Job Turnover and Trade:

A General Equilibrium Analysis.

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Introduction

Does trade increase job instability?

- Policy pundits argue yes (Blinder, Rodrik...).
- But the empirical evidence is mixed.
- And the theoretical literature provides little guidance:
  - Trade literature "ignores" job turnover,
  - Turnover literature "ignores" trade.

- Our goal is to quantify the link between trade and job turnover.

Introduction

- We revisit this issue in a G.E. model of job turnover and trade:
  - We build a G.E. model of plant-level employment and export dynamics to quantify the effect of trade openness on turnover. The model is related to both the Melitz model of trade and to the Hopenhayn model of industry dynamics.
  - We reproduce the basic employment and export dynamics from the data.
  - And we quantify what happens to job turnover when we remove trade barriers.

Preview of findings

- For the U.S., there is a small rise in JT^{SS} from a big increase in trade (5% to 25%)
  - JT^{SS} rises 0.2 points (i.e., more rapid reallocation of workers).
  - But, there is a big welfare effect on steady-state consumption.
- The impact is small because trade has offsetting effects on JT:
  - New plants start smaller (less JT),
  - Plants stay exporters longer (less JT),
  - New exporters sell more (more JT).
- In transition, JT_t spikes in the short-run,
  - the short-run increase in turnover is 10 times larger than the long-run one.

Outline

- Model: Melitz meets Hopenhayn and Rogerson.
- Calibration.
- Turnover and trade: steady state and transitions.
- Evidence: Canadian data.

Empirical literature

- *Increase in job instability in the 80's and 90's*: Rodrik (1997) and Farber (1996).
- *Exchange rate appreciation and industry turnover*: Gourinchas (1998, 1999), Goldberg, Tracy and Aaronson (1999), Haltiwanger et al (2004), OECD (2007).
- *Trade orientation and industry turnover rates*: Davis, Haltiwanger and Schuh (1997), Klein, Schuh and Triest (2002), Christev (2005), Kletzer (1999), Levinsohn (1999), Goldberg and Pavcnik (2006).
- *F.T.A. and industry employment losses*: Trefler (2004).
- *Heterogeneity & export dynamics*: Das, Roberts,Tybout (2007).

Model: basic structure

- Two symmetric countries $\{H, F\}$ - infinite horizon.
- In each country, a competitive (non-traded) final good sector uses tradable and non-tradable intermediates as inputs.
- Heterogeneous productive units, producing unique varieties.
- Export costs.

Model: basic structure

- Intermediate producers (prod. z) as monopolistic competitors,
  - stochastic processes given by $\phi(z'|z)$, $\phi_E(z')$ and $n_d(z)$.

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  - country (H, F),
  - sector (T, NT),
  - productivity (z),
  - export status ($m = 0$ for non-exporters, $m = 1$ for exporters).

