Economic Structure, Relative Prices and Optimal Monetary Policy for Small Developing Economies

Pat Leepipatpiboon

UCLA

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Overview

Motivation

- The change in composition of industry has contributed to pass-through declines (Campa & Goldberg, 2005).
- Composition of trade in developing countries consists of less complex goods that subjected to high competition.
- Role of exchange rate, trade competitiveness and ability to pass-through in developing countries.

Research Question

- What is the impact of exchange rate shock given countries economic structure?
- How could firms adjust to the exchange rate shock that reduces competitiveness? What's the implications on relative wages, prices and monetary policy?

Overview

Why is this important?:

- Export policies in developing countries. Is it a good idea to grow by exporting low-value added goods?
- Applicable to joining global value chain and being OEM exporters.
- Optimal policy given the stage of development.

Mechanism:

- Developing economies that export commodities.
- Ability to adjust domestic input prices.
- Relative prices between consumption goods and capital goods.

Today's Presentation

1. **Theoretical Model: Salter-Swan Model**
   - Focus on an extreme case of commodity exporters.
   - Explore the impact of change in exchange rate when firms are price-taker.

2. **Empirical Exercises**
   - Two commodities in Thailand during episode of depreciation.
   - Data on export price and domestic price.

Related Literature

1. **Role of Trade in Economic Development:**
   Hsieh and Klenow (2007); Atkin and Donaldson (2021)

2. **Exchange Rate Passthrough:**
   Burstein and Gopinath (2014); Atkeson and Burstein (2008); Gopinath & Itskhoki (2021); Campa and Goldberg (2005)

3. **Dependent Economy Model**:
   Dornbusch (1980); Schmitt-Grohé and Uribe (2020)

4. **Optimal Monetary Policy:**
   Itskhoki and Mukhin (2022)

Theoretical Framework

Microfounded Salter-Swan Model

(Schmitt-Grohé and Uribe, 2020)

- Small open economy model
- Exogenous export, import prices and terms of trade.
- Tradable and nontradable goods are the key for expenditure switching mechanism.
- Assume nominal wage rigidity.

Compare with Other Models

	PCP	LCP	DCP	Salter-Swan
Nominal Exchange Rate	$+1$	$+1$	$+1$	$+1$
Terms of trade	$+1$	-1	0	0
- Home import price	$+1$	0	$+1$	$+1$
- Foreign import price	-1	0	0	0
Home CPI inflation (P)	$+\gamma$	0	$+\gamma$	$+\gamma$
Foreign CPI inflation (P^*)	$-\gamma^*$	0	0	0

Table: Impacts of Exchange Rate Depreciation

- Dollar Currency Pricing (DCP) has downward sloping demand.
- Salter-Swan model has perfectly inelastic demand.

Model: Household

- Identical infinitely-lived households with preferences:

$$\sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\sigma} - 1}{1-\sigma}$$

where $\beta \in (0,1)$ and $\sigma > 0$.

- Consumption (c_t) is a composite of tradable (c_t^T) and nontradable (c_t^N) with CES Armington aggregator,

$$c_t = A(c_t^T, c_t^N) \equiv \left[a(c_t^T)^{1-\frac{1}{\xi}} + (1-a)(C_t^N)^{1-\frac{1}{\xi}} \right]^{\frac{1}{1-\frac{1}{\xi}}}.$$

- Assume that preferences are separable in tradable and nontradable consumption.

$$\xi = \frac{1}{\sigma}$$

Model: Household

- Households are endowed with $\bar{h}$ hours each period and supply labor market inelastically.
- Households have access to foreign-currency denominated financial instruments at world interest rate r.
- Law of one price holds for tradable goods,

$$P_t^T = \mathcal{E}_t P_t^{T*}$$

- Household budget constraint in unit of tradable goods (normalize $P_t^{T*} = 1$)

$$c_t^T + p_t c_t^N + d_t = w_t h_t + \phi_t + \frac{d_{t+1}}{1+r}$$

- No Ponzi-game and strictly increasing preferences in consumption.

$$\lim_{t \to \infty} (1+r)^{-t} \, dt = 0$$

Model: Household

- First-order conditions associated with household's optimization problem:

$$p_t = \frac{A_2(c_t^T, c_t^N)}{A_1(c_t^T, c_t^N)} \tag{1}$$

$$\left(\frac{c_{t+1}^T}{c_t^T}\right)^{\sigma} = \beta(1+r) \tag{2}$$

- Assume subjective and market discount rates are equal,

$$c_t^T = c^T$$

Model: Firms

- Production technologies for tradable and nontradable goods

$$y_t^T = A_t^T F_T(h_t^T)$$
$$y_t^N = A_t^N F_N(h_t^N)$$

where F_T and F_N are strictly increasing and concave function.

