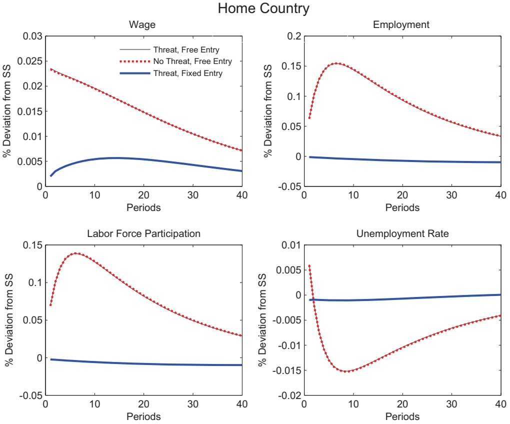

Figure 4: Impact of threat effect on the Home labor market in response to a temporary shock to the iceberg cost of shipping the offshored intermediate good back to the Home country.

Sensitivity Analysis (I)

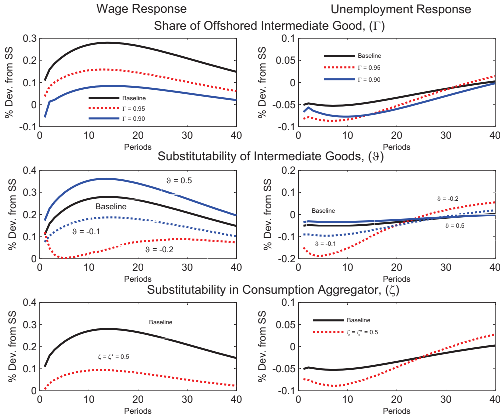

Figure 5: Impact of threat effect on the Home labor market in response to a temporary technology shock to Home intermediate goods production.

Sensitivity Analysis (II)

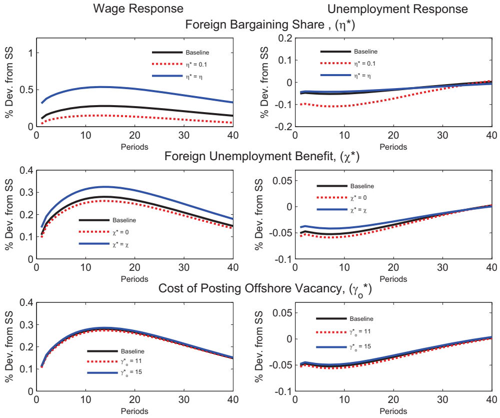

Figure 6: Impact of threat effect on the Home labor market in response to a temporary technology shock to Home intermediate goods production.

Multinational (Home) Firm: Optimization (con't.)

- Optimal domestic job creation combines

Vacancy posting condition in domestic market:

$$\begin{aligned}\lambda_{D,t} &= -\gamma - \Omega(1-k^f(\theta_{D,t}))\gamma_O^* \\ &+k^f(\theta_{D,t})\mu_{D,t} + \Omega(1-k^f(\theta_{D,t}))k^f(\theta_{O,t}^*)\mu_{O,t}^* \\ &+(1-k^f(\theta_{D,t}))(1-\Omega k^f(\theta_{O,t}^*))(1-\rho^o)E_t[\Xi_{t+1|t}\lambda_{D,t+1}]\end{aligned}$$

Job creation condition in domestic market:

$$\mu_{D,t} = f_{n_D,t} - w_{D,t} + (1-\rho^o)E_t\left[\Xi_{t+1|t}\left(\rho^x\lambda_{D,t+1} + (1-\rho^x)\,\mu_{D,t+1}\right)\right]$$

Multinational (Home) Firm: Optimization (con't.)

- Optimal domestic job creation combines

Vacancy posting condition in domestic market:

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Job creation condition in domestic market:

$$\mu_{D,t} = f_{n_D,t} - w_{D,t} + (1-\rho^o)E_t\left[\Xi_{t+1|t}\left(\rho^x\lambda_{D,t+1} + (1-\rho^x)\,\mu_{D,t+1}\right)\right]$$

- If $\Omega = 0$ and, in absence of fixed cost, $\lambda_{D,t} \rightarrow 0$

$$\frac{\gamma_D}{k^f(\theta_{D,t})} = f_{n_D,t} - w_{D,t} + (1-\rho)E_t\left[\Xi_{t+1|t}\left(\frac{\gamma_D}{k^f(\theta_{D,t+1})}\right)\right]$$