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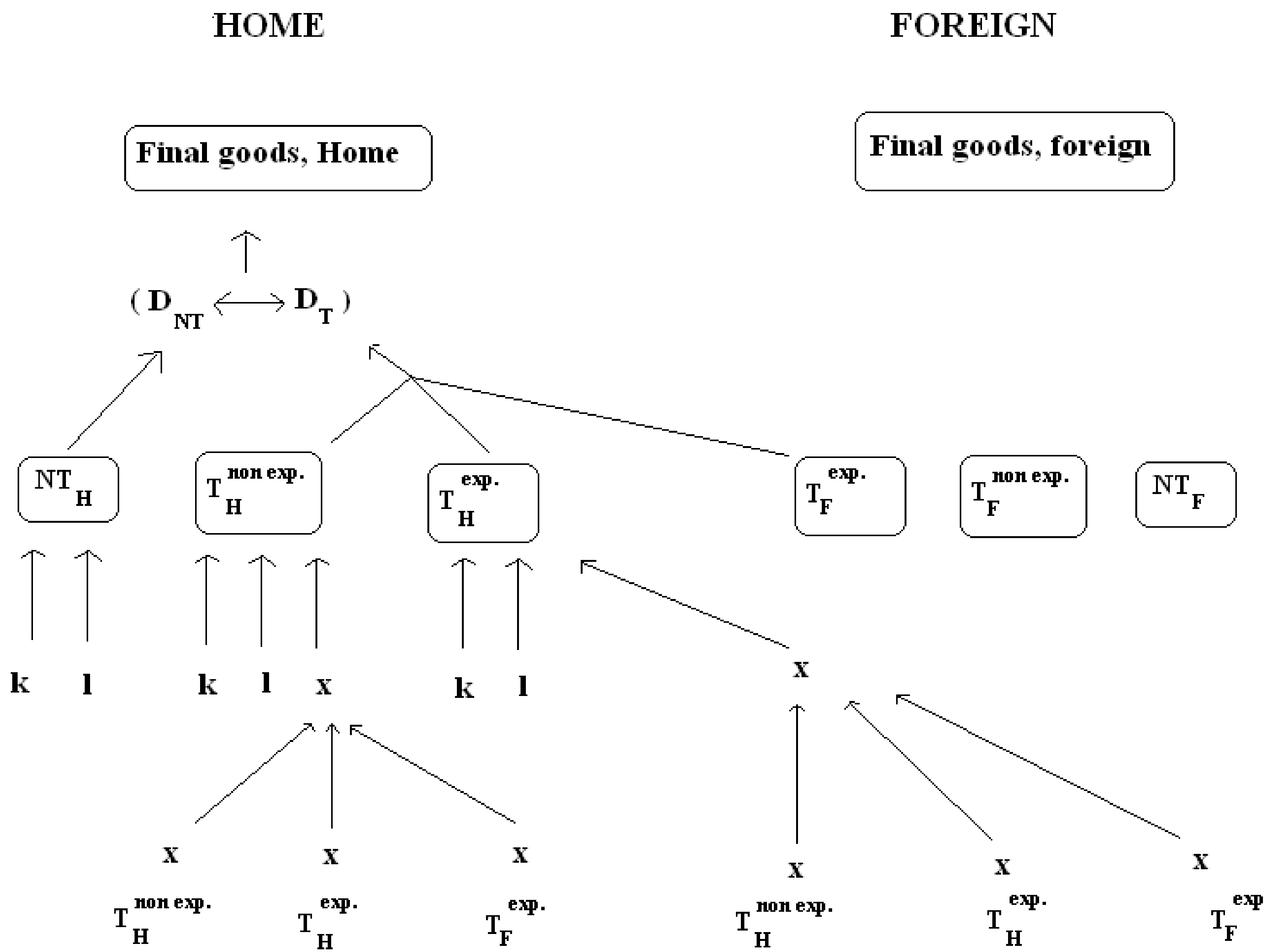
  - Tariff rate τ and iceberg costs ξ.


HOME
FOREIGN
Final goods, Home
Final goods, foreign
(D NT ⟷ D T)
NT H
T H non exp.
T H exp.
T F exp.
T F non exp.
NT F
k
l
k
l
x
k
l
x
x
T H non exp.
x
T H exp.
x
T F exp.
x
T H non exp.
x
T H exp.
x
T F exp.

Main abstractions

- Symmetric countries: no reallocation due to comparative advantage.
- Abstract away from business cycle fluctuations (Alessandria and Choi, 2007: export participation is pro-cyclical).
- Iceberg costs are exogenous and identical across firms.

Consumer problem

$$\max \sum_{t=0}^{\infty} \beta^t U(C_t),$$
$$s.t.\ c_t + k_t - (1-\delta) k_{t-1} + Q_t \frac{b_t}{P_t} = W_t l_t + R_t k_{t-1} + \frac{b_{t-1}}{P_t} + \Pi_t + T_t.$$

-
  - P_t: price of final good; (W_t, R_t): real factor prices; Q_t: price of bonds.
  - Π_t: home country profits; T_t: lump-sum transfer from home government.
  - The foreign problem is similar.

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- The FOC's are

$$Q_t = \beta \frac{U_{C,t+1}}{U_{C,t}} \frac{P_t}{P_{t+1}}, \qquad q_t \equiv \frac{e_t . P_t^*}{P_t} = \frac{U_{C,t}^*}{U_{C,t}}.$$

Technologies

- Final good:

$$D = D_T^{\gamma} \cdot D_N^{1-\gamma}.$$

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- Tradable good:

$$D_T = [\sum_m \int_z y_H(z,m)^{\frac{\theta-1}{\theta}} \psi_T(z,m) dz + \int_z y_F(z,1)^{\frac{\theta-1}{\theta}} \psi_T^*(z,1) dz]^{\frac{\theta}{\theta-1}}$$

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- Non-tradable good:

$$D_N = [\int_z y_N(z)^{\frac{\theta-1}{\theta}} \psi_N(z)\, dz]^{\frac{\theta}{\theta-1}}.$$

