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

Trade Policy Uncertainty (TPU): why should we worry?

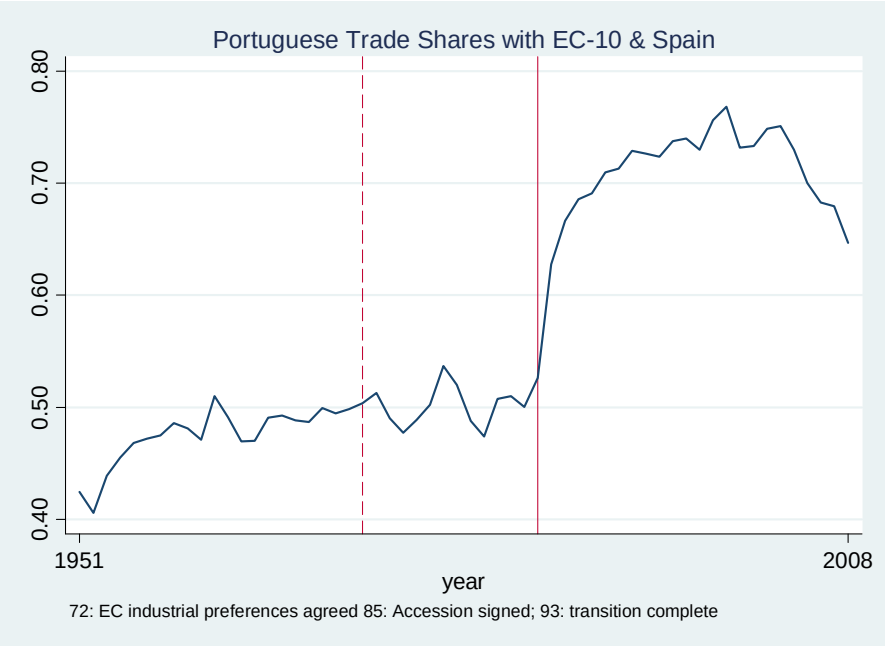
- Common instrument (tariff) not very volatile over time (unlike ex-rate) but any changes are more permanent
- When TP shocks do occur they can shut down markets:
  - e.g. 1930' trade wars: key event in creation of the GATT, and still a main function of WTO:
    "Predictability through bindings and transparency [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)

TPU: PTAs as Source and (possible) Solution

- 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)

TPU: Preliminary Evidence

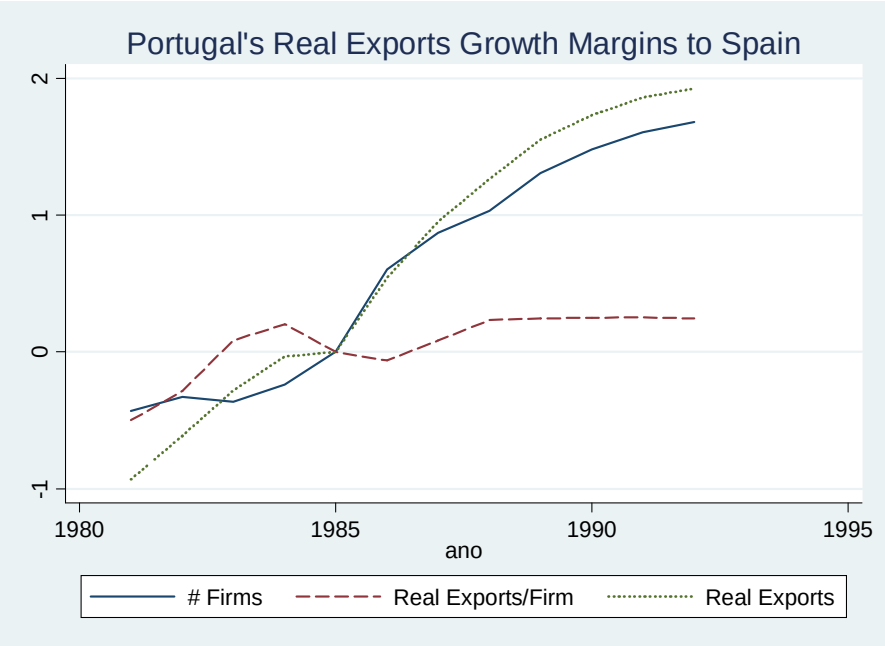
Portuguese Trade Shares: Uncertain vs. Certain Preferences (w/ EC10 & Spain)