- Exogenous terms of trade

$$p_t^x \equiv \frac{P_t^X}{P_t^T} = \frac{P_t^{X*}}{P_t^{T*}}$$

- Firm's objective function:

$$p_t^x A_t^T F_T(h_t^T) + p_t A_t^N F_N(h_t^N) - w_t(h_t^T + h_t^N).$$

- Optimal demand for labor:

$$p_t^x A_t TF_T'(h_t^T) = w_t$$
$$p_t A_t^N F_N'(h_t^N) = w_t$$

Model: Market Clearing

1. Nontradable goods market

$$c_t^N = y_t^N$$

2. Employement

$$h_t^T + h_t^N = h_t \leq \bar{h}$$

3. Combinded sequential budget constriants

$$c_t^T + d_t = p_t^x y_t^T + \frac{d_{t+1}}{1+r}$$

4. Apply $d_0 = 0$ and No ponzi condition

$$c^T = \frac{r}{1+r} \sum_{t=0}^{\infty} \left(\frac{1}{1+r} \right)^t (p_t^x y_t^T)$$

Equilibrium

$$p = \frac{A_2(c^T, F_N(h - h^T))}{A_1(c^T, F_N(h - h^T))} \tag{3}$$

$$p = \frac{W/\mathcal{E}}{F_N'(h - h^T)} \tag{4}$$

$$p^x F_T'(h^T) = W/\mathcal{E} \tag{5}$$

From (3),(4) and (5),we could find h_{ss} using steady state condition:

$$\frac{A_2(c^T, F_N(\bar{h} - h_{ss}^T))}{A_1(c^T, F_N(\bar{h} - h_{ss}^T))} = \frac{p_{ss}^x F_T'(h_{ss}^T)}{F_N'(\bar{h} - h_{ss}^T)}. \tag{6}$$

Main Mechanism

Tradable and Nontradable Expenditure Switching:

- Excess demand in tradable goods can be exported.
- Excess demand in nontradable good requires an adjustment in prices to clear the market.

What do we expect to see?

- Depreciation raises relative price of imported to nontradable goods.
- Quantity response of depreciation:
  - Export increases due to cost declines in local currency
  - Import declines as good becomes more expensive.
  - Demand and supply of nontradable goods increase.

Deviation from the steady state

Suppose that economy was in the steady state, then exchange rate temporary depreciates for 1 period and wage is pre-determined.

$$c^T = \frac{r}{1+r} p^x F_T(h^T) + \frac{1}{1+r} p^x_{ss} F_T(h^T_{ss}) \tag{7}$$

From (6)

$$h^T_{ss} = H^T_{ss}(\underset{(-)}{c^T})$$

From (7) and (5), Consumption

$$c^T = C^T(\underset{(-)}{W/\mathcal{E}}, \underset{(+)}{P^x})$$

Demand and Supply of Nontradable Goods

From (3), nontradable Price is a derived labor demand from demand of tradable goods.

$$p = D(\underset{(-)}{h}; \underset{(-)}{W/\mathcal{E}}, \underset{(+)}{P^x})$$

From (4), Nontradable Price is a derived labor demand from supply of tradable goods.

