Protectionism and the Business Cycle

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Motivation

- Rising concerns about possible use of trade restrictions

- Debate about costs and benefits of trade policy as a macroeconomic policy tool
  - Boost output, rebalance external accounts, or address distributional effects of trade
  - Influential scholars argued that temporary tariffs may be beneficial in a liquidity trap, thanks to the inflationary effect of higher import costs (e.g., Eichengreen, 2016)

- We study the effects of protectionism on macroeconomic fluctuations both empirically and theoretically
Contribution

1. Estimate effects of temporary trade barriers using country-level and panel VARs
   - Quarterly/monthly data on product-level antidumping investigations (which typically lead to the imposition of tariffs)
   - Annual data on applied tariff rates

2. Transmission of tariff shocks:
   - SOE with key macro/trade ingredients: physical capital, nominal rigidities, endogenous trade structure (firm heterogeneity + sunk/fixed entry costs)
   - Baseline scenario mirrors the empirical analysis: normal times under a flexible exchange rate
   - Model counterfactuals where protectionism advocated as potentially beneficial: (i) liquidity trap and (ii) fixed exchange rate regime
Empirical analysis: temporary trade barriers act as a negative supply shock

- Recessionary, inflationary, with (at best) a small positive effect on the trade balance/GDP

Macro and micro dynamics behind the contractionary effects of tariffs

- Macro level: expenditure switching vs. decline in real income and investment (coupled with contractionary monetary policy response)

- Micro level: reallocation of market shares towards less efficient domestic producers

Protectionism remains contractionary even in a liquidity trap or under a peg
Literature

- Empirical work on the cyclicality of temporary trade barriers
  - Bown (2013) and Bown and Crowley (2013, 2014)

- Earlier theoretical literature on the macro effects of trade policy

- Border adjustment tax and departures from Lerner’s symmetry

- Dynamic consequences of trade integration (permanently lower trade costs)
  - Trefler (2005), Barattieri (2014), Cacciatore (2014) among many others
Empirical Analysis
Temporary Trade Barriers

- Low applied tariffs but frequently changing temporary trade barriers (TTBs)
  - Antidumping duties, global safeguards, and countervailing duties

- Antidumping (AD) duties are the primary policy exceptions to WTO rules
  - Account for 80% – 90% of all TTBs across countries

- Turkey and India: largest and most active users; Canada among developed SOE
  - Up to 6% of imported products affected by TTBs in Turkey (≈ 1% of GDP)
  - 2% in Canada (0.5% of GDP; higher prior to 2001)
Global Antidumping Database

- GAD (Bown, 2016): product-level data on AD investigations and related tariffs
- Possible to build time series for AD policy actions at any time frequency

**Opening of AD investigation**
- Publicly announced
- Agents can forecast tariff duties

**AD tariffs can be retroactive**

**Petition by industry producers**
- **Regulation**: qualified support + evidence about dumped imports

**Outcome**
- **Large majority** of investigations end up with tariffs
- Tariffs are proportional to the dumped margins
- Tariffs remain in place for **several years**
Empirical Strategy

- **Quarterly and monthly VARs** for Canada and Turkey (India for robustness)

- **Baseline trade-policy measure**: \# of HS-6 digits products for which an AD investigation begins in a given month or quarter

- **Standard macro variables**:
  - **Quarterly data**: real GDP growth, inflation, and trade balance/GDP
  - **Monthly data**: also include nominal interest rate and nominal exchange rate growth (IP rather than GDP)
Data: New Antidumping Initiatives in Canada

[Graph showing Antidumping Initiatives and GDP growth over time]
Understanding Magnitudes


- Consider 2001:Q1
  - AD initiatives in the steel sector worth \( \sim 30\% \) of sectoral imports
  - Steel sector output was 1.1\% of GDP (including IO linkages)

- All AD initiatives were successful

- Median imposed tariff equal to 56\%
Empirical Strategy

- **Structural VAR**

\[ Y_t = \Theta + \sum_{i=1}^{p} \Phi_i Y_{t-i} + A^{-1}u_t \]

\[ E(u_t u'_t) = I_N \]