- 1972-1985: Uncertain and partial preferences. EC-EFTA preferences in industrial goods (1972) and Spain-EFTA (1980).
- 1986: EC accession transition starts (ends 1993), signature timing determined by Spanish-EC negotiations

TPU: Preliminary Evidence

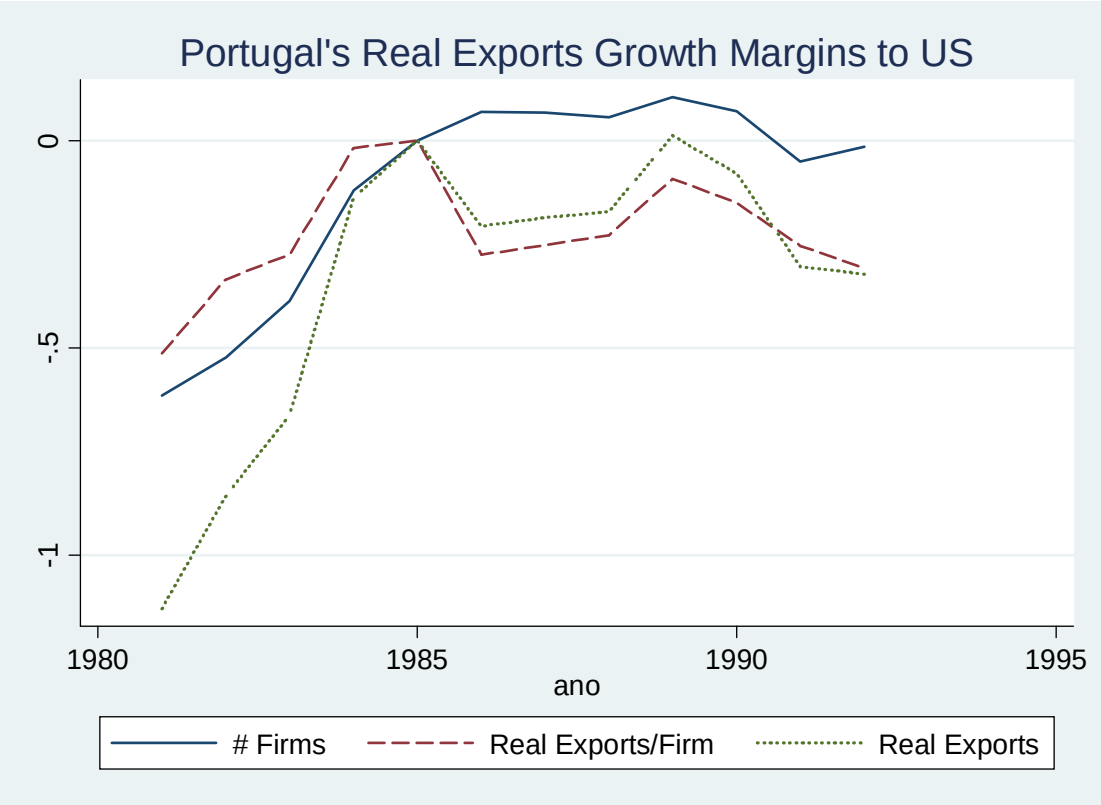
Margins of Real Export Growth: Preferential partner (Spain, 1981-1992)



- Strong export growth to Spain (& EC10) post-accession characterized by firm entry
- Table 1 gravity estimates: robust to controlling for income, x-rate, prices

TPU: Preliminary Evidence

Margins of Real Export Growth: Non-preferential partner (US, 1981-1992)



- Insignificant real export and firm entry growth to large non-preferential markets (US) post-accession

Theoretical Framework: Demand

- Each country i has a mass of consumers w/ identical CES preferences over differentiated goods v (eos=σ)
- Demand for each v and the associated price index P_i are standard:

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

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

- where
  - μY_i is aggregate expenditure on differentiated goods
  - p_{iv} is the consumer price for v in i, inclusive of any trade costs
  - p_{iv}/τ_{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 $\Longrightarrow$ standard markup rule & operating profit

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

  - Aggregate cost and foreign demand summarized by $A_i = (1-\rho)\mu Y_i \left(w/P_i\rho\right)^{1-\sigma}$
  - 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) $\Longrightarrow$ 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 δ of exogenous exporter death
- Discount factor $\beta = (1-\delta)/(1+R)$ also reflects interest rate, R.