$$p = S(\underset{(+)}{h}; \underset{(+)}{W/\mathcal{E}}, \underset{(-)}{p^x})$$

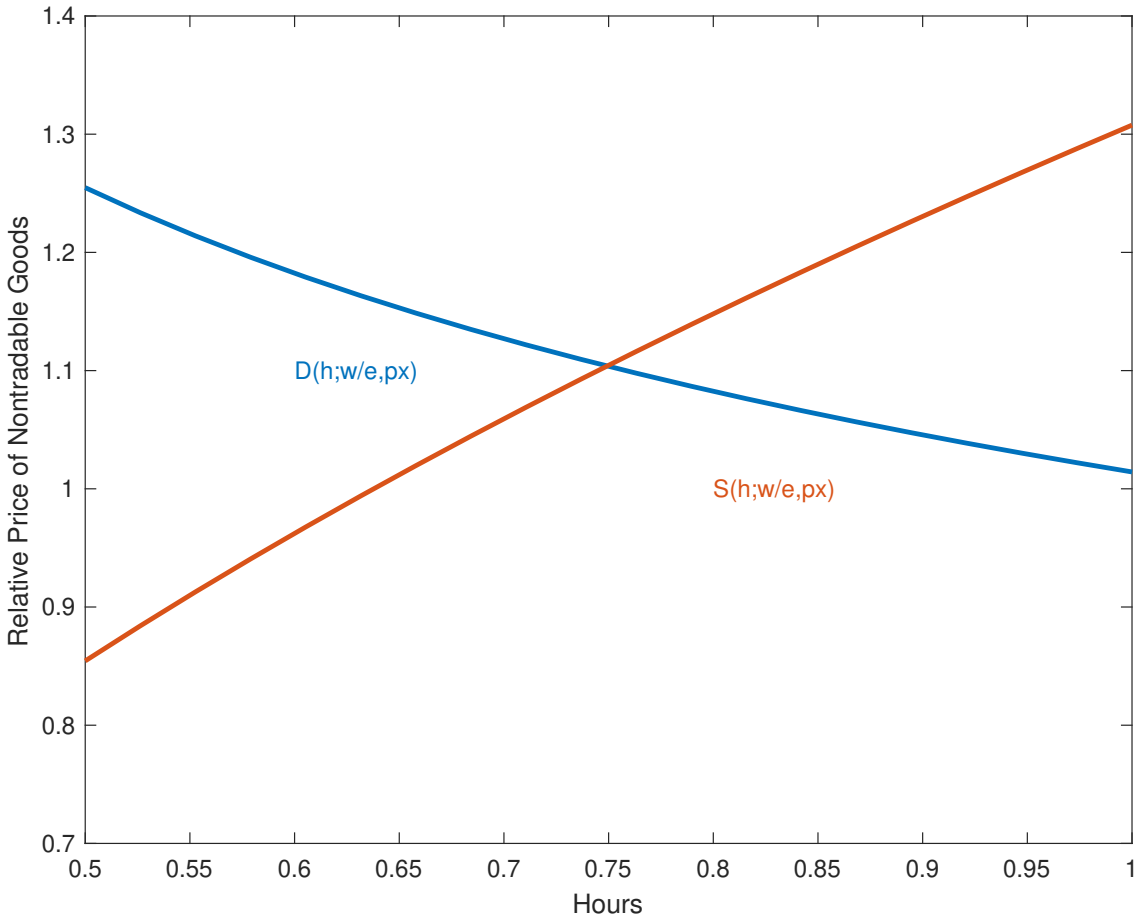


Figure: Equalibrium price of non tradable goods and working hours

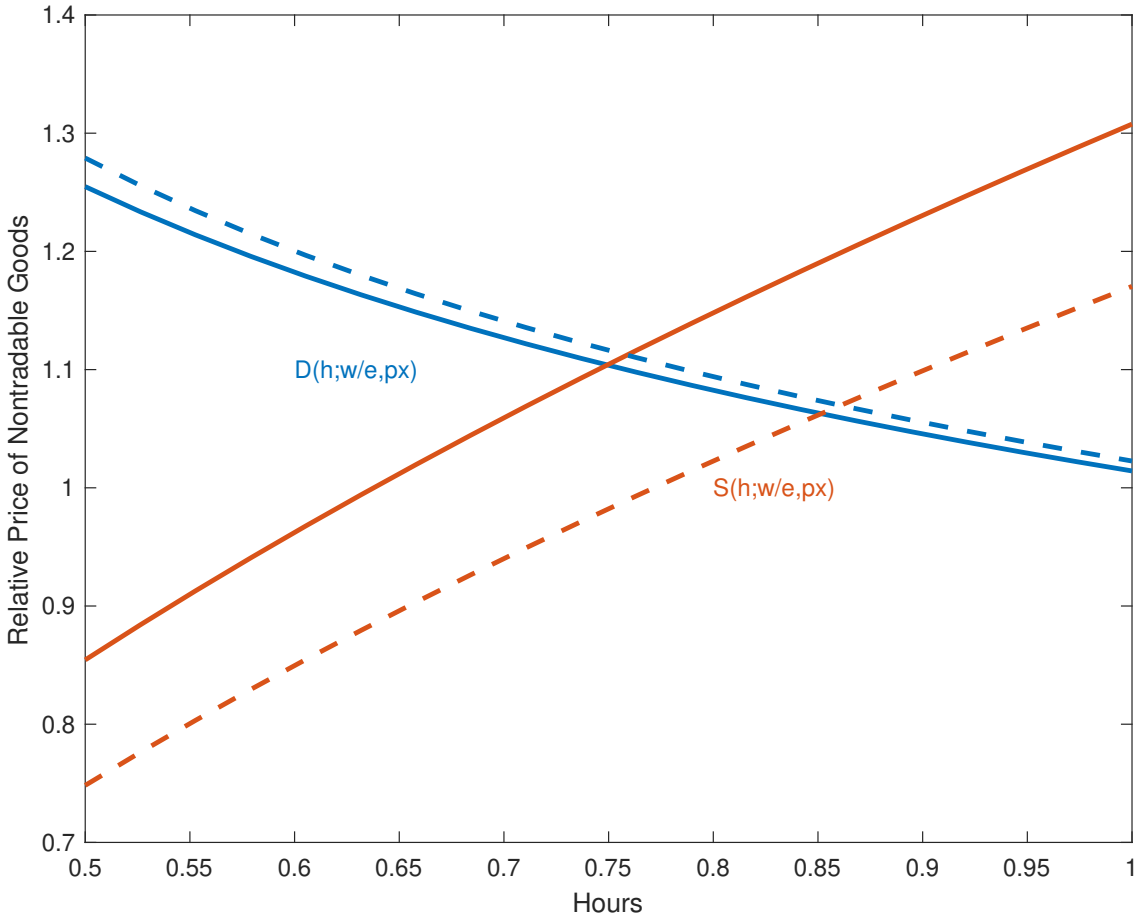


Figure: Exchange Rate Depreciation

Summary of Model

- Country takes export prices and import prices as given.
- Terms of trade is exogenous.
- Exchange rate depreciation implies cheaper factor prices which stimulates both demand and supply for nontradable.
- Due to low marginal propensity to consumer out of transitory increase in tradable income,price of nontradable good will be lower.

Empirical Exercises

Exchange Rate Shock and Firms Adjustment

- In reality, how could firm adjust prices to exchange rate shock?
- Would exchange rate shock affect firm profits? Would firms manage to maintain profits by reduces the input costs?

Methodology

- Identification Strategy: Devaluation episode in Thailand.
- Focus on commodities where firms take prices as given.
- Select two agricultural products: Rice and Rubber due to high share of local contents.

Exchange Rate Shock and Firm Adjustment in Thailand

Firm Survey conducted by Bank of Thailand in 2010

- Impact of Thai Baht appreciation severly affect:
  1. Firms with high local input share.
  2. Firms that produce homogeneous products as their competitors.

- Firm Adjustment Mechanism
  1. Price or Input Price Adjustment (Short-term)
     - 80% of firms indicates that it's hard to adjust output prices
     - 50% indicates that it's hard to adjust input price.
  2. Financial Hedging (Short-term)
     - Limited access by small firms due to high cost and terms offered.
  3. Destination Country Adjustment (Short-term)
  4. Product Quality Upgrading (Medium-term)

Data and Identification

Data

- Rice and Rubber export in Thailand during devaluation episode.
  - Major export products in Thailand.
    - Thailand export 63% of global Ribbed smoked sheet rubber. Detail
    - Thailand export 11.9% of global rice (Value terms). Detail
  - Take world price as given.
  - High local input share.

