Trade Policy Strategic Game Considering Political Propensity

Case of Trump’s Tariff Policy

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◆ Variation of Model
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Motivation and Background

US tariffs on China could cost American households $1,000 per year, JPMorgan says

By Matt Egan, CNN Business
Updated 1852 GMT (0252 HKT) August 20, 2019

The US-China trade war hurts American families

By Mary E. Lovely for CNN Business Perspectives
Updated 1944 GMT (0344 HKT) May 20, 2019

TRADE WAR

US-China trade war intensifies as Trump pushes 25% tariffs
Motivation and Background

Exhibit 5: The Impact of the Tariffs on Consumer Prices Is Clearly Visible

Index (Feb 2018 = 100)

- CPI Across Nine Tariff-Impacted Categories*
- CPI All Other Core Goods

*Includes laundry equipment and other appliances, furniture, bedding, and floor coverings, auto parts, materials. Weighted by relative importance to headline index.

Source: Department of Labor, Department of Commerce, Goldman Sachs Global Investment Research
Trump’s pro-business policy

• Reduction in corporate tax
  : reduced from 35% -> 21% in 2017 (21% -> 20% in 2018)

• Easing environmental regulation
  : abolition of Obama government environmental regulation
  : easing methane gas emission regulation

• Weakening Labor union
  : reducing labor union project
  : cut the time off granted for paid union activities
Motivation and Background

[Objective]
• To figure out whether Trump administration’s political propensity affects tariffs

[Expected Result]
• Trump’s pro-business propensity is related to high tariffs
• **Political propensity**: government`s tendency to behave according to which economic agent they are focusing on

  - **Pro-business government**: it implies the government placing greater weight on firm`s profit when determining domestic tariff

  - **Pro-consumer government**: it implies the government placing greater weight on consumer surplus when determining domestic tariff
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Structure of the Model

- Two Stage Sequential Game

- Players: Two governments (Home / Foreign)
  Two firms (Home / Foreign)

- Strategy: \( \{t, q\} \)
  - \( t \) is tariff rate and \( q \) is production
  - \( q_i = h_i + e_i \)

- Preference
  1) Government
     → Social Welfare
  2) Firm
     → Profit
Notation of Variables

• $P_i(Q_i) = a - Q_i$
  
  where $P_i = \text{market – clearing price in country } i$
  
  $Q_i = \text{trade volume in country } i\text{’s market}$

• $Q_i = h_i + e_j$
  
  where $h_i = \text{firm } i\text{'s production for home consumption}$
  
  $e_j = \text{export by firm } j$

• Tariff costs for firm $i$: $t_j e_i$
  
  where $t_j = \text{tariff by government } j$
  
  $e_i = \text{export by firm } i$
Government’s Objective Function: Social Welfare

\[
\max \left[ \text{Consumer Surplus}_i + \text{Profit}_i + \text{Tariff Revenue}_i \right]
\]

\[
CS_i = \frac{1}{2} Q_i^2 = \frac{1}{2} (h_i + e_j)
\]

\[
\pi_i = (P_i - c)h_i + (P_j - c)e_i - t_j e_i
\]

\[
TR_i = t_i e_j
\]
Firm’s Objective Function: Profit

\[ \pi_i = (\text{domestic profit})_i + (\text{export profit})_i - (\text{tariff cost})_i \]

\[ = (P_i - c)h_i + (P_j - c)e_i - t_je_i \]

where \( i = H,F \)

- \( P_i \): market – clearing price in country \( i \)
- \( P_j \): market – clearing price in country \( j \)
- \( h_i \): firm \( i \)'s production for home consumption
- \( e_i \): export by firm \( i \)
- \( t_j \): tariff by government \( j \)

\( c \): constant and equal production cost of firm \( i \& j \)
Backward Induction

- Backward induction

  - the process of reasoning backwards in time, from the end of a problem or situation, to determine a sequence of optimal actions.

  - It proceeds by first considering the last time a decision might be made and choosing what to do in any situation at that time.
Backward Induction

Governments

Firms

\[
\begin{align*}
\max W_i &= \left[ \frac{1}{2} Q_i^2 + \pi_i + t_i e_j \right] \\
\max \pi_i &= (p_i - c_i) h_i + (p_j - c_i) e_i - t_j e_i \\

\Rightarrow h_i^* &= \frac{1}{3} (a - c + t_i) \\
\Rightarrow e_i^* &= \frac{1}{3} (a - c + 2t_i)
\end{align*}
\]
• Find Subgame Perfect Nash Equilibrium

\[ h_i^* = \frac{1}{3} (a - c + t_i) = \frac{4}{9} (a - c) \]

\[ e_i^* = \frac{1}{3} (a - c + 2t_i) = \frac{5}{9} (a - c) \]

\[ t_i^* = \frac{a - c}{3} = t_j^* \]
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Variation of Basic Model

\[ G_i = (1 - \rho)CS_i + \rho \pi_i + TR_i \]

where \( CS_i \) = consumer surplus
\( \pi_i \) = firm’s profit
\( TR_i \) = tariff revenue

