Trade and Investment under Policy Uncertainty:
Theory and Firm Evidence

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Motivation

- Firms face considerable uncertainty which:
  - arises from both economic and policy shocks (e.g. taxes, regulation, bailouts)
  - is important if sunk cost investment is large: new tech., good or market

- Firms entering new export markets face both:
  - large sunk costs
  - high uncertainty: new consumers & competitors, x-rate volatility and trade policy uncertainty
Main Question

- What is the impact of *trade policy uncertainty* (TPU) on the decision of (heterogenous) firms to invest and enter foreign markets?
Outline

- Preliminary Evidence for Importance of TPU
- Theoretical Framework
- Evidence of Impact of Trade Agreements on Firm Entry via reductions in TPU
Common instrument (tariff) not very volatile over time (unlike ex-rate) but any changes are more permanent

When TP shocks do occur they can shut down markets:
- e.g. 1930’s trade wars: key event in creation of the GATT, and still a main function of WTO:
  "Predictability through bindings and transparency [to] promote investment..."
- Even if trade wars and depressions are "rare" they can have important effects

WTO may reduce TPU but does not eliminate it
- Policy restrictiveness doubles if we include NTBs, often unregulated by WTO
- Macro shocks generate protectionist fears, e.g. in recent great recession, and attempts to counter them (e.g. G20 statements, WTO monitoring)
Proliferation of Preferential Trade Agreements (PTAs) in last 20 years: >270 in force, hundreds negotiated

PTAs as a source of systemic increase in TPU for
- Non-member exporters: potentially lower prices in export market b/c competitor receives preference
- Recipients of unilateral/unsecured preferences
  (e.g. U.S. GSP and ATPA currently expired, as they often have)

PTAs as a possible solution to TPU for
- for countries that can now avoid NTBs from partners
- for countries that can secure pre-existing preferences
  (e.g. Peru, Colombia PTAs w/ US; ACP countries w/ EU; Portugal and EC)

1986: EC accession transition starts (ends 1993), signature timing determined by Spanish-EC negotiations
Strong export growth to Spain (& EC10) post-accession characterized by firm entry

Table 1 gravity estimates: robust to controlling for income, x-rate, prices
Insignificant real export and firm entry growth to large non-preferential markets (US) post-accession
Each country $i$ has a mass of consumers w/ identical CES preferences over differentiated goods $v$ (eos=$\sigma$)

Demand for each $v$ and the associated price index $P_i$ are standard:

$$q_{iv} = \frac{\mu Y_i}{P_i} \left[ \frac{p_{iv}}{P_i} \right]^{-\sigma}$$

$$P_i = \left[ \int_{v \in \Omega} (p_{iv})^{1-\sigma} \, dv \right]^{1/(1-\sigma)}$$

where

- $\mu Y_i$ is aggregate expenditure on differentiated goods
- $p_{iv}$ is the consumer price for $v$ in $i$, inclusive of any trade costs
- $p_{iv}/\tau_{iV}$ is the price received by producers so $\tau_{iV} \geq 1$ is the advalorem trade cost factor, tariffs in our setting, common for any $v \in V$
Market Structure & Operating Profits

- Market structure: monopolistic competition
- Production costs = $w_e c_v$
  - $c_v$: constant mc (or productivity $1/c_v$) heterogenous & summarized by CDF, $G_V(1/c)$
  - $w_e$: unit input cost in country $e$, e.g. wage, common across firms
- Timing: production and pricing after policy & demand known
- Profit maximization $\implies$ standard markup rule & operating profit

$$\pi_{iv} = (\tau_{iV})^{-\sigma} c_v^{1-\sigma} A_i$$

- Aggregate cost and foreign demand summarized by
  $$A_i = (1 - \rho) \mu Y_i (w / P_i \rho)^{1-\sigma}$$
- Decreasing in foreign applied tariff
Investment and Entry Decision into Export Market:
Basic Assumptions

- No fixed costs to enter/produce domestically (as in Helpman et al., 2008) \( \Rightarrow N_V \) firms for each \( V \) producing for home and we focus on determining which invest to enter exporting.
- Fixed cost investment \( K \) to enter a new export market
- Probability \( \delta \) of exogenous exporter death
- Discount factor \( \beta = (1 - \delta) / (1 + R) \) also reflects interest rate, \( R \).
Firm invests & enters if PDV of operating profits exceeds entry cost:

\[
\frac{\pi_{iv}}{1 - \beta} \geq K_{iv}
\]

Zero profit cutoff for potential exporters of a \( v \in V \) to country \( i \)

\[
c^D (\tau_{iv}) = \left[ \frac{(\tau_{iv})^{-\sigma} A_i}{(1 - \beta) K_{iv}} \right]^{1/(\sigma - 1)}
\]

Cutoff elasticity wrt permanent change in \( \tau \): 

\[
- \frac{d \ln c^D}{d \ln \tau} = \frac{\sigma}{\sigma - 1}.
\]
Firms can be divided into:
- exporters, with value denoted by $\Pi_e$
- non-exporters, with value $\Pi_w(aiting)$, who enter iff

$$\Pi_e(\bar{\tau}, c) - K \geq \Pi_w(\bar{\tau}, c)$$

Option value of waiting, $\Pi_w > 0$, b/c potential policy improvement.

Investment/entry decision rule for firm $c_v$: a trigger tariff $\tau_t \leq \bar{\tau}(c_v)$ where $\bar{\tau}$ makes firm indifferent between entry and waiting.