Investment and Entry under Policy Certainty

- 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 τ: $-d \ln c^D / d \ln \tau = \frac{\sigma}{\sigma-1}$.

Investment and Entry under Policy Uncertainty

- Firms can be divided into
  - exporters, with value denoted by Π_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.

Modelling Trade Policy Uncertainty

- Two components of policy regime
  - Timing of shocks: follows Poisson process, i.e. probability (γ) of shocks that prompt policy review, e.g. recession, trade agreement initiation, completion, failure
  - Magnitude: after shock policy maker sets a new policy, τ', higher or lower
- Exporters take regime as given & have rational expectations over τ'
  - summarized by CDF $H(\tau')$ w/ $\tau' \in [1, \tau_h]$.
  - γ 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 (γ, H)?

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  - γ 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 τ_t is

$$\Pi_e(\tau_t) = \pi(\tau_t) + \beta[\underbrace{(1-\gamma)\Pi_e(\tau_t)}_{\text{No Shock}} + \underbrace{\gamma E_t \Pi_e(\tau')}_{\text{Shock}}].$$

- Value of waiting

$$\begin{aligned}\Pi_w(\tau_t) &= 0 + \beta[\underbrace{(1-\gamma)\Pi_w(\tau_t)}_{\text{No Shock}} + \underbrace{\gamma(1-H(\bar{\tau}))\Pi_w(\tau_t)}_{\text{Shock Above Trigger}} \\ &\quad + \underbrace{\gamma H(\bar{\tau})(E_t\Pi_e\left(\tau'|\tau' \leq \bar{\tau}\right) - K)}_{\text{Shock Below Trigger}}]\end{aligned}$$

- $E_t\Pi_e(\tau') = E\pi(\tau')/(1-\beta)$ is *ex-ante* value of exporting following a policy shock to a new tariff τ'
- $E_t\Pi_e\left(\tau'|\tau' \leq \bar{\tau}\right)$ is the expected value of exporting after a policy shock below the trigger $\tau \leq \bar{\tau}$, linear in $E_t\Pi_e(\tau')$.

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

$$\Pi_w(\tau_t, c) = \frac{\beta\gamma H(\bar{\tau}(c))}{1-\beta\left(1-\gamma H\left(\bar{\tau}\right)\right)} \left\{ \begin{array}{c} \frac{E\pi(\tau'|\tau' \leq \bar{\tau}(c))}{1-\beta(1-\gamma)} - K \\ + \frac{\beta\gamma}{1-\beta}\frac{E_t\pi(\tau')}{1-\beta(1-\gamma)} \end{array} \right\}$$

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 Π_e, Π_w we obtain

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

- $\gamma = 0 \Longrightarrow c_t^U = c^D$ but uncertainty $\Longrightarrow c_t^U \leq c^D$, since $\Delta(\tau_t) \leq 1$
- Interpreting $\Delta(\tau_t) - 1$: expected % reduction in operating profits if start at τ_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

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- Key result and intuition
  - Uncertainty reduces incentive to invest whether improvement is more or less likely & despite covexity 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 (τ_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, γ
  - Unobservability of cutoff

Empirical approach: Modelling Uncertainty I

- 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,
  - τ_m: intermediate preferences by EC and Spain and
  - τ_h: no preferences in the rest (e.g. agric.), which face same τ as ROW
- Allows us to compute theory-based uncertainty measure

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

  - Tractable and intuitive, relies on observed initial applied tariffs, τ_{0iV}, threat tariffs, τ_{hiV} (non-preferential rates), and elasticities.
  - Requires p_h to be estimated so assumed constant over country and industry.