Final good sector

- Final good firms

$$
\begin{aligned}
\max \Pi_F = \quad & D - \sum_{m \in \{0,1\}} \int_z [\tfrac{P_H(z,m)}{P}] y_H^d(z,m)\, \psi_T(z,m)\, dz \\
& - \int_z [\tfrac{(1+\tau) P_F(z,1)}{P}] y_F^d(z,1) \psi_T^*(z,1)\, dz \\
& - \int_z [\tfrac{P_N(z)}{P}] y_N^d(z) \psi_N(z)\, dz,
\end{aligned}
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& - \int_z [\frac{P_N(z)}{P}] y_N^d(z) \psi_N(z)\, dz,
\end{aligned}
$$

subject to

$$
\begin{cases}
D \text{ aggregate of } D_N,\ D_T, \\
D_T \text{ aggregate of all } y_H^d(z,m) \text{ and all } y_F^d(z,1), \\
D_N \text{ aggregate of all } y_N^d(z).
\end{cases}
$$

Non-tradable producers

- The non-tradable producer chooses $P_{N,t}(z)$, $k_{N,t}(z)$ and $l_{N,t}(z)$ to maximize

$$V_{N,t}(z) = \max \pi_{N,t}(z) + n_s(z) Q_t \int_{z'} V_{N,t+1}(z') \phi(z'|z) dz',$$

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$$s.t. \quad \begin{cases} \pi_{N,t}(z) = \frac{P_{N,t}(z)}{P_t} y_{N,t}(z) - W_t l_{N,t}(z) - R_t k_{N,t}(z), \\ y_{N,t}(z) = e^z \cdot k_{N,t}(z)^{\alpha} \cdot l_{N,t}(z)^{1-\alpha}, \\ y_{N,t}(z) = y^d_{N,t}(z). \ (FG\text{-}prob.) \end{cases}$$

Tradable producers

The tradable producer chooses $P_{H,t}(z,m)$, $P^*_{H,t}(z,1)$, $k_{T,t}(z,m)$, $l_{T,t}(z,m)$, $x_t(z,m)$ [materials] and next period's export status m' to maximize

$$\begin{aligned} V_{T,t}(z,m) = \quad \max \quad & \pi_{T,t}(z,m) - m' W_t \left[f_1 m + (1-m) f_0 \right] \\ & + n_s(z) Q_t \int_{z'} V_{T,t+1}(z',m') \, \phi(z'|z) \, dz', \end{aligned}$$

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$$

where

$$
\begin{aligned}
\Pi_{T,t}(z,m) = \quad & \textit{foreign sales} + \textit{domestic sales} \\
& \textit{- payments to labor and capital} \\
& \textit{- payments to other TP,}
\end{aligned}
$$

Tradable producers

subject to

$$\begin{cases} \textit{production with inputs } k_{T,t}\left(z,m\right), l_{T,t}\left(z,m\right), x_t(z,m), \\ x_t(z,m) \textit{ aggregate of tradable intermediates,} \\ \textit{supply dom. mkt} = \textit{demand by dom. FGP} + \textit{dom. TP,} \\ \textit{supply foreign mkt} = \textit{demand by foreign FGP} + \textit{foreign TP,} \\ \textit{total supply} = \textit{dom. supply} + (1+\xi) * \textit{foreign supply.} \end{cases}$$

Exporting decision

- *Value of exporting at t+1:*

$$V^1_{T,t}(z,m) = \max \quad \Pi_{T,t}(z,m) - W_t\left[f_1 m + (1-m) f_0\right]$$
$$+ n_s(z)\, Q_t \int V_{T,t+1}(z',1)\,\phi(z'|z)\,dz',$$

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- *Value of not exporting at t+1:*

$$V^0_{Tt}(z,m) = \max \Pi_{Tt}(z,m) + n_s(z)\, Q_t \int_{z'} V_{Tt+1}(z',0)\, \phi(z'|z)\, dz'.$$

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- Thus, the value is $V_{T,t}(z,m) = \max\{V^0_{T,t}(z,m), V^1_{T,t}(z,m)\}$.

Exporting decision

- The value is increasing in z, given m. There are two thresholds that determine when non-exporters start exporting (z_0), and when exporters stop exporting (z_1), i.e.

$$\begin{cases} V^0_{T,t}\left(z_{0,t},0\right) = V^1_{T,t}\left(z_{0,t},0\right), \\ V^0_{T,t}\left(z_{1,t},1\right) = V^1_{T,t}\left(z_{1,t},1\right). \end{cases}$$