Given $c_v$ is the only source of heterogeneity for $v \in V$ a tariff $\tau_t \leq \bar{\tau}(c_v)$ triggers entry for any firm more productive than $v$. 
Two components of policy regime

- Timing of shocks: follows Poisson process, i.e. probability ($\gamma$) of shocks that prompt policy review, e.g. recession, trade agreement initiation, completion, failure
- Magnitude: after shock policy maker sets a new policy, $\tau'$, higher or lower

Exporters take regime as given & have rational expectations over $\tau'$

- summarized by CDF $H(\tau')$ w/ $\tau' \in [1, \tau_h]$.
- $\gamma$ and $H(\tau')$ are common knowledge to firms and time-invariant w/in a given policy regime

Why characterize policy regime by 2 independent components ($\gamma$, $H$)?
Modelling Trade Policy Uncertainty

- **Two components of policy regime**
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- **Why characterize policy regime by 2 independent components ($\gamma$, $H$)?**
  - $\gamma$ captures lack of policy persistence/credibility at aggregate level (e.g. how insecure is preference regime)
Two components of policy regime

- Timing of shocks: follows Poisson process, i.e. probability \( \gamma \) of shocks that prompt policy review, e.g. recession, trade agreement initiation, completion, failure
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- \( \gamma \) and \( H(\tau') \) are common knowledge to firms and time-invariant w/ in a given policy regime

Why characterize policy regime by 2 independent components (\( \gamma, H \))?

- \( \gamma \) captures lack of policy persistence/credibility at aggregate level (e.g. how insecure is preference regime)
- \( H(.) \) reflects industry specific preferences of policy maker
The Value of Entry and Waiting

- Value of exporting at time $t$ after having observed $\tau_t$ is

$$\Pi_e(\tau_t) = \pi(\tau_t) + \beta \left[ (1 - \gamma)\Pi_e(\tau_t) + \gamma E_t\Pi_e(\tau') \right].$$

- Value of waiting

$$\Pi_w(\tau_t) = 0 + \beta \left[ (1 - \gamma)\Pi_w(\tau_t) + \gamma (1 - H(\bar{\tau}))\Pi_w(\tau_t) \right]$$

$$+ \gamma H(\bar{\tau})(E_t\Pi_e(\tau' | \tau' \leq \bar{\tau}) - K)$$

- $E_t\Pi_e(\tau') = E\pi(\tau') / (1 - \beta)$ is ex-ante value of exporting following a policy shock to a new tariff $\tau'$

- $E_t\Pi_e(\tau' | \tau' \leq \bar{\tau})$ is the expected value of exporting after a policy shock below the trigger $\tau \leq \bar{\tau}$, linear in $E_t\Pi_e(\tau')$. 

Handley and Limão ()
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Equilibrium Value of Exporting vs. Waiting

Solving system of equations we obtain

- value of exporting

\[ \Pi_e(\tau_t, c) = \frac{\pi(\tau_t)}{1 - \beta(1 - \gamma)} + \frac{\beta \gamma}{1 - \beta} \frac{E \pi(\tau')}{1 - \beta(1 - \gamma)} \]

- value of waiting

\[ \Pi_w(\tau_t, c) = \frac{\beta \gamma H(\bar{\tau}(c))}{1 - \beta (1 - \gamma H(\bar{\tau}))} \left\{ \frac{E \pi(\tau'|\tau' \leq \bar{\tau}(c))}{1 - \beta(1 - \gamma)} + \frac{\beta \gamma}{1 - \beta} \frac{E_t \pi(\tau')}{1 - \beta(1 - \gamma)} \right\} - K \]
Value of Credible vs. "Incredible" Policies

- **Policy experiment I**
  - The government announces a reduction in current policy, credible iff $\gamma_p = 0$, otherwise “incredible”
  - Credible is more valuable than “incredible” policy change ($\gamma_p = 0$) since the tariff reduction is permanent

\[ -\frac{\partial}{\partial \tau_t} \Pi_e(\tau_t, \gamma_p = 0) > -\frac{\partial}{\partial \tau_t} \Pi_e(\tau_t, \gamma_0 > 0) \]

- **Policy experiment II**
  - Start with incredible policy and suppose it is free trade ($\tau_t = 1$, $\gamma_0 > 0$), now change policy regime to make it credible
  - Uncertainty reduction increases value of exporting ($\pi(1) > E \pi(\tau')$)

\[ \Pi_e(1, \gamma_{post} = 0) - \Pi_e(1, \gamma_0 > 0) = \frac{\pi(1) - E \pi(\tau')}{1 - \beta} \frac{\beta \gamma_0}{1 - \beta(1 - \gamma_0)} > 0 \]
Entry Decision under Uncertainty vs. Certainty

- Using operating profit, threshold condition and $\Pi_e, \Pi_w$ we obtain

\[
\begin{align*}
    c^U_t &= \mathbb{E}(1 - \beta + \beta \gamma \Delta(\tau_t))^{\frac{1}{\sigma-1}} \frac{A\tau_t^{-\sigma}}{K(1 - \beta)}^{\frac{1}{\sigma-1}} \\
    &= c^D_t
\end{align*}
\]

- $\gamma = 0 \implies c^U_t = c^D$ but uncertainty $\implies c^U_t \leq c^D$, since $\Delta(\tau_t) \leq 1$