Empirical approach: Modelling Uncertainty II

- Arrival of policy shocks and change of policy regime

$$\gamma_{ti} = \gamma_0 (1 - EC_{it}) + \gamma_{post} EC_{it}$$

  - $EC_{it} = 1$ 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 $\ln G(c_{tiV}^U) = k \ln \left(c_{tiV}^U / c_{tV} \right)$

Estimation Equation

- Levels

$$\ln n_{tiV} = \left(b_{\gamma 0}\left(1 - EU_{it}\right) + b_{\gamma post}\, EU_{it}\right) \times unc_{iV} + b_{\tau} \ln \tau_{tiV} + \mathbf{a}_{tiV} + \tilde{u}_{tiV}$$

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

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- Changes (before and after agreement)

$$\Delta_t \ln n_{tiV} = \left(b_{\gamma post} - b_{\gamma 0}\right) EU_i \times unc_{iV} + b_{\tau} \Delta_t \ln \tau_{tiV} + a_i + a_V + \tilde{u}_{iV}$$

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

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- 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)

	EC-10	Spain	Total
Pre Tariff (Portugal)	2.39	7.80	3.03
	(5.37)	(5.14)	(5.62)
Pre Tariff (GATT)	7.95	14.1	8.67
	(4.20)	(7.75)	(5.14)
Post Tariff (Portugal)	1.79	1.33	1.74
	(3.96)	(3.51)	(3.91)
Tariff Change (Port)	-0.658	-6.56	-1.39
	(1.44)	(4.78)	(2.90)
Change in No. Firms	24.7	91.1	32.9
	(48.7)	(62.55)	(55.1)
Proportion of Profits Lost if Preference Reversed	15.6	16.3	15.6
	(11.2)	(9.77)	(11.0)
Observations (in levels)	682	92	781

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

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	(4.20)	(7.75)	(5.14)
Post Tariff (Portugal)	1.79	1.33	1.74
	(3.96)	(3.51)	(3.91)
Tariff Change (Port)	-0.658	-6.56	-1.39
	(1.44)	(4.78)	(2.90)
Change in No. Firms	24.7	91.1	32.9
	(48.7)	(62.55)	(55.1)
Proportion of Profits Lost if Preference Reversed	15.6	16.3	15.6
	(11.2)	(9.77)	(11.0)
Observations (in levels)	682	92	781

- 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)$\Longrightarrow$focus on cross-"industry" variation

Investment, Trade and TPU Evidence

Basic Results and Robustness for Entry Predictions

- 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 σ)
  - dropping goods w/ substantially higher σ or in agriculture
- Similar results if we focus on growth in varieties (new product by firm, Table 4)

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  - dropping goods w/ substantially higher σ 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)

Investment, Trade and TPU Evidence

Quantification of Changes in Entry and Value of Exporting

- 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)

Investment, Trade and TPU Evidence

Effect of TP on Aggregate Export Values

- In theory TP changes that lead to new entry are not sufficient to generate strong aggregate export growth b/c
  - 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)