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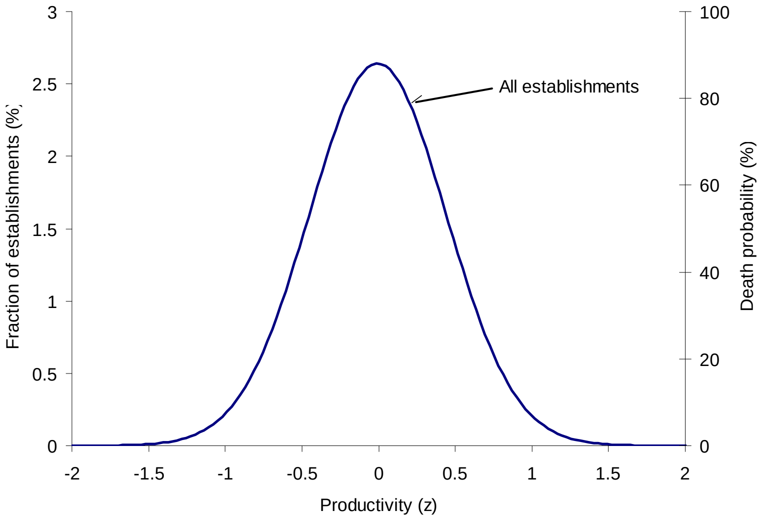
- We have that $z_{1,t} < z_{0,t}$ (hysteresis in exporter status).
- The starter rate for non-exporters decreases with z_0 and the stopper rate for exporters increases with z_1.

Establishment distributions



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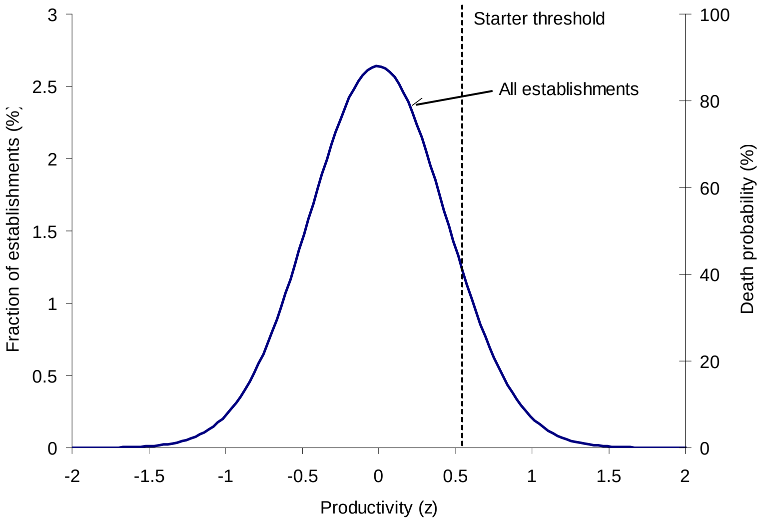

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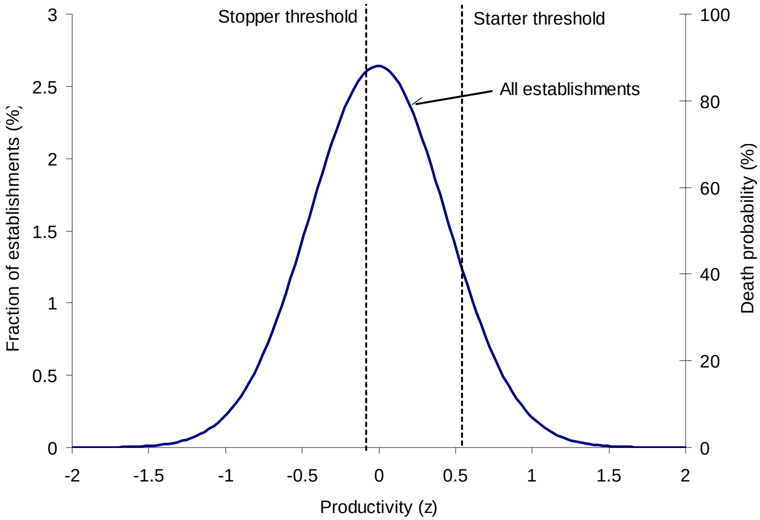