- Interpreting $\Delta(\tau_t) - 1$: expected % reduction in operating profits if start at $\tau_t$ & policy shock leads to $\tau \geq \tau_t$

\[
\Delta(\tau_t) - 1 = - (1 - H(\tau_t)) \frac{\tau_t^{-\sigma} - E(\tau^{-\sigma} | \tau \geq \tau_t)}{\tau_t^{-\sigma}} \leq 0
\]

- Key result and intuition
Entry Decision under Uncertainty vs. Certainty

- Using operating profit, threshold condition and $\Pi_e, \Pi_w$ we obtain

$$c_t^U = \frac{1 - \beta + \beta \gamma \Delta(\tau_t)}{1 - \beta + \beta \gamma} \left[ \frac{1}{\sigma - 1} \right] = U_t$$

- $\gamma = 0 \implies c_t^U = c_t^D$ but uncertainty $\implies c_t^U \leq c_t^D$, since $\Delta(\tau_t) \leq 1$
- Interpreting $\Delta(\tau_t) - 1$: expected % reduction in operating profits if start at $\tau_t$ & policy shock leads to $\tau \geq \tau_t$

$$\Delta(\tau_t) - 1 = - (1 - H(\tau_t)) \frac{\tau_{t-\sigma} - E(\tau^{-\sigma} | \tau \geq \tau_t)}{\tau_{t-\sigma}} \leq 0$$

- Key result and intuition
  - Uncertainty reduces incentive to invest whether improvement is more or less likely & despite covexity of operating profits in tariffs.
Entry Decision under Uncertainty vs. Certainty

- Using operating profit, threshold condition and $\Pi_e, \Pi_w$ we obtain

$$c_t^U = \left[ \frac{1 - \beta + \beta \gamma \Delta(\tau_t)}{1 - \beta + \beta \gamma} \right]^{1/(\sigma-1)} = U_t$$

$$= \frac{A \tau_t^{-\sigma}}{K(1 - \beta)} \left[ \frac{1}{\sigma-1} \right]$$

$$c_t^D = \left[ \frac{1 - \beta + \beta \gamma \Delta(\tau_t)}{1 - \beta + \beta \gamma} \right]^{1/(\sigma-1)}$$

$$\gamma = 0 \implies c_t^U = c_t^D \text{ but uncertainty } \implies c_t^U \leq c_t^D, \text{ since } \Delta(\tau_t) \leq 1$$

- Interpreting $\Delta(\tau_t) - 1$: expected % reduction in operating profits if start at $\tau_t$ & policy shock leads to $\tau \geq \tau_t$

$$\Delta(\tau_t) - 1 = -(1 - H(\tau_t)) \frac{\tau_t^{-\sigma} - E(\tau^{-\sigma}|\tau \geq \tau_t)}{\tau_t^{-\sigma}} \leq 0$$

- Key result and intuition
  - Uncertainty reduces incentive to invest whether improvement is more or less likely & despite convexity of operating profits in tariffs.
  - Intuition: Example of “bad news principle”: by waiting firms avoid incurring a cost if there are bad news but can always enter if they receive good news.
Empirical approach: Structural Equation

**Basic questions**

- Do agreements reduce uncertainty?
- What are the 1st order effects of current policy & uncertainty on entry & trade?

**Structural equation:** 1st order loglinear approach around original applied policy values ($\tau_0$) and null hypothesis ($\gamma = 0$)

$$\ln(c^U) |_{\tau_0, \gamma} \approx \gamma \left( \frac{\beta}{1 - \beta} \right) \frac{\Delta(\tau_0) - 1}{\sigma - 1} - \frac{\sigma}{\sigma - 1} \ln \tau + \frac{1}{\sigma - 1} \ln \frac{A}{K(1 - \beta)}$$

**Empirical model requires us to address two key issues**

- Modelling uncertainty: impact on profits ($\Delta(\tau) - 1$) & shock arrival, $\gamma$
- Unobservability of cutoff
Measuring $\Delta (\tau_0) - 1$, requires specific distribution, we assume

$$\tau_t = \tau_s, \quad \Pr(\tau_s) = p_s \text{ for each } s \in \{l, m, h\}$$

Captures 3 key cases in data:

- $\tau_l = 1$ for some goods exported to EC,
- $\tau_m$: intermediate preferences by EC and Spain and
- $\tau_h$: no preferences in the rest (e.g. agric.), which face same $\tau$ as ROW

Allows us to compute theory-based uncertainty measure

$$\Delta (\tau_{0iV}) - 1 = -p_h \left( \frac{\tau_{0iV} - \tau_{hiv}}{\tau_{0iV}^{-\sigma}} \right)$$

Tractable and intuitive, relies on observed initial applied tariffs, $\tau_{0iV}$, threat tariffs, $\tau_{hiv}$ (non-preferential rates), and elasticities.