- \( p \) determined with standard information criteria

- **Identification (matrix A):** 
  \# of AD investigations is predetermined within a month/quarter
  - Decision lags: coordination issues among producers and regulation
  - AD investigations reflect unfair foreign competition
More on Identification

- Bown and Crowley (2013): countercyclical, lagged response of TTBs to macroeconomic shocks (up to 2008)

- **Not a challenge for identification:**
  1. Analysis at monthly frequencies (decision lags realistically exceed a quarter)
  2. VAR lag structure captures AD response to previous macro shocks
  3. In our samples, $\text{corr} (\Delta y_t, AD_t) \approx 0$
  4. Reduced-form VAR: very weak covariance between trade-policy and macro shocks
  5. IRFs not consistent with demand/financial shocks (realistic drivers of business cycles in our sample period)
Quarterly VAR: Canada

- Antidumping Initiatives
- GDP Growth
- Inflation
- NX over GDP
Quarterly VAR: Turkey

Antidumping Initiatives

GDP Growth

Inflation

NX over GDP
Monthly estimates yield similar results

- Monthly Canada
- and
- Monthly Turkey

Results are also similar when considering India

 Variety of robustness checks

- Additional controls

- Focus only on AD investigations that end up with tariffs

- Different recursive ordering: AD initiatives respond to all macro shocks contemporaneously
Monthly VAR and Robustness

- Monthly estimates yield similar results
  - Monthly Canada and Monthly Turkey

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- Variety of robustness checks
  - Additional controls
  - Focus only on AD investigations that end up with tariffs
  - Different recursive ordering: AD initiatives respond to all macro shocks contemporaneously
Panel VAR

- AD investigations only apply to a subset of imports

- More comprehensive trade policy measure (only available at annual frequency): import-weighted average of the applied tariff rates

- Panel VAR using harmonized data for fifteen small open economies over the period 1996-2014
  - All the countries had flexible exchange rates and did not hit the ZLB

- Continue to assume that trade policy responds with a one-period delay to macroeconomic shocks
Panel VAR

- **Tariff**
- **GDP Growth**
- **Inflation**
- **NX over GDP**
The Model
Key Features

- Small open economy model (two-country model in which Home is of measure zero relative to Foreign)

- Two vertically integrated production stages
  - Non-tradable intermediate input \( (Y_t^I) \) produced with capital \( (K_t) \) and labor \( (L_t) \)
  - Tradable and non-tradable final consumption sectors (use \( Y_t^f \))

- Firm heterogeneity and endogenous producer entry in the tradable sector (Ghironi and Melitz, 2005)

- Trade policy captured by an ad-valorem import tariff

- Incomplete international asset markets and nominal rigidities
Preferences

Household $h \in [0, 1]$, maximizes

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[ \frac{C_t(h)^{1-\gamma}}{1-\gamma} - \frac{L_t(h)^{1+\omega}}{1+\omega} \right]$$

$$C_t = \left[ (1 - \alpha_N) \frac{1}{\phi_N} \left( C_t^T \right)^{\frac{\phi_{N-1}}{\phi_N}} + \alpha \frac{1}{\phi_N} \left( C_t^N \right)^{\frac{\phi_{N-1}}{\phi_N}} \right]^{\frac{\phi_N}{\phi_N-1}}$$

$$C_t^T = \left[ (1 - \alpha_X) \frac{1}{\phi_T} \left( C_{D,t}^T \right)^{\frac{\phi_{T-1}}{\phi_T}} + \alpha_X \frac{1}{\phi_T} \left( C_{X,t}^T \right)^{\frac{\phi_{T-1}}{\phi_T}} \right]^{\frac{\phi_T}{\phi_T-1}}$$

Number of tradable varieties is endogenous

$$C_{D,t}^T = \left[ \int_{\omega \in \Omega} \left( C_{D,t}^T(\omega) \right)^{\frac{\theta_{T-1}}{\theta_T}} d\omega \right]^{\frac{\theta_T}{\theta_{T-1}}}$$

and

$$C_{X,t}^T = \left[ \int_{\omega \in \Omega^*} \left[ C_{X,t}^T(\omega) \right]^{\frac{\theta_{T-1}}{\theta_T}} d\omega \right]^{\frac{\theta_T}{\theta_{T-1}}}$$