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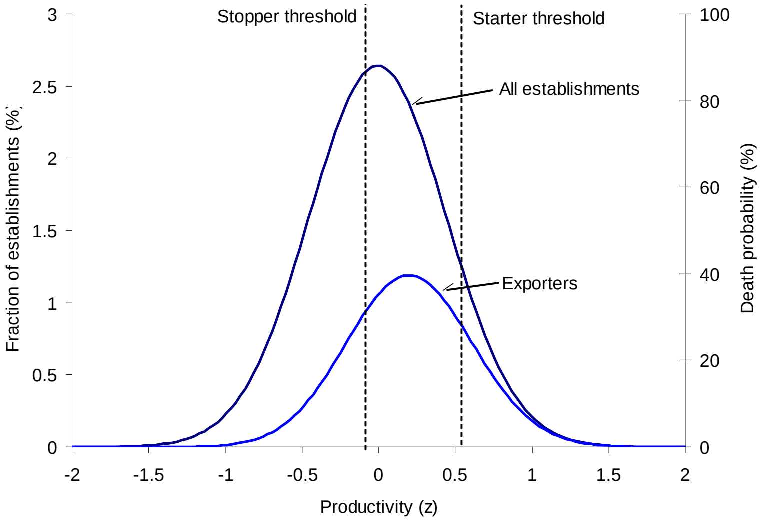

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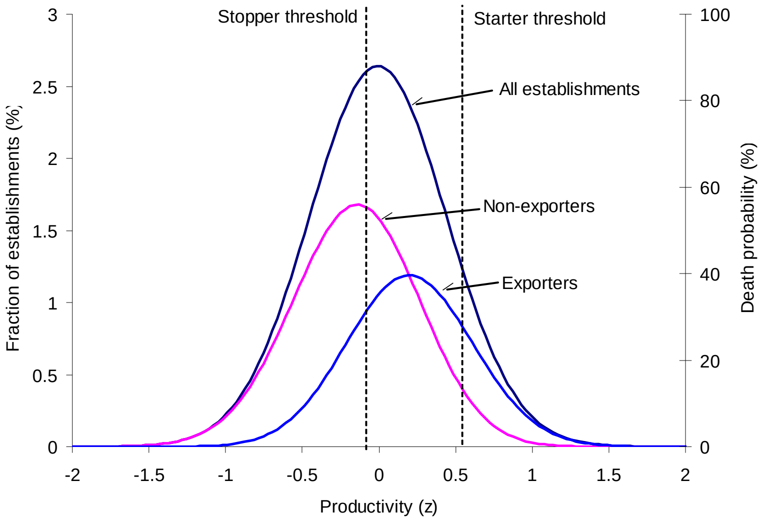

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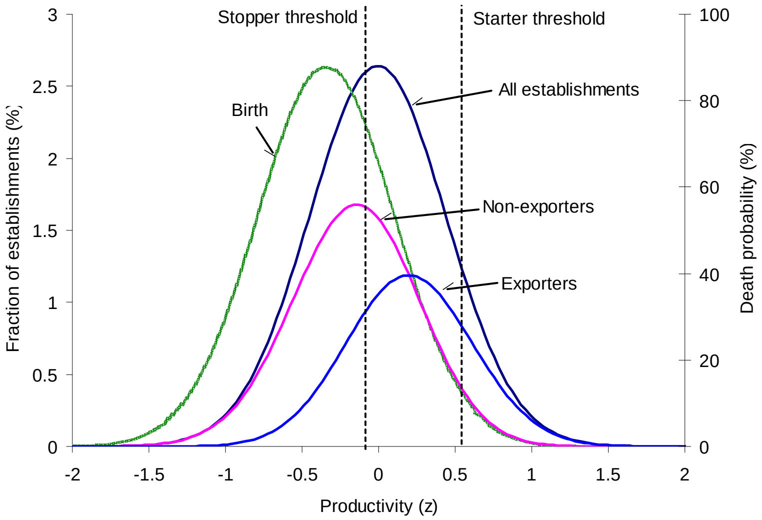

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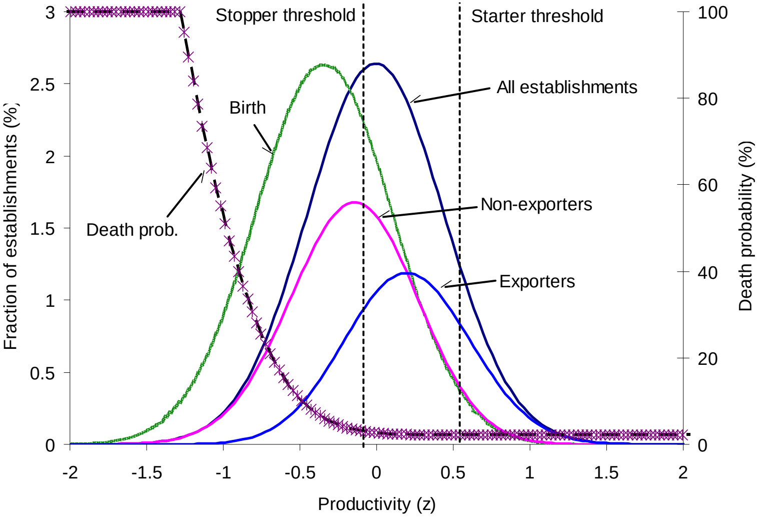

Entry into the market

- Firms pay $f_E \cdot W_t$ and start the next period with no workers.