Requires $p_h$ to be estimated so assumed constant over country and industry.
Arrival of policy shocks and change of policy regime

\[ \gamma_{ti} = \gamma_0 \left(1 - EC_{it}\right) + \gamma_{post} EC_{it} \]

- \( EC_{it} = 1 \) if importer \( i \) has a secure preferential agreement with exporters at time \( t \) and zero otherwise
- Test if agreement reduces uncertainty, i.e. \( \gamma_0 > \gamma_{post} \), and possibly eliminates it \( (\gamma_0 - \gamma_{post} = \gamma_0) \)
Empirical approach: From Cutoff to Firm entry

- Cutoff is importer and industry specific so we focus on fraction of exporters in \( V \) to \( i \), which is at least \( G(c_{tiV}^U) \)
- Relationship to observed numbers of firms

\[
\ln \frac{n_{tiV}}{n_{tV}} = \ln G(c_{tiV}^U) + u_{tiV}
\]

- \( u_{tiV} \) is a disturbance term capturing measurement error in dependent variable
- \( u_{tiV} \) may also reflect “legacy” effects (inefficient firms remaining from entry under better times) but argue unlikely in Portugal 1985-1987 (gross entry new firms 35% and 42% respectively)
- Parameterize distribution as Pareto so \( \ln G(c_{tiV}^U) = k \ln \left( \frac{c_{tiV}^U}{c_{tV}} \right) \)
Estimation Equation

- Levels

\[ \ln n_{t|V} = (b_{\gamma_0} (1 - EU_{it}) + b_{\gamma_{post}} EU_{it}) \times unc_{i|V} + b_\tau \ln \tau_{t|V} + a_{t|V} + \tilde{u}_{t|V} \]
Estimation Equation

- Levels

\[ \ln n_{tiV} = (b_{\gamma 0} (1 - EU_{it}) + b_{\gamma \text{post}} EU_{it}) \times unc_{iV} + b_\tau \ln \tau_{tiV} + a_{tiV} + \tilde{u}_{tiV} \]

- \( unc_{iV} \equiv \frac{(\tau_{0iV}^{\sigma} - \tau_{hiV}^{\sigma})/\tau_{0iV}^{\sigma}}{\sigma-1} : \) Initial uncertainty (normalized)
Estimation Equation

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- \( a_{tiV} \equiv a_{ti} + a_{iV} + a_{tV} \): controls for unobserved heterogeneity and \( A_{ti}, n_{tV}, K_{iV} \).
Estimation Equation

- Levels

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- Changes (before and after agreement)

\[ \Delta_t \ln n_{tiV} = (b_{\gamma \text{post}} - b_{\gamma 0}) EU_i \times unc_{iV} + b_\tau \Delta_t \ln \tau_{tiV} + a_i + a_V + \tilde{u}_{iV} \]
Estimation Equation

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- Parameters and predictions
Estimation Equation

- Levels

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- Initial uncertainty (normalized)
  \[ unc_{iV} = (\tau_{0iV}^{-\sigma} - \tau_{hiv}^{-\sigma}) / \tau_{0iV}^{-\sigma} / \tau_{0iV}^{-1} \]

- Controls for unobserved heterogeneity and
  \[ a_{tiV} = a_{ti} + a_{iV} + a_{tV} \]
  \[ A_{ti}, n_{tV}, K_{iV}. \]

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\[ b_{\gamma \text{post}} - b_{\gamma 0} = - (\gamma_{\text{post}} - \gamma_0) p h \frac{\beta k}{1-\beta} > 0 \]
Estimation Equation

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\Delta_t \ln n_{tiV} = (b_{γpost} - b_γ0) EU_{i} \times unc_{iV} + b_τ \Delta_t \ln τ_{tiV} + a_{i} + a_{V} + \tilde{u}_{iV}
\]

- Parameters and predictions

- \( b_{γpost} - b_γ0 = -\left(γ_{post} - γ_0\right) p_h \frac{βk}{1-β} > 0 \)

- \( b_τ = -\frac{kσ}{σ^{-1}} < 0 \)
Estimation Equation

- Levels

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\ln n_{itV} = (b_{\gamma 0} (1 - EU_{it}) + b_{\gamma post} EU_{it}) \times unc_{iV} + b_{\tau} \ln \tau_{tiV} + a_{tiV} + \tilde{u}_{tiV}
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- Parameters and predictions

  - \( b_{\gamma post} - b_{\gamma 0} = - \left( \gamma_{post} - \gamma_0 \right) p_h \frac{\beta k}{1 - \beta} > 0 \)
  - \( b_{\tau} = - \frac{k \sigma}{\sigma - 1} < 0 \)

- Sources of identification: Variation over time, industry (2-digit) and importer (EC-10 vs. Spain)
Portugal’s EC accession

- **Pre-Accession (1970s -1985)**
  - Portugal had duty free preferential access in industrial products by 1977 with EC-10 and EFTA members
  - EFTA-Spain agreement (1980)
    - Phase 1- preferential liberalization of industrial tariffs 1980-83 in Spain
    - Phase 2 indeterminate length requiring more negotiations, GATT incompatibility issues

- **Post-Accession (1986+)**
  - Spain reduces industrial tariffs to zero immediately, staged reduction on agriculture of 12.5% per year to free trade by 1993
  - Harmonization of Spain and Portugal to external Common Customs Tariff by 1993
  - Existing EC members reduced agricultural tariffs by 14.3% per year to free trade by 1992
Investment, Trade and TPU Evidence

Data

- **Firm level trade**
  - **Source:** INE (previously not explored for relevant period)
  - **Coverage:** 1981-2005 monthly firm shipment (values, quantities, destination, mode transport)
  - Baseline focus on narrow window around agreement (1985-1987) to better identify effect and avoid breaks (e.g. data collection method changes 1993, product concordance: 1982, 1988)