Ad-valorem import tariff

$$P_{X,t}^* = \left\{ \int_{\omega \in \Omega_t} \left[ (1 + \tau_{IM}^t) P_{X,t}^*(\omega) \right]^{1-\theta_T} d\omega \right\}^{1/(1-\theta_T)}$$
Intermediate Input Producers

- Homogenous intermediate input:
  \[ Y_t^I = Z_t K_t^\alpha L_t^{1-\alpha} \]

- \( L_t \) is a composite of differentiated labor inputs supplied by households:
  \[
  L_t \equiv \left[ \int_0^1 (L_t(h))^{(\eta-1)/\eta} \, dh \right]^{\eta/(\eta-1)}
  \]

  where \( L_t(h) \equiv \) labor hired from household \( h \)

- Capital rented in a competitive market
Tradable Sector

- Endogenous \# of monopolistically competitive firms \((N_{D,t})\) with heterogenous productivity \((z)\)
  - Time to build: 
    \[ N_{D,t} = (1 - \delta)(N_{D,t-1} + N_{E,t-1}) \]

- Sunk entry cost \(f_{E,t}\) and per-period fixed export cost \(f_{X,t}\)

- Flexible prices (we also consider price stickiness, PCP and LCP)

- **Standard Melitz-type selection of tradable producers into exporting:**
  - Relatively more productive firms export: 
    \(z > z_{X,t}\) to cover fixed export costs
  - Number of exporting firms: 
    \[ N_{X,t} = \left[ 1 - G(z_{X,t}) \right] N_{D,t} \]

- Free entry condition determines \(N_{D,t}\)

- Additional Model Details
Households and Monetary Policy

- Households can invest in **three assets**:
  1. Non-contingent nominal bonds in Home and Foreign currency
  2. Shares in a mutual fund of domestic tradable-sector firms
  3. Physical capital accumulation

- Household sets $w^n_t(h)$ subject to a **quadratic wage-adjustment cost**:
  $$\frac{w^n_t(h)}{P_t} = \mu^w_t(h) \frac{L_\omega}{C^{-\gamma}}$$

- Nominal interest rate follows a feedback rule
  $$1 + i_{t+1} = \max \left\{ 1 + i^{*lb}, (1 + i_t)^{\varrho_i} \left[ (1 + i) (1 + \bar{\tau}_C t)^{\varrho_\pi} (\bar{Y}_{gt})^{\varrho_Y} \right]^{1 - \varrho_i} \right\}$$

- Calibrate the model using standard values in the literature
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\]

- Calibrate the model using standard values in the literature
Protectionism in Normal Times
Protectionism in Normal Times

- Temporary increase in $\tau^t = 5\%$ ($\rho_{\tau^t} = 0.75$ to match panel-VAR estimates)
Micro and Macro Forces: Intuition

- For a given nominal exchange rate $\varepsilon_t$
  1. Expenditure switching toward Home goods and trade surplus
  2. $P_t$ increases: directly through $\tau_t^{IM} + \text{realloction of market shares}$

$$P^T_t = \left[ \omega_{D,t}^T \left( \hat{P}^T_{D,t} \right)^{1-\phi_T} + \omega_{X,t}^T \left( \varepsilon_t \frac{\hat{P}^T_{D}^*}{\hat{z}^*_{X, t}} \left( 1 + \tau_t^{IM} \right) \right)^{1-\phi_T} \right]^{\frac{1-\phi_N}{1-\phi_T}}$$

- $\varepsilon_t$ appreciates but not enough to offset $\tau_t^{IM}$

- Higher $P_t$:
  - Reduces real income: lower investment and decline in firm entry
  - Contractionary monetary policy response
**Micro and Macro Forces**

- **Alternative models:** (i) financial autarky; (ii) no firm dynamics; (iii) no capital/no firm dynamics
Counterfactual Scenarios
Counterfactual Scenarios

- Use the model to study scenarios where temporary trade barriers advocated as potentially beneficial

  1. Is protectionism expansionary when countries are in a liquidity trap (ZLB)?
  2. Can protectionism be beneficial under a fixed exchange rate?