Identification Challenges

$$\Delta \log P_{it} = \alpha + \beta \Delta \log e_t + \gamma X_{it} + \epsilon_{it}$$

- Endogeneity between exchange rate and global demand.
- Endogeniety between rubber price, oil price and exchange rate.
- Devaluation episode in Thailand.

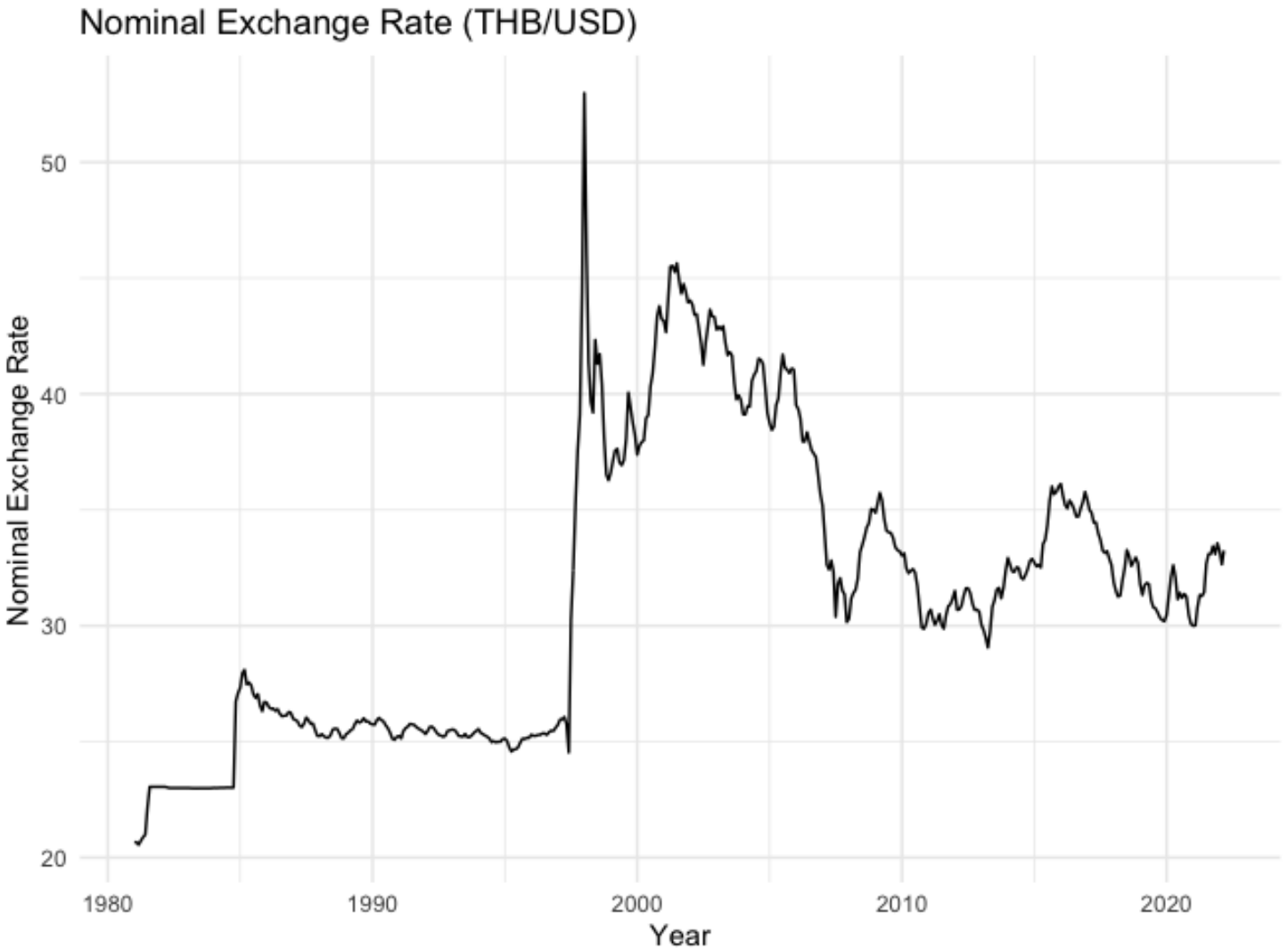
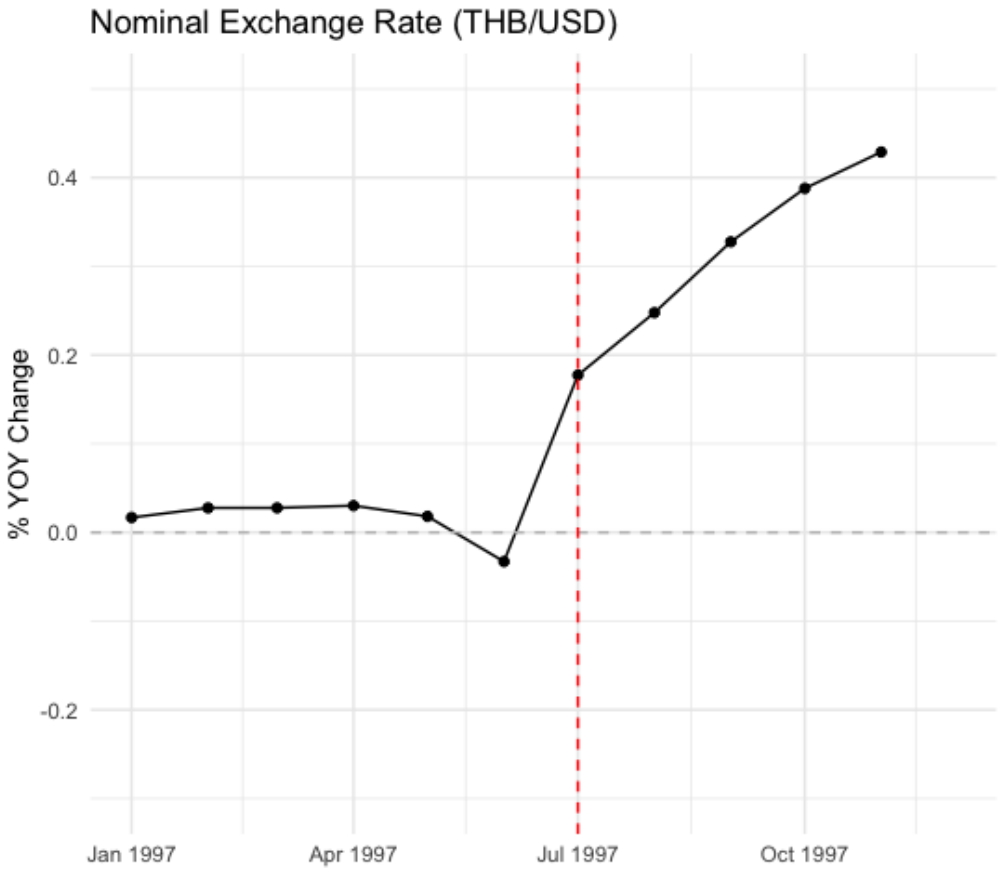