- **Policy Data**
  - **Source:** International Customs Tariff Bureau Catalogs, Spain (1984), Portugal (1983)
  - **Source:** EC Official Journal L342 (1980)
  - **Coverage:** Autonomous Tariffs (Spain, EC), GATT Tariff (Spain, EC, Portugal), Preferential Duties for EC (Spain)
  - Digitized from hardcopy and augmented by GATT notifications, Articles of Accession, EFTA-Spain and EC-Spain preferential agreements
**Investment, Trade and TPU Evidence**

**Tariffs and Uncertainty faced by Port. exporters (Mean (s.d.) across industries: Table 2)**

<table>
<thead>
<tr>
<th></th>
<th>EC-10</th>
<th>Spain</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Tariff (Portugal)</td>
<td>2.39</td>
<td>7.80</td>
<td>3.03</td>
</tr>
<tr>
<td></td>
<td>(5.37)</td>
<td>(5.14)</td>
<td>(5.62)</td>
</tr>
<tr>
<td>Pre Tariff (GATT)</td>
<td>7.95</td>
<td>14.1</td>
<td>8.67</td>
</tr>
<tr>
<td></td>
<td>(4.20)</td>
<td>(7.75)</td>
<td>(5.14)</td>
</tr>
<tr>
<td>Post Tariff (Portugal)</td>
<td>1.79</td>
<td>1.33</td>
<td>1.74</td>
</tr>
<tr>
<td></td>
<td>(3.96)</td>
<td>(3.51)</td>
<td>(3.91)</td>
</tr>
<tr>
<td>Tariff Change (Port)</td>
<td>-0.658</td>
<td>-6.56</td>
<td>-1.39</td>
</tr>
<tr>
<td></td>
<td>(1.44)</td>
<td>(4.78)</td>
<td>(2.90)</td>
</tr>
<tr>
<td>Change in No. Firms</td>
<td>24.7</td>
<td>91.1</td>
<td>32.9</td>
</tr>
<tr>
<td></td>
<td>(48.7)</td>
<td>(62.55)</td>
<td>(55.1)</td>
</tr>
</tbody>
</table>

- **Proportion of Profits Lost if Preference Reversed**
  - EC-10: 15.6
  - Spain: 16.3
  - Total: 15.6
  - Standard Deviation: 11.2, 9.77, 11.0

- **Observations (in levels)**
  - EC-10: 682
  - Spain: 92
  - Total: 781

- Substantial differences between preferential and other tariffs used to construct theory-based uncertainty measure faced by Port. exporters.
Substantial differences between preferential and other tariffs used to construct theory-based uncertainty measure faced by Port. exporters.

- 80% variation in EC applied tariffs faced by Portugal at 2-digit (75% for uncertainty variable) → focus on cross-“industry” variation.

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<td>(5.62)</td>
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<tr>
<td>Pre Tariff (GATT)</td>
<td>7.95</td>
<td>14.1</td>
<td>8.67</td>
</tr>
<tr>
<td>(4.20)</td>
<td>(7.75)</td>
<td>(5.14)</td>
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<td>Post Tariff (Portugal)</td>
<td>1.79</td>
<td>1.33</td>
<td>1.74</td>
</tr>
<tr>
<td>(3.96)</td>
<td>(3.51)</td>
<td>(3.91)</td>
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<tr>
<td>Tariff Change (Port)</td>
<td>-0.658</td>
<td>-6.56</td>
<td>-1.39</td>
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<tr>
<td>(1.44)</td>
<td>(4.78)</td>
<td>(2.90)</td>
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<tr>
<td>Change in No. Firms</td>
<td>24.7</td>
<td>91.1</td>
<td>32.9</td>
</tr>
<tr>
<td>(48.7)</td>
<td>(62.55)</td>
<td>(55.1)</td>
<td></td>
</tr>
<tr>
<td>Proportion of Profits Lost if Preference Reversed</td>
<td>15.6</td>
<td>16.3</td>
<td>15.6</td>
</tr>
<tr>
<td>(11.2)</td>
<td>(9.77)</td>
<td>(11.0)</td>
<td></td>
</tr>
<tr>
<td>Observations (in levels)</td>
<td>682</td>
<td>92</td>
<td>781</td>
</tr>
</tbody>
</table>
Support for both basic predictions (Table 3): more entry in goods w/
- larger tariff reductions, $b_\tau = -2.7^{**}$
- higher initial uncertainty (so uncertainty fell) $b_\gamma_{post} - b_\gamma_0 = 3.95^{**}$

Robust to
- controlling for other changes in applied policy (specific tariffs, NTMs, std dev. applied tariffs)
- Alternative calculations of uncertainty measure (w/ different $\sigma$)
- dropping goods w/ substantially higher $\sigma$ or in agriculture

Similar results if we focus on growth in varieties (new product by firm, Table 4)
Support for both basic predictions (Table 3): more entry in goods with:
- larger tariff reductions, $b_\tau = -2.7^{**}$
- higher initial uncertainty (so uncertainty fell) $b_{\gamma_{post}} - b_{\gamma_0} = 3.95^{**}$

Robust to
- controlling for other changes in applied policy (specific tariffs, NTMs, std dev. applied tariffs)
- Alternative calculations of uncertainty measure (w/ different $\sigma$)
- dropping goods w/ substantially higher $\sigma$ or in agriculture

Similar results if we focus on growth in varieties (new product by firm, Table 4)