- Same trade policy shock considered in normal times
Protectionism in a Liquidity Trap

- Evidence and theoretical analysis suggest that protectionism is inflationary

- Through this channel, $\tau_{t}^{IM}$ may help lift the economy out of a liquidity trap

- We perform the following exercise:

1. At $t = 0$, risk-premium shock $\Lambda_{a,t}$ depresses output and generates deflation (binding ZLB)

\[
1 + \Lambda_{at} = (1 + i_{t+1}) E_t \left( \frac{\beta_{t,t+1}}{1 + \pi_{t+1}} \right)
\]

\[
1 + \psi a_{*,t+1} + \Lambda_{at} = (1 + i_{t+1}^*) E_t \left( \frac{\beta_{t,t+1}}{1 + \pi_{t+1}^*} \frac{Q_{t+1}}{Q_t} \right)
\]

- Interpretation for $\Lambda_{at}$: shock to the demand for safe/liquid assets

2. At $t = 1$, unanticipated tariff increase
Protectionism in a Liquidity Trap

- Temporary increase in $\tau_{t}^{IM} = 5\%$ at the ZLB

\[ IM_t = 5\% \]
Protectionism under a Fixed Exchange Rate

- Widespread diffusion of pegs, crawling pegs, and very narrow bands (Reinhart and Rogoff, 2004)

- Recent experience of Ecuador (dollarized economy) illustrates the issue
  - Broad range of temporary tariffs in 2015-2016 to fight a balance-of-payments crisis
  - Trade balance effectively improved but real GDP further declined, together with consumption and investment

- In contrast to typical conclusion of textbook models, we find that protectionism remains contractionary under a peg
Protectionism under a Fixed Exchange Rate

- **Baseline vs no capital/no firm dynamics**

![Graphs showing GDP, Inflation, and Real Exchange Rate under Baseline and No Capital/No Firm Dynamics](image-url)
Conclusions

1. Structural VARs using trade-policy and macro data at different frequency
   - Temporary trade barriers act as a negative supply shock
   - At best a small positive effect on the trade balance

2. Small-open economy model with key macro/trade ingredients reproduces VAR evidence
   - Both macro and micro dynamics behind the contractionary effects of tariffs

3. Policy takeaway: protectionism remains a bad idea—at least for small open economies
   - Even when in a liquidity trap and regardless of exchange rate arrangements
   - Detrimental economic effects even when abstracting from retaliation from trade partners
Data: Antidumping Investigations in Turkey
Monthly VAR: Canada

- Antidumping Initiatives
- Industrial Production
- Inflation
- Net Exports
- Nominal Exchange Rate
- Interest Rate
Monthly VAR: Canada

- **Antidumping Initiatives**
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Antidumping Initiatives

Industrial Production

Inflation

Net Exports

Nominal Exchange Rate

Interest Rate
Data: Applied Tariff Rates
Data: Applied Tariff Rates

AUS  BRA  CAN  CHL
COL  ISL  KOR  MYS
NOR  NZL  PHL  PRY
TUR  URY  ZAF
Producer Currency Pricing

![Graphs showing various economic indicators over time.](image)

- Consumption
- GDP
- Investment
- Inflation
- Current Account
- Real Exchange Rate
- Number of Producers
- Number of Exporters
- Average Firm Productivity
Tradable Sector (cont.)

- Producer $z$ faces domestic and export demand:

$$Y_{D,t}^T(z) = \left( \frac{P_{D,t}^T(z)}{P_{D,t}^T} \right)^{-\theta_T} Y_{D,t}^T$$

$$Y_{X,t}^T(z) = \left[ (1 + \tau_{t}^{IM^*}) \frac{P_{X,t}^T(z)}{P_{X,t}^T} \right]^{-\theta_T} Y_{X,t}^T^*$$

- Prices: constant markups over marginal cost

$$\frac{P_{D,t}^T(z)}{P_{D,t}^T} = \frac{\theta_T}{(\theta_T - 1)} \varphi_t \frac{z}{\rho_{X,t}^T}$$

$$\frac{P_{X,t}^T(z)}{P_{X,t}^T} = (1 + \tau_t) \frac{\rho_{D,t}^T(z)}{Q_t}$$

- Firm exports if

$$d_{X,t}^T(z) = \left[ Q_t \rho_{X,t}^T(z) - (1 + \tau_t) \frac{\varphi_t}{\rho_{X,t}^T} \right] Y_{X,t}^T(z) - \varphi_t f_{X,t} > 0$$