- At $t+1$, firms draw z from $\phi_E(z)$ and produce

Tradable entry:

$$V_{T,t}^{E} = -W_t.f_E + Q_t \int_{z'} V_{T,t+1}(z',0)\,\phi_E(z')\,dz' = 0,$$

Non-tradable entry:

$$V_{N,t}^{E} = -W_t.f_E + Q_t \int_{z'} V_{N,t+1}(z')\,\phi_E(z')\,dz' = 0.$$

Calibration (macro)

- θ to match producer markup of 25%, also consistent with US trade-weighted import elasticity.
- Tariff rate of 8% mid-point of tariff and non-tariff barriers in industrialized countries.
- Transportation cost ξ set to match exporters' export to sales ratio of 13%.
- Tradable share γ set to match manufacturers' nominal value added relative to industry GDP.
- Labor share in production technology to match labor share of income.
- Share of materials into production determines ratio of gross output to value added in manufacturing.
- Entry cost f_E so total mass of establishments normalized to 2.

Calibration (establishment dynamics)

- The underlying stochastic process is given by: $z' = \rho z + \varepsilon$; for entrants, $z' = -\mu_E + \varepsilon_E$. The death rate is

$$n_d(z) = \max\{0, \min\{\lambda e^{-\lambda e^z} + n_{d0}, 1\}\},$$

decreasing in z.

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decreasing in z.

- The parameters of the stochastic processes $(\rho, \sigma_\varepsilon, \mu_E, \lambda, n_{d_0})$ and the export cost parameters (f_0, f_1) are set to match:
  - exporter rate [22.3%],
  - exporter output premium [5.6%],
  - stopper rate [17%],
  - entrants labor share [1.5%],
  - Shutdown establishments' labor share [2.3%],
  - five-year exit rate of entrants [37%],
  - Estab. employment and size distributions (to pin σ_ε down).

Calibration - Parameters

		Sunk
θ	Elasticity of Substitution	5
ρ	Persistence of idiosyncratic shock	0.69
σ_ε^2	Variance of idiosyncratic shock	0.33^2
λ	Exit shock	2.02
n_{d0}	Constant exit rate	2.25
μ_E	Productivity disadvantage young firms	0.335
f_E	Entry Cost	2.25
f_0	Startup export cost	0.219
f_1	Continuation cost	0.028

Calibration - Parameters

Period		year
Elasticity of Demand	θ	5
Discount factor	β	0.96
Capital Depreciation	δ	0.10
Capital Share	α	0.33
Tradables share	γ	0.21
Materials Share	α_x	0.70

Calibration

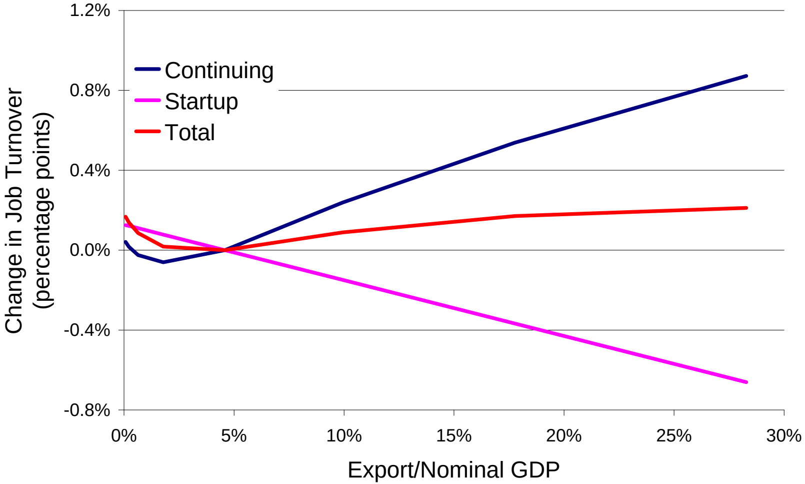
- Calibration tight on:
  - establishment distributions,
  - exporter persistence.
- Calibration substantially overstates JT (55% vs. 10%):
  - results robust in lower turnover calibration though.

Experiments

- We study the steady state relation between job turnover and trade, by varying trade costs ξ.

- We examine the transition dynamics to a large unanticipated cut in trade costs.