Uncertainty not only fell but eliminated (insignificant effect on entry by 1987)
• Uncertainty explains more of entry variation than applied policy changes
• Reducing applied tariffs to zero increases entry by 4% (2% for EC; 20% for Spain)
• Reducing uncertainty to zero increases entry by 31%
• Counterfactual: what is % change in value of exporting if we reversed uncertainty effect of agreement but kept current tariffs at free trade?
  • Central estimate is 7.5%, almost twice as large as the value of tariff reductions
  • Requires probability exporters placed on preference loss before agreement \( \gamma_0 p_h \approx 0.24 \) (from estimate of structural equation)
In theory, TP changes that lead to new entry are not sufficient to generate strong aggregate export growth because:

- Typical new entrant smaller than continuing (Fig. 8)
- New Exporters *could* have displaced sales of existing ones

In practice: find both uncertainty and applied tariff reductions did contribute to aggregate export growth.
Conclusion
Main Results

- **Theoretical** (from dynamic exporting model w/ TPU)
  - uncertainty reducing agreements valuable to exporters facing barriers that are already low
  - value of exporting (and entry) less sensitive to applied tariff reductions under uncertainty
  - structural equation relating firm investment and entry to applied tariffs and TPU

- **Empirical**
  - Compute theory-based measure of TPU across country, time & products
  - Test investment and entry predictions w/ new firm level data
  - Strong evidence that Portugal’s EC accession in 1986 reduced TPU faced by its exporters and was key motive for their entry to EC markets
Conclusion

Future Research

- Test accession and negotiation effects of bindings based on theoretically sound uncertainty framework
- Revisit work on impact of unilateral and preferential trade reforms that focuses only on applied protection (most) to include credibility/uncertainty measures, otherwise misleading results, particularly if focus on ex-ante studies (see Table 5)
- Impact of foreign and own TPU on other firm level variables (e.g. investment expenditures directly, fdi, productivity)
- Interaction of TPU and other shocks (ex-rate, macro-shocks, etc)
- Estimate impact of TPU on entry and trade using the great recession as a shock and determine its contribution to great trade collapse (in progress)
- Model role of agreements when policy uncertain but endogenously determined by politically driven governments (in progress)
PTAs

- Demonstrates potential gains for members of securing trade preferences (e.g. developing countries access to developed and each other)
- Stronger entry effects of PTAs that reduce uncertainty also highlight they are potentially more harmful than expected for non-members.
- Clearer WTO rules and enforcement of which preference schemes are allowed may be useful in reducing uncertainty for non-members
WTO Accession, Negotiations and NTBs

- Potential benefit from accession: securing MFN status, e.g. China no longer worries about US annual MFN review
- Binding tariffs and negotiating reductions in them can reduce uncertainty (improves “worst” case scenario) and thus increase investment and trade even if applied is unchanged (but strongest effect if both reduced)
- Bindings only reduce uncertainty if credible worst case scenario so
  - even more important to enforce violations
  - regulate NTBs since their mere possibility can lower trade
  - regulate/limit worst case of potential future protection (carbon taxes at the border, labor and environmental duties, etc)
Sunk entry cost costs and option value of waiting (Dixit, 1989; Baldwin and Krugman, 1989).

Theory and evidence on firm heterogeneity and export selection highlight role of extensive margin (Bernard and Jensen, 1995; Bernard et al., 2007; Melitz, 2003; Chaney, 2008)

Evidence on aggregate trade effects of PTAs is mixed, especially for EC (Frankel, 1997), but very large in some estimates (c.f. Baier and Bergstrand, 2007)

Policy uncertainty:

- some theoretical work (e.g. Rodrik, 1991. Francois and Martin, 2004)
Portugal's Export Firm Entry Growth 1981-1992

- Spain
- Germany
- US
Strong real export growth to Germany (and other large EC-10 countries) post-accession driven initially by new firm entry

<table>
<thead>
<tr>
<th>Dependent variable (ln):</th>
<th>1 Exports</th>
<th>2 Number of Firms</th>
<th>3 Exports/firm</th>
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</thead>
<tbody>
<tr>
<td>EC-10*Post_86</td>
<td>0.239***</td>
<td>0.182***</td>
<td>0.0573</td>
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<td></td>
<td>[0.0595]</td>
<td>[0.0460]</td>
<td>[0.0766]</td>
</tr>
<tr>
<td>Spain*Post_86</td>
<td>1.231***</td>
<td>0.965***</td>
<td>0.266**</td>
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<tr>
<td></td>
<td>[0.130]</td>
<td>[0.0932]</td>
<td>[0.116]</td>
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<tr>
<td>US*Post_86</td>
<td>-0.103</td>
<td>-0.152</td>
<td>0.049</td>
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<tr>
<td></td>
<td>[0.132]</td>
<td>[0.0952]</td>
<td>[0.0924]</td>
</tr>
<tr>
<td>Real Importer GDP (ln)</td>
<td>1.208***</td>
<td>0.628***</td>
<td>0.580***</td>
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<td></td>
<td>[0.259]</td>
<td>[0.117]</td>
<td>[0.224]</td>
</tr>
<tr>
<td>Importer Price Index (ln)</td>
<td>0.165**</td>
<td>0.0501</td>
<td>0.115**</td>
</tr>
<tr>
<td></td>
<td>[0.0668]</td>
<td>[0.0365]</td>
<td>[0.0546]</td>
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<tr>
<td>Exchange Rate (ln)</td>
<td>0.163**</td>
<td>-0.0188</td>
<td>0.182***</td>
</tr>
<tr>
<td></td>
<td>[0.0670]</td>
<td>[0.0341]</td>
<td>[0.0554]</td>
</tr>
</tbody>
</table>

| Observations | 1590 | 1590 | 1590 |
| Adj R2       | 0.912| 0.967| 0.682|

**Margins of Growth Decomposition**

<table>
<thead>
<tr>
<th></th>
<th>EC-10</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.76</td>
<td>0.24</td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td>0.78</td>
<td>0.22</td>
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</table>