- Number of exporting firms:

$$N_{X,t} = [1 - G(z_{X,t})] N_{D,t}$$

$$z_{X,t} = \inf \{ z : d_{X,t}^T(z) > 0 \}$$
Producer $z$ faces domestic and export demand:

$$Y_{D,t}^T(z) = \left( \frac{P_{D,t}^T(z)}{P_{D,t}^T} \right)^{-\theta_T} Y_{D,t}^T$$

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Prices: constant markups over marginal cost

$$\frac{P_{D,t}^T(z)}{P_{D,t}^T} = \frac{\theta_T}{(\theta_T - 1)} \frac{\varphi_t}{z}$$

and

$$\frac{P_{X,t}^T(z)}{P_{X,t}^T} = (1 + \tau_t) \frac{\rho_{D,t}^T(z)}{Q_t}$$

Firm exports if

$$d_{X,t}^T(z) = \left[ Q_t \rho_{X,t}^T(z) - (1 + \tau_t) \frac{\varphi_t}{z} \right] Y_{X,t}^T(z) - \varphi_t f_{X,t} > 0$$

Number of exporting firms:

$$N_{X,t} = [1 - G(z_{X,t})] N_{D,t}$$

$$z_{X,t} = \inf \{ z : d_{X,t}^T(z) > 0 \}$$
The representative Home household’s period budget constraint is:

\[
A_{t+1} (h) + \varepsilon_t A_{*,t+1} (h) + \frac{\psi}{2} \varepsilon_t P^*_t \left( \frac{A_{*,t+1} (h)}{P^*_t} \right)^2 + P_t C_t (h) + P_t l_{K,t} (h) + \tilde{\varepsilon}_t (N_{D,t} + N_{E,t}) x_{t+1} (h) = \\
(1 + i_t) A_t (h) + (1 + i^*_t) A_{*,t} (h) \varepsilon_t + \left[ 1 - \frac{v_w}{2} \left( \frac{w^n_t (h)}{w^n_{t-1} (h)} - 1 \right)^2 \right] w^n_t (h) L_t (h) + \\
P_t r_K, t K_t (h) + (\tilde{d}_t^T + \tilde{e}_t) N_{D,t} x_t (h) + T_t (h),
\]
The representative Home household’s period budget constraint is:

\[ A_{t+1}(h) + \varepsilon_t A_{*,t+1}(h) + \frac{\psi}{2} \varepsilon_t P_t^* \left( \frac{A_{*,t+1}(h)}{P_t^*} \right)^2 + P_tC_t(h) + P_t I_{K,t}(h) + \tilde{e}_t(N_{D,t} + N_{E,t})x_{t+1}(h) = \]

\[ (1 + i_t)A_t(h) + (1 + i^*_t)A_{*,t}(h) \varepsilon_t + \left[ 1 - \frac{v_w}{2} \left( \frac{w_{t}^n(h)}{w_{t-1}^n(h)} - 1 \right) \right] w_t^n(h) L_t(h) + \]

\[ + P_t r_{K,t} K_t(h) + (\tilde{d}_t^T + \tilde{e}_t) N_{D,t} x_t(h) + T_t(h), \]
Calibration

- Symmetric calibration with standard values in the literature

- Set parameters that directly affect trade volumes and monetary policy to match Canadian/U.S. data
  - Home bias: $\alpha_N \implies \text{trade-to-GDP} = 50\%$
  - Size of the tradable sector: $\alpha_T \implies \text{manufacturing output share} = 30\%$
  - Iceberg trade costs: $\tau = \tau^* = 0.3$
  - Average import tariffs: $\tau^{IM} = \tau^{IM*} = 0.02$

- Interest rate rule using estimates in Kichian (2015): $\phi_i = 0.5$, $\phi_\pi = 2.80$, $\phi_Y = 0$
Local Currency Pricing

- Consumption
- GDP
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Protectionism under a Fixed Exchange Rate

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