Trade/Investment Policy Implications

- 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

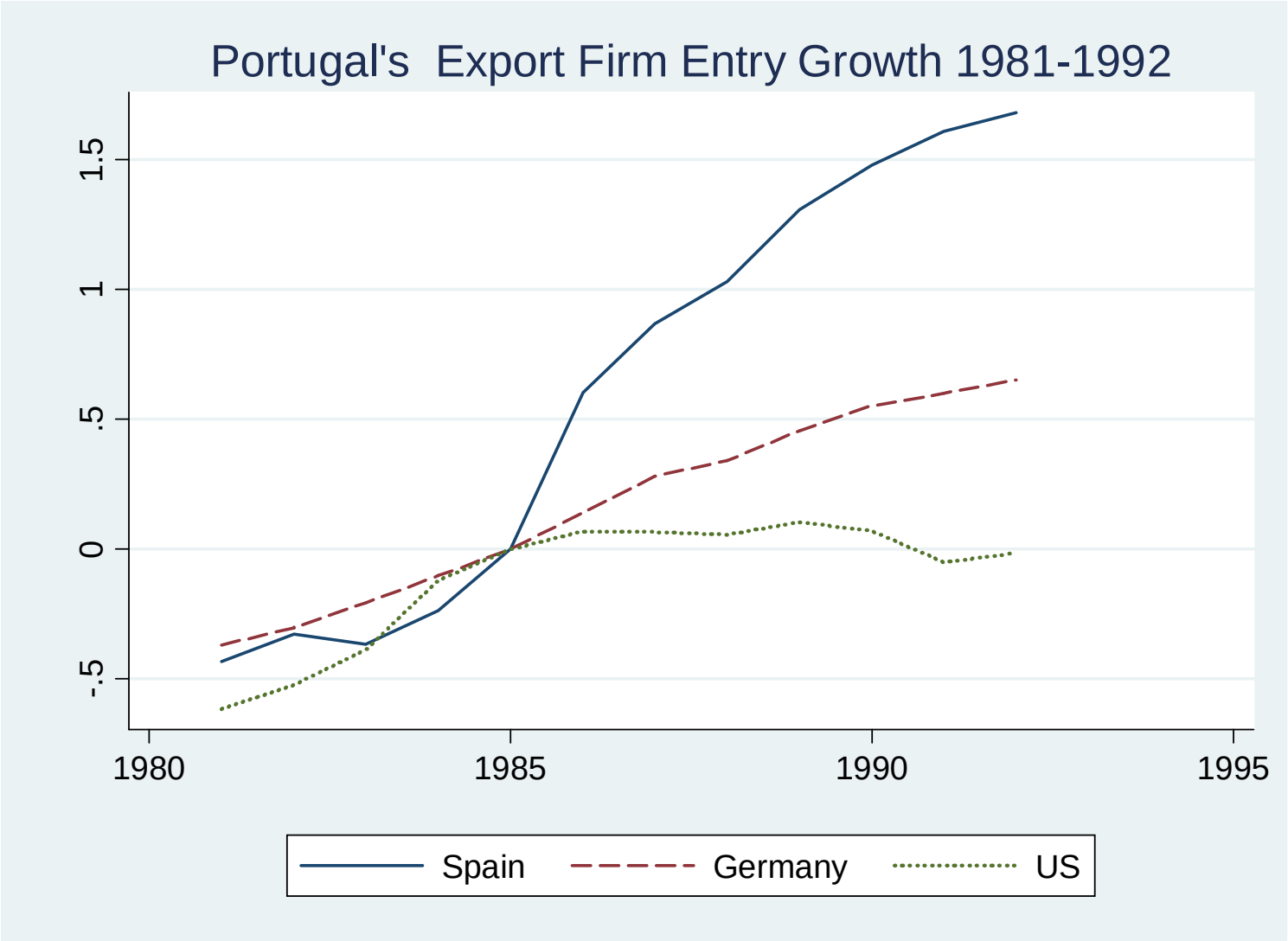
Trade/Investment Policy Implications

- 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)