**Notes:**
Firm entry growth into EC-10/Spain (Robustness across e.o.s.)

<table>
<thead>
<tr>
<th>Dependent variable (ln):</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tbody>
<tr>
<td>Change in the Number of Firms</td>
<td>2.721**</td>
<td>3.952**</td>
<td>4.823**</td>
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<td>[1.209]</td>
<td>[1.716]</td>
<td>[2.051]</td>
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<td>Uncertainty Measure</td>
<td>-2.686**</td>
<td>-2.719**</td>
<td>-2.751**</td>
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<td>[1.184]</td>
<td>[1.182]</td>
<td>[1.180]</td>
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<tr>
<td>Observations</td>
<td>731</td>
<td>731</td>
<td>731</td>
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<tr>
<td>Adj R2</td>
<td>0.389</td>
<td>0.389</td>
<td>0.39</td>
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<tr>
<td>Change in Probability of Reversal</td>
<td>σ=2</td>
<td>σ=3</td>
<td>σ=4</td>
</tr>
<tr>
<td></td>
<td>-0.23</td>
<td>-0.24</td>
<td>-0.26</td>
</tr>
</tbody>
</table>

Notes:
All specifications include country and industry effects.
Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1
Sample: Spain and EC 10 countries, 1987-1985
Parameters: For uncertainty measure and computing probability of reversal, σ=2, 3, 4 as indicated, β=0.90
### Uncertainty and Applied Policy effects on Variety Growth to EC-10 and Spain

#### Table: Regression Results

<table>
<thead>
<tr>
<th>Dependent variable (ln):</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td>Change in Number of Varieties (Firm*Product)</td>
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<td></td>
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<tr>
<td>Uncertainty Measure</td>
<td>4.399**</td>
<td>4.301**</td>
<td>4.431**</td>
<td>4.351**</td>
<td>4.752**</td>
<td>4.415**</td>
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<td>[1.844]</td>
<td>[1.884]</td>
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<td>[1.288]</td>
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<tr>
<td></td>
<td></td>
<td>[0.269]</td>
<td></td>
<td></td>
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<tr>
<td>Specific Tariff Share Change</td>
<td></td>
<td></td>
<td>-0.579</td>
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<td>Applied Tariff SD Change</td>
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<td></td>
<td></td>
<td>0.468</td>
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<tr>
<td></td>
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<td></td>
<td>[4.243]</td>
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<td>Price Index Proxy Change (ln)</td>
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<td>1.946</td>
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<td>[3.923]</td>
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<td>SD of Price Index Proxy Change</td>
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<td>3.121</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>[11.13]</td>
<td></td>
</tr>
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<td>731</td>
<td>731</td>
<td>731</td>
<td>731</td>
<td>731</td>
</tr>
<tr>
<td>Adj R2</td>
<td>0.379</td>
<td>0.379</td>
<td>0.379</td>
<td>0.378</td>
<td>0.378</td>
<td>0.378</td>
</tr>
<tr>
<td>Change in probability of policy reversal</td>
<td>-0.24</td>
<td>-0.24</td>
<td>-0.25</td>
<td>-0.23</td>
<td>-0.23</td>
<td>-0.23</td>
</tr>
</tbody>
</table>

**Notes:**
Legacy effects

- Legacy effects in theory
  - $G(c_{tiV}^U)$ captures the fraction of exporters in market $i$ today in good times”, i.e. if $c_{tiV}^U \geq \max\{c_{TiV}^U \forall T < t\}$
  - Otherwise $G(c_{tiV}^U)$ is a lower bound since some exporters entered under better times than today and so some have $c_{tiV}^L > c_{tiV}^U$. Appendix derives exact relationship $\frac{n_{tiV}^*}{n_{tV}^*} = G(c_{tiV}^U)\lambda_{tiV}$ and $\lambda_{tiV} \geq 1$

- Legacy effects in estimation
  - Portugal’s case in 1985-1987 likely to represent “good times" as evidenced by very strong entry
  - Appendix shows estimation is robust to some forms of legacy effects, e.g. those caused by aggregate shocks to $A_{ti}$, since control for country*time effects.
Size Heterogeneity of New vs. Continuing

Total value (ln) of exports by NPC type in 1987

- New Exporters
- Continuing Exporters

Kernel = Epanechnikov, Bandwidth = .45

Handley and Limão () Trade & Investment under Policy Uncertainty
Portuguese Trade Share with Spain

85: Accession signed; 93: transition complete

Portuguese Export Shares with EC-10 & Spain

72: EC industrial preferences agreed

Handley and Limão (2008)
Basic Properties of Tariff Stochastic Process

- Long-run mean policy given by $E(\tau')$, determined by distribution $H(\tau')$ and independent of $\gamma$ if $\gamma > 0$.
  - Stresses importance of policy credibility: announcing $\tau_t$ has no effect on $E(\tau')$ unless exporters convinced that either $H(\tau')$ has changed or no policy reversals will occur ($\gamma = 0$)
  - Useful to try to identify and contrast the effects of changes in current policies at different $\gamma$ and changes in $\gamma$ itself