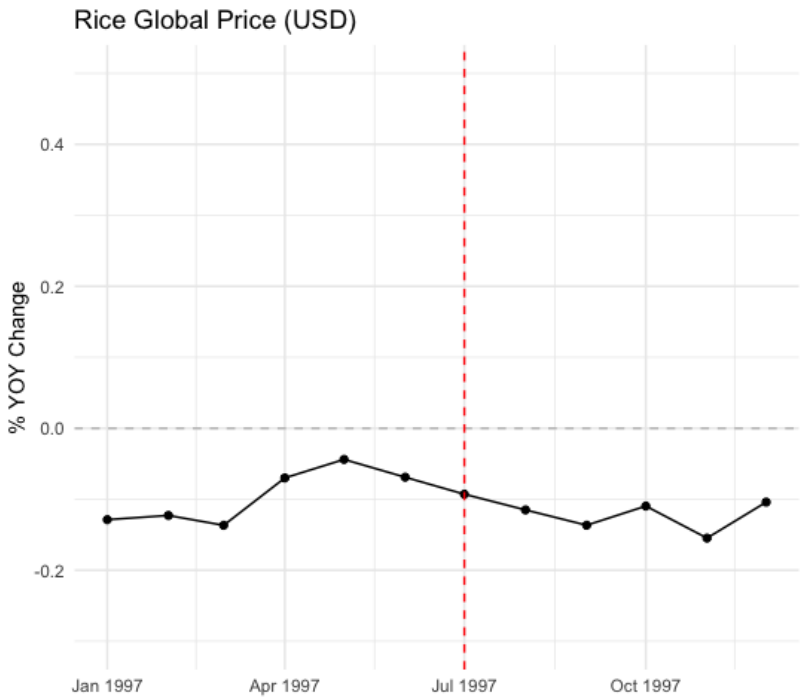
Figure: Exchange Rate: THB/USD

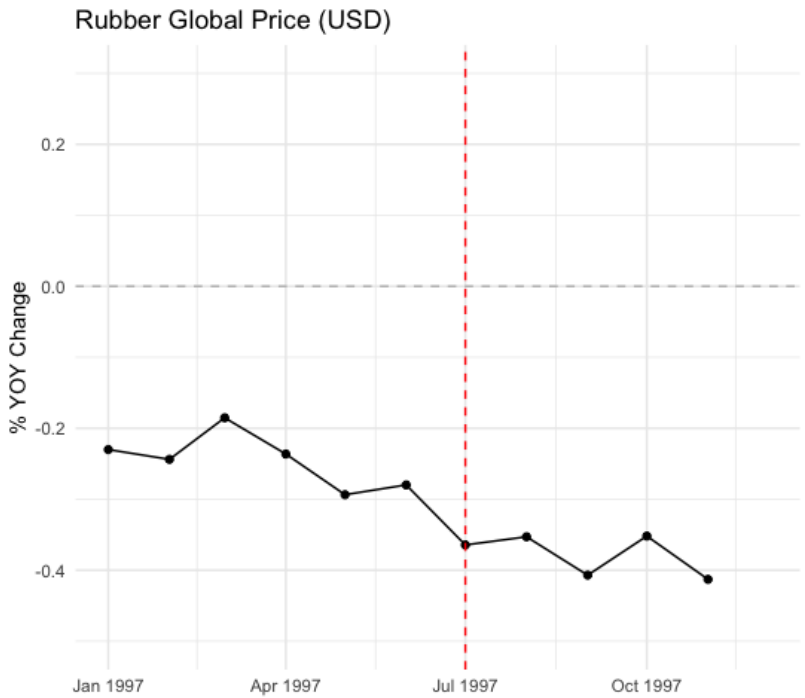
Exchange Rate



	1997M6	1997M7	1997M8	1997M9
change (%)	-0.03	0.18	0.25	0.32

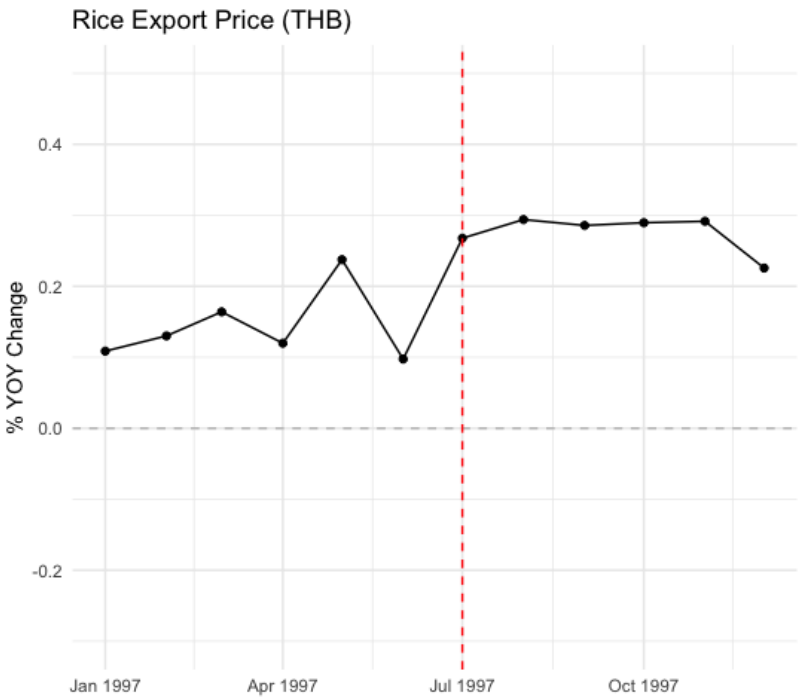