\( \rho \) : relative weight on firm’s profit in social welfare
\[ 0 < \rho < 1 \]
Variation of Basic Model: Meaning of $\rho$

- $\rho > \frac{1}{2}$: pro-business government
- $\rho < \frac{1}{2}$: pro-consumer government
Solution Method

\[ \max G_i = (1 - \rho)CS_i + \rho \pi_i + TR_i \]

- Find \( t_i \) by solving \( \frac{\partial G_i}{\partial t_i} = 0 \)

\[
\frac{\partial G_i}{\partial t_i} = (1 - \rho) \left( -\frac{1}{9} \right) (2a - 2c - t_i) + \rho \left( \frac{2}{9} \right) (a - c + t_i) + \frac{1}{3} (a - c - 4t_i)
\]
\[ = \frac{1}{9} (1 + 4\rho)(a - c) + \left( \frac{1}{9} \rho - \frac{11}{9} \right) t_i = 0 \]

\[
\Rightarrow t_i^* = \frac{1 + 4\rho}{11 - \rho} (a - c) = t_j^*
\]
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Graphical Analysis : Increase in tariff

- positive relationship between $\rho$ and $t$
- Implication:
  - Trump’s pro-business government ($\rho > \frac{1}{2}$)
  - chooses high tariffs to maximize government’s utility
Graphical Analysis: Government’s Utility Graph

- Government’s utility graph slopes upward when $\rho > 0.481$
  - Government’s utility increases when $\rho$ is close to 1
- Implication
  - Trump’s pro-business government ($\rho > \frac{1}{2}$) increases government’s utility
  - It is better to choose specific stance rather than middle stance
Comparative Statics: Social Welfare Graph

\[ W, \ CS, \ \pi, \ TR \]

\[ \rho, W, CS, \\pi, TR \]

\[ \frac{\rho}{\rho} \]

\[ W_i^*, \ \pi_i^*, \ CS_i^*, \ TR_i^*, \ W_i^* \]

\[ \rho < 0.412 \]

\[ \rho \geq 0.412 \]

\[ W_i^* \]

\[ \pi_i^* \]

\[ CS_i^* \]

\[ TR_i^* \]

\[ W_i^* \]

\[ \frac{\rho}{\rho} \]

\[ - \]

\[ + \]

\[ - \]

\[ + \]

\[ - \]

\[ - \]

- If \( \rho < 0.412 \), **Negative effect of CS is bigger than positive effect of \( \pi \) and \( TR \).**
  - \( \rightarrow \) Social Welfare decreases

- If \( \rho \geq 0.412 \), **Negative effect of CS and TR is bigger than positive effect of \( \pi \).**
  - \( \rightarrow \) Social Welfare decreases
Quantity-traded Comparison

\[ Q = h_i + e_j = \left( \frac{7 - 2\rho}{11 - \rho} \right)(a - c) \]

: Quantity in our Model \( t > 0 \)

\[ Q = \frac{2}{3}(a - c) \]

: Quantity when \( t = 0 \)

\[
\left( \frac{7 - 2\rho}{11 - \rho} \right)(a - c) < \frac{2}{3}(a - c) \]

\( (: 0 < \rho < 1) \)

→ Quantity-traded when the tariff exists is smaller than the quantity-traded when the tariff doesn’t exist
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Case Study - Corporate Tax Graph


[source: TradingEconomics.com | Internal Revenue Service]
Case Study - Nixon Government

- Nixon government's pro-business policy, 1969 ~ 1974
  [New Economic Policy]

  1. Quitting the Bretton Woods agreement to make price competitiveness high in exporting manufacturing industry

  2. Providing a taxation privilege to industries to promote investments
Case Study - Reagan Government


1. Reduction in corporate tax rate: reduced from 46% -> 34%
2. Easing transportation, energy, telecommunication regulation
3. Regulating illegal labor strike by strict law enforcement
## Case Study - Tariff Policy

<table>
<thead>
<tr>
<th>President</th>
<th>Actions</th>
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| Nixon(69-74) | - 10% additional tariff on all imported goods  
   - political intention for the “1972 election” |
| Reagan(81-89) | - 25% on Japanese Cars  
   - 45% on Japanese Motorcycle  
   - 100% on Japanese electronic device |
| Trump(17-) | - 15%~45% tariff on Chinese goods (telephone, clothes, electronic device, shoes)  
   - 20% on all European Cars  
   - 25% on Steel and Aluminum of EU, Canada, Mexico |
Conclusion

• Trump’s strong pro-business propensity leads to higher tariffs

• Trump’s tariff policy due to pro-business propensity, increases government’s utility, decreases social welfare, quantity traded

• Governments tend to focus on government's utility rather than considering all parts of social welfare equally

[Contribution]

➢ Political propensity affects international trade policy as in Nixon, Reagan, Trump administration’s case.
Literature Reference

• Nash and Social Welfare impact in an international trade model (Martins, Pinto, Zubelli)

• Political economy of trade policy (Dani Rodrik)

• Trade War and Trade Talk (Grossman, Helpman)

• Tariff games: Cooperation with random variation in political regimes (Dale O.Stahl, Arja H)