- What is $\gamma$ and what does it affect?
  - It is the probability of policy change, thus we refer to it simply as policy uncertainty
  - Affects next period policy variance (increases it) and mean (but only if $\tau_t \neq E(\tau')$)

$$E(\tau_{t+1}) = (1 - \gamma)\tau_t + \gamma E(\tau')$$
$$\text{Var}(\tau_{t+1}) = \gamma(1 - \gamma)(\tau_t - E(\tau'))^2 + \gamma \text{Var}(\tau')$$
Policy Impact on Investment and Entry

- Recall entry condition for marginal firm

\[ \Pi_e(\bar{\tau}, c) - K \geq \Pi_w(\bar{\tau}, c) \]

- Use equilibrium values, re-arrange and interpret

\[
\frac{\pi(\tau_t, c^U_t)}{1 - \beta(1 - \gamma)} + \frac{\beta \gamma}{1 - \beta} \frac{E\pi(\tau, c^U_t)}{1 - \beta(1 - \gamma)} + \beta \gamma \frac{H(\tau_t)[\pi(\tau_t, c^U_t) - E\pi(\tau|\tau \leq \tau_t, c^U_t)]}{1 - \beta(1 - \gamma)} \geq K
\]

- Investment cost can’t exceed the sum of
  - discounted profits at the current tariff.
  - the present value, following a shock, of the contribution to profits at the ex-ante expected tariff.
  - the present value of the expected loss of entering today, given that the next policy change is at or below the threshold.
Robustness to Elasticity Assumptions

- **Elasticity of substitution assumptions**
  - Baseline $\sigma = 3$ based on median from BLW (2008) estimates for these countries (3.4 at slightly less aggregate level)
  - Alternative common $\sigma$ (Table 6): similar results
  - Maintained assumption of similar typical $\sigma$ across 2-digit industries supported by the data (only 3 with $\sigma > 5$, dropping those does not change results)

- **Differences in elasticities across products, $\sigma$, vs across industries, $\sigma_V$**
  - Straightforward to re-derive results for special CD aggregator over industries (so $\sigma > \sigma_V \rightarrow 1$)
  - The demand conditions summarized by $A_{itV}$ now reflect industry*country price indices, $P_{itV}$.
  - Main empirical concern: Spain simultaneously liberalizing against ROW (to converge to EC CET)
  - Proxy for change in Spanish price index constructed based on its policy changes relative to ROW has “right” sign but insignificant and does not affect baseline results (Table 3,4 columns 5 and 6)
Uncertainty and Applied Policy effects on Firm Entry to EC-10 and Spain

- Predictions: $b_{\gamma_{post}} - b_{\gamma_0} > 0$; $b_{\tau} = -\frac{k\sigma}{\sigma - 1} < 0$

<table>
<thead>
<tr>
<th>Dependent variable (ln):</th>
<th>Change in Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Uncertainty Measure</td>
<td>3.952**</td>
</tr>
<tr>
<td></td>
<td>[1.716]</td>
</tr>
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<td></td>
<td>[1.182]</td>
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<td>NTM Share Change (ln)</td>
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<td>Price Index Proxy Change (ln)</td>
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<tr>
<td>R-squared</td>
<td>0.48</td>
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<td>Change in probability of policy rev</td>
<td>-0.24</td>
</tr>
</tbody>
</table>

Notes:
- All specifications include country and industry effects
- Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1
Quantification of Change in Export Value

- Counterfactual: what is the percent change in the value of exporting if we were to reverse the uncertainty effect of the agreement but maintain current tariffs at free trade.

\[ - \frac{\Pi_e(1, \gamma_{post} = 0) - \Pi_e(1, \gamma_0 > 0)}{\Pi_e(1, \gamma_{post} = 0)} \approx - \frac{\beta \gamma_0 p_h}{1 - \beta(1 - \gamma_0)} (1 - \tau_{hV}^{-\sigma}) \]

- Model estimate of \( \gamma_0 p_h = 0.24 \): the implied probability exporters attributed to a policy reversal to worst case scenario
  - under the counterfactual
    \[ (\gamma_0 - \gamma_{post}) p_h = \left[ \frac{\sigma}{\sigma - 1} \frac{1 - \beta}{\beta} \left( \frac{b_{\gamma_{post}} - b_{\gamma_0}}{-b_{\tau}} \right) \right]_{\sigma=3, \beta=0.9, \gamma_{post}=0} \]
  - Direct evidence for \( \gamma_{post} = 0 \) and \( \beta = 0.9 \) and \( \sigma = 3 \) in the paper
  - Implies lower bound for \( \gamma_0 \) and \( p_h \geq 0.24 \)

- Thus uncertainty reducing value of agreement for exporter ranges from 4% to 13%. Central estimate (\( \gamma = p_h \approx 0.5 \)) implies a value of 7.5% almost twice as large as the value tariff reductions.
Lessons for ex-ante evaluations of Agreements (1985)

- Pre agreement level effect of uncertainty on entry: negative and significant as expected; magnitude similar to that implied by changes
- Applied tariff effect on total exports insignificant - dampened due to uncertainty
- Re-estimating using changes in tariffs combined with uncertainty reduction are both significant