Literature Review

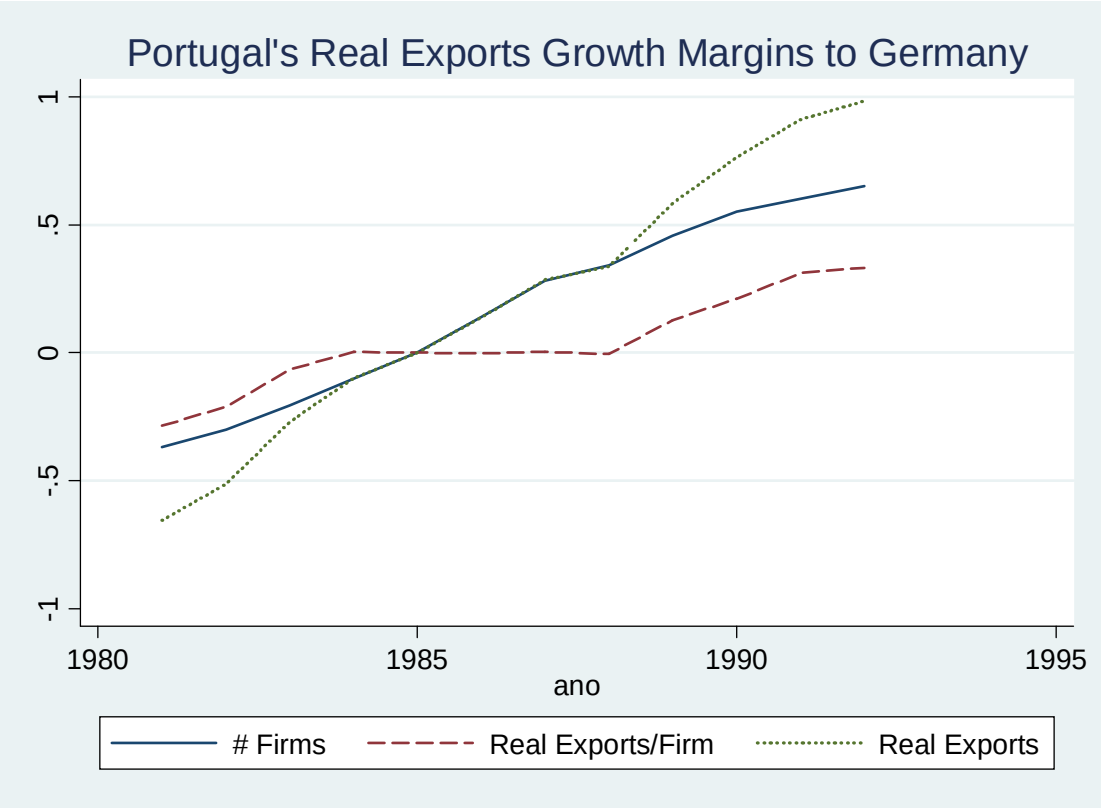
- Sunk entry cost costs and option value of waiting (Dixit, 1989; Baldwin and Krugman, 1989).
- Theory and evidence on firm heterogeneity and export selection highlight role of extensive margin (Bernard and Jensen, 1995; Bernard et al., 2007; Melitz, 2003; Chaney, 2008)
- Evidence on aggregate trade 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)
  - Handley (2010): theory and test using "gap" between applied tariffs and bindings for Australia. Finds evidence of delayed entry and reduced tariff elasticities in product level flows.

Export Firm Entry Growth, Long Run: 1981-1992



TPU: Preliminary Evidence

Margins of Real Export Growth: Germany (1981-1992)



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

Portuguese Export Growth Margins: Aggregate Evidence 1981-1992

Dependent variable (ln):	1 Exports	2 Number of Firms	3 Exports/firm
EC-10*Post_86	0.239***	0.182***	0.0573
	[0.0595]	[0.0460]	[0.0766]
Spain*Post_86	1.231***	0.965***	0.266**
	[0.130]	[0.0932]	[0.116]
US*Post_86	-0.103	-0.152	0.049
	[0.132]	[0.0952]	[0.0924]
Real Importer GDP (ln)	1.208***	0.628***	0.580***
	[0.259]	[0.117]	[0.224]
Importer Price Index (ln)	0.165**	0.0501	0.115**
	[0.0668]	[0.0365]	[0.0546]
Exchange Rate (ln)	0.163**	-0.0188	0.182***
	[0.0670]	[0.0341]	[0.0554]
Observations	1590	1590	1590
Adj R2	0.912	0.967	0.682

Margins of Growth Decomposition			
EC-10	1	0.76	0.24
Spain	1	0.78	0.22

Notes:

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

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

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

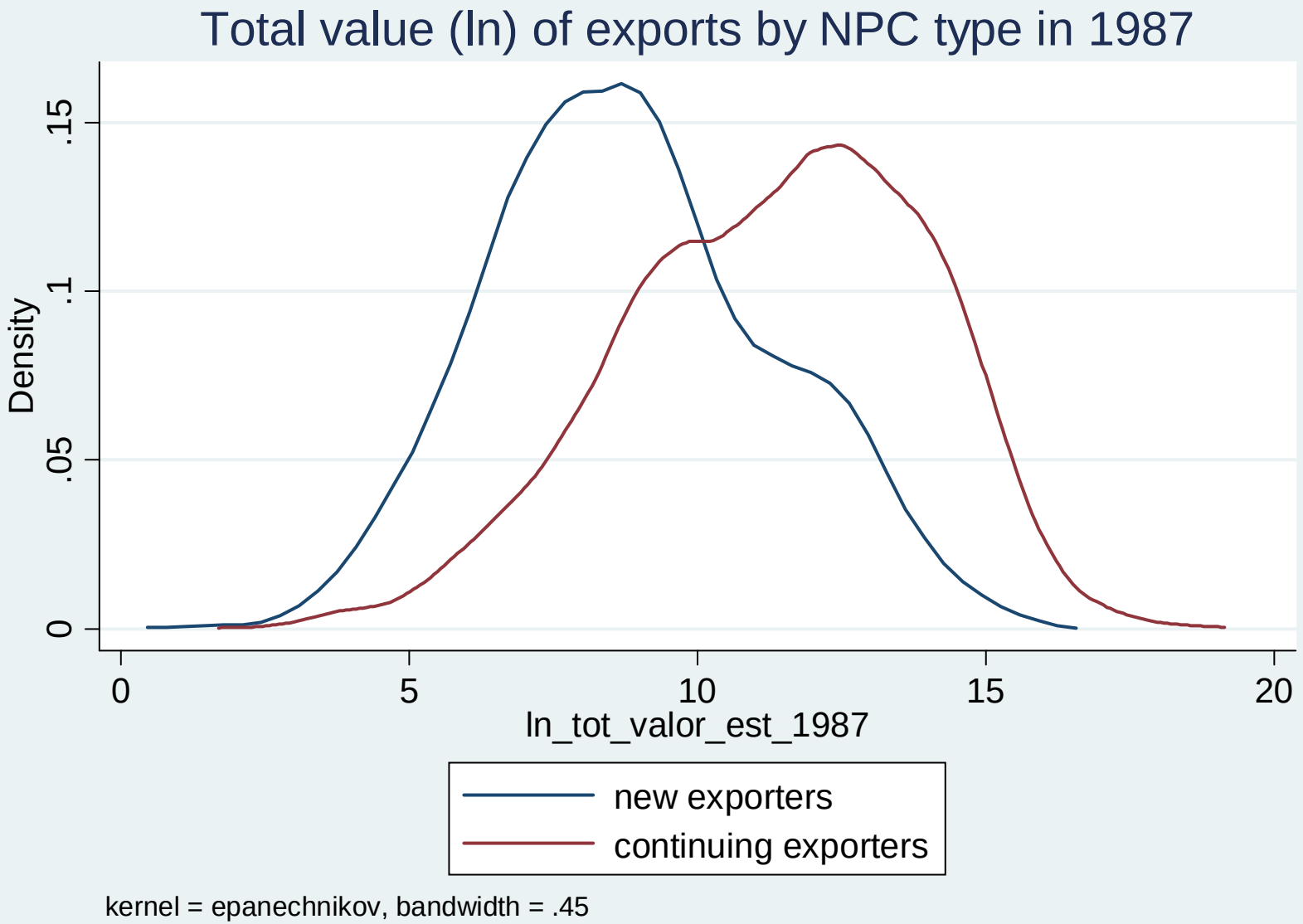
	1	2	3	4	5	6
Dependent variable (ln):	Change in Number of Varieties (Firm*Product)					
Uncertainty Measure	4.399**	4.301**	4.431**	4.351**	4.752**	4.415**
	[1.844]	[1.884]	[1.858]	[1.914]	[1.929]	[2.151]
Applied Tariff Change (ln)	-3.006**	-3.072**	-2.919**	-3.113**	-3.520***	-3.279*
	[1.301]	[1.305]	[1.288]	[1.333]	[1.328]	[1.724]
NTM Share Change (ln)		-0.166				
		[0.269]				
Specific Tariff Share Change			-0.579			
			[1.042]			
Applied Tariff SD Change				0.468		
				[4.243]		
Price Index Proxy Change (ln)					1.946	1.006
					[2.276]	[3.923]
SD of Price Index Proxy Change						3.121
						[11.13]
Observations	731	731	731	731	731	731
Adj R2	0.379	0.379	0.379	0.378	0.378	0.378
Change in probability of policy reversal	-0.24	-0.24	-0.25	-0.23	-0.23	-0.23

Notes:

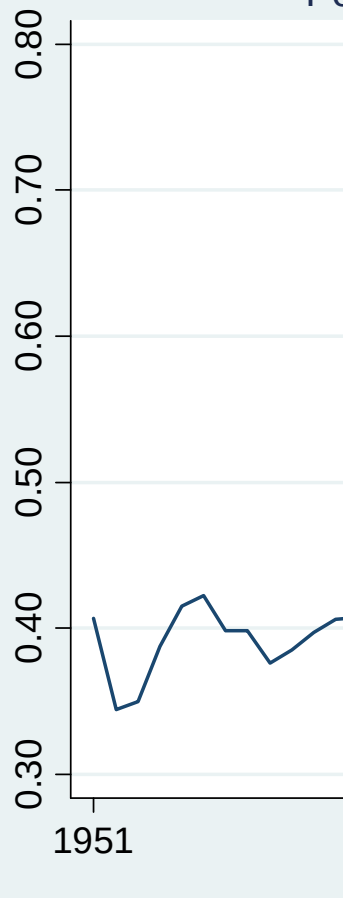
Legacy effects

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



85: Accession signed; 93: transition complete



72: EC industrial pref

Basic Properties of Tariff Stochastic Process

- Long-run mean policy given by $E(\tau')$, determined by distribution $H(\tau')$ and independent of γ if $\gamma > 0$.
  - Stresses importance of policy credibility: announcing τ_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 γ and changes in γ itself
- What is γ 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 $\tau_t \neq E(\tau')$)

$$\begin{aligned} E(\tau_{t+1}) &= (1-\gamma)\tau_t + \gamma E(\tau') \\ Var(\tau_{t+1}) &= \gamma(1-\gamma)\left(\tau_t - E(\tau')\right)^2 + \gamma Var\left(\tau'\right) \end{aligned}$$

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

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

- 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 σ (Table 6): similar results
  - Maintained assumption of similar typical σ across 2-digit industries supported by the data (only 3 with $\sigma > 5$, dropping those does not change results)
- Differences in elasticities across products, σ, vs across industries, σ_V
  - Straightforward to re-derive results for special CD aggregator over industries (so $\sigma > \sigma_V \to 1$)
  - 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: $b_{\gamma post} - b_{\gamma 0} > 0$; $b_{\tau} = -\frac{k\sigma}{\sigma - 1} < 0$

	1	2	3	4	5	6
Dependent variable (ln):	Change in Number of Firms					
Uncertainty Measure	3.952**	3.857**	3.975**	3.653**	4.223**	3.848**
	[1.716]	[1.759]	[1.731]	[1.810]	[1.783]	[1.887]
Applied Tariff Change (ln)	-2.719**	-2.783**	-2.655**	-3.385***	-3.117**	-2.847*
	[1.182]	[1.177]	[1.165]	[1.131]	[1.242]	[1.604]
NTM Share Change (ln)		-0.159				
		[0.258]				
Specific Tariff Share Change			-0.434			
			[1.162]			
Applied Tariff SD Change				2.912		
				[3.994]		
Price Index Proxy Change (ln)					1.5	0.453
					[2.243]	[3.730]
SD of Price Index Proxy Change						3.479
						[10.56]
Observations	731	731	731	731	731	731
R-squared	0.48	0.48	0.48	0.48	0.48	0.48
Change in probability of policy rev	-0.24	-0.24	-0.25	-0.18	-0.23	-0.23

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.

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

- 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 $\left(\gamma_0-\gamma_{post}\right)p_h = \left[\frac{\sigma}{\sigma-1}\frac{1-\beta}{\beta}\left(\frac{b_{\gamma post}-b_{\gamma 0}}{-b_\tau}\right)\right]_{\sigma=3,\beta=0.9,\gamma_{post}=0}$.
  - Direct evidence for $\gamma_{post}=0$ and $\beta=0.9$ and $\sigma=3$ in the paper
  - Implies lower bound for γ_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)

Dependent variable (ln):	1 Number of Firms	2 Exports per Firm	3 Number of Varieties	4 Exports per Variety	5 Exports
Uncertainty Measure	-4.064**	2.435	-4.711**	3.082	-1.629
	[1.829]	[4.841]	[2.299]	[4.394]	[6.190]
Applied Tariff (ln)	-1.426	-3.688	-1.331	-3.783	-5.113
	[1.952]	[2.760]	[2.412]	[2.461]	[4.351]
Observations	781	781	781	781	781
Adj R2	0.848	0.499	0.842	0.486	0.677

- 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