Steady state turnover



Steady state turnover

- Contributions from entrants fall, as new plants start smaller.
- More job turnover from continuing firms.
- The net effect is small.

Steady state turnover - effects

Impact on entrants:

- Trade barriers affect the level of competition plants face at home. Reducing tariffs reduces domestic sales as foreign competitors come in.

- Also big domestic plants demand more labor and push wages up.

▶ This has a negative effect on entry by small firms.

Steady state turnover - effects

Impact on incumbents:

- Shocks move firms across employment levels and export status:
  - Both the decisions of (*i*) whether to export, and (*ii*) how much to export affect JT,
- Reducing tariffs decrease z_0 and z_1 - more entry, less exit into and out of exporting. Plants stay in the export market longer.
- Reducing tariffs increases foreign sales and employment changes associated with a switch.

Non-linear relation between trade and turnover

More trade (lower barriers):

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  - Share of plants exporting (N_X / N) rises.

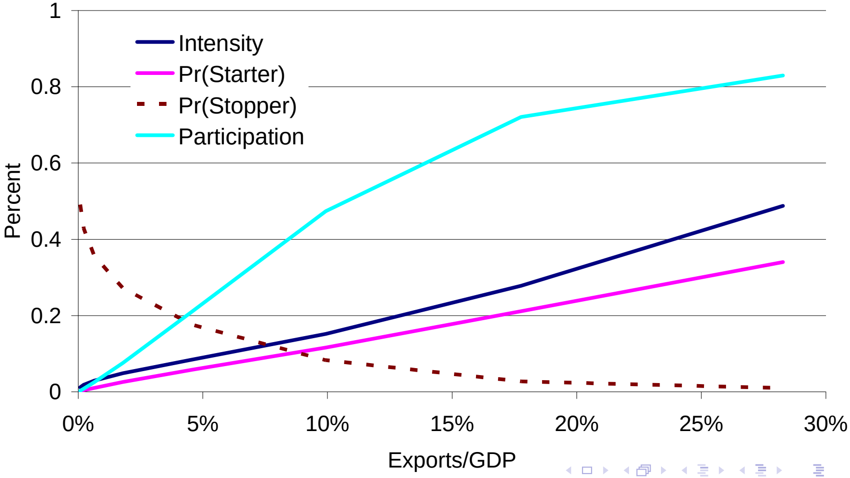
Non-linear relation between trade and turnover

More trade (lower barriers):

- Export intensity rises —> Changes in export status associated with greater adjustment in plant-level employment,
- More non-exporters start and fewer exporters stop,
    - Share of plants exporting (N_X/N) rises.
- So changes in exporting may increase/decrease.

$$\Delta status = \underbrace{\mathrm{N}_X/N}_{\uparrow} \underbrace{\Pr(\mathrm{stop})}_{\downarrow} + \underbrace{(1-\mathrm{N}_X/N)}_{\downarrow} \underbrace{\Pr(\mathrm{start})}_{\uparrow}$$

Non-linear relation between trade and turnover

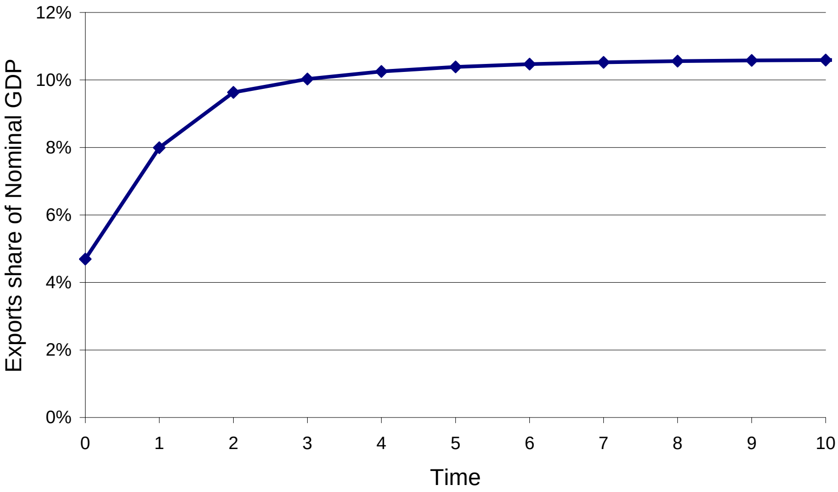


Transition

Consider an unanticipated cut in tariffs from 8 percent to zero.

- Long run impact on:
  - Job turnover up 0.1 percentage point,
  - Exports/Nominal GDP rises from 4.9 percent to 10.9 percent.
- Substantially more job turnover initially.

Transition



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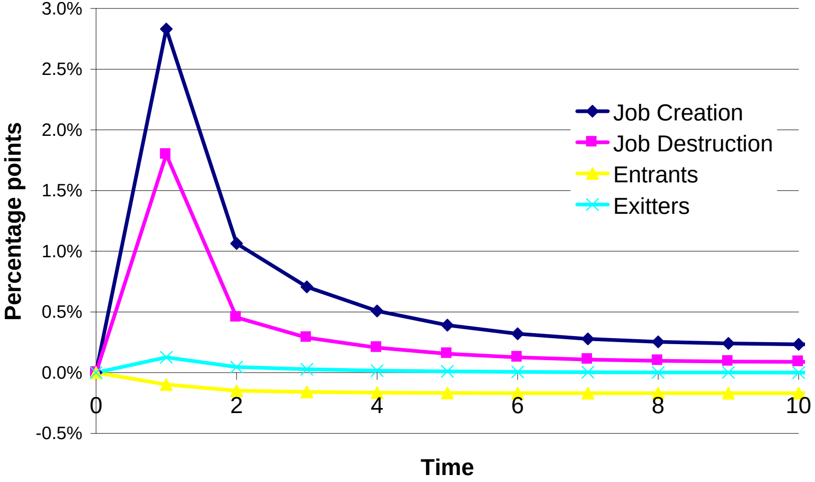

3.0%
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
-0.5%
Percentage points
0
2
4
6
8
10
Time
Job Creation
Job Destruction
Entrants
Exitters

A look at Canadian data

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- We can check whether the main mechanisms highlighted and results find support in the data:

1. Effect on entry,
2. Two opposing effects on the turnover of incumbents (reduced switching / greater adjustment after switch),
3. Total turnover when trade opens up.

A look at Canadian data

- We look at the Annual Survey of Manufacturers (1973-1999):
  - Population of establishments in Canada,
  - Industry, age, size, shipments, inventories, employment,
  - Some years, export data is reported: exports/sales, destination.

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  - Some years, export data is reported: exports/sales, destination.
- We look at low-frequency turnover:
  - Availability of data,
  - High-frequency job turnover swamps low-frequency turnover due to export status changes.

Canadian data: reduced entry.

- The relative contribution of startups to job creation has decreased over time:

	Trade share	%JC by incumbents	%JC by entrants
1984-1990	26.5%	85%	15%
1993-1999	36.6%	88%	12%

Canadian data: reduced entry.

- The relative contribution of startups to job creation has decreased over time:

	Trade share	%JC by incumbents	%JC by entrants
1984-1990	26.5%	85%	15%
1993-1999	36.6%	88%	12%

- Entry rates have decreased post-FTA relative to pre-FTA (for all class sizes).

Canadian data: gains/decreases from switches.

- Bernard and Jensen (1999) argue that regressing plant-level employment growth rates on export status is misleading because of switching behavior. We follow their suggestion and regress

$$\Delta N_i^p = \alpha^p + \beta_1^p.start_{i,0} + \beta_2^p.both_{i,0} + \beta_3^p.stop_{i,0} + \theta X_{i,0} + \varepsilon,$$

  where the period $p \in \{84/90, 93/99\}$.

- The coefficients give the growth rate differentials for new exporters, continuing exporters and stoppers, relative to continuing non-exporters.

Canadian data: gains/decreases from switches.

	1984-1990	1993-1999
start	$+0.71\%$	$+1.94\%$
both	-0.62%	$+1.28\%$
stop	-1.99%	-0.26%
growth diff.		
NE / NN	$+0.71\%$	$+1.94\%$
EN / EE	-1.37%	-1.54%

Canadian data: aggregate turnover.

- Gross job reallocation (GJR) is relatively constant over time:

	84-90	93-99
GJR	30.5%	30.1%

Conclusion

1. We built a model of employment and export dynamics to look at the relation between job turnover and trade.
2. We found that the long-run effect of increased trade integration on job turnover is small:
    - Startups are smaller,
    - There are offsetting effects on job turnover:
        - Plants change export status less often,
        - But changes lead to more hiring/firing.
3. Cuts in trade cost lead to a short-run spike in job turnover.

Future research

- As of yet, the model overpredicts job turnover. A less volatile model would miss on establishment and exporter distributions.
  - Another source of heterogeneity may be needed. Coming closer to JT may require adjustment costs and shocks to fixed costs.
- Trade integration and the turnover of various types of plants:
  - exporters,
  - firms in the tradable sector.
- Large job losses and trade?