Global Prices

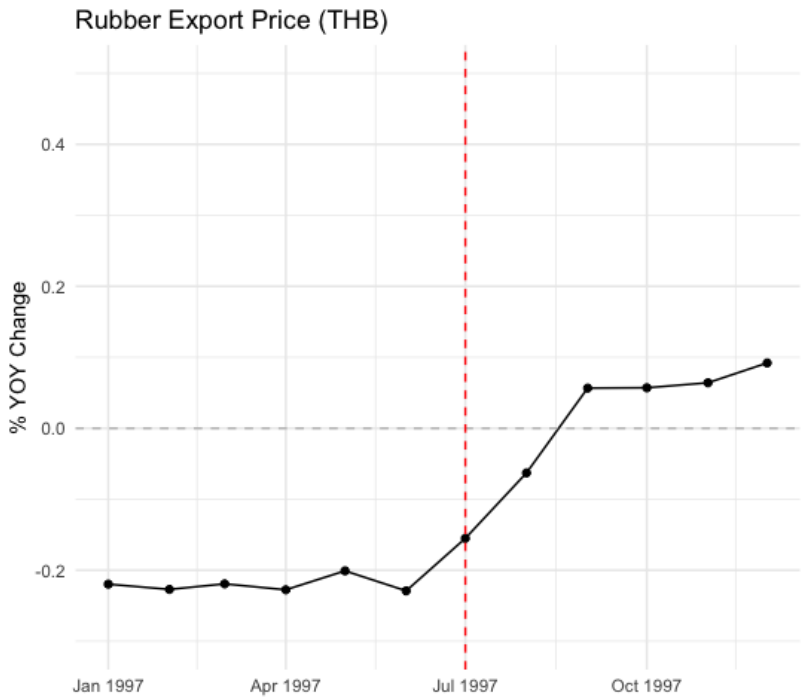




change (%)	1997M6	1997M7	1997M8	1997M9
Rice	-0.07	-0.09	-0.12	-0.14
Rubber	-0.28	-0.36	-0.35	-0.41

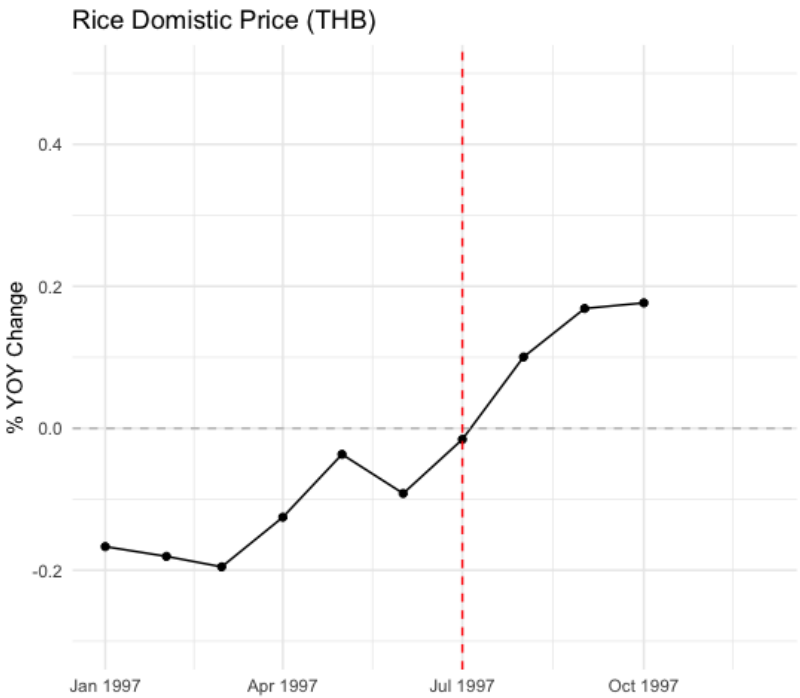
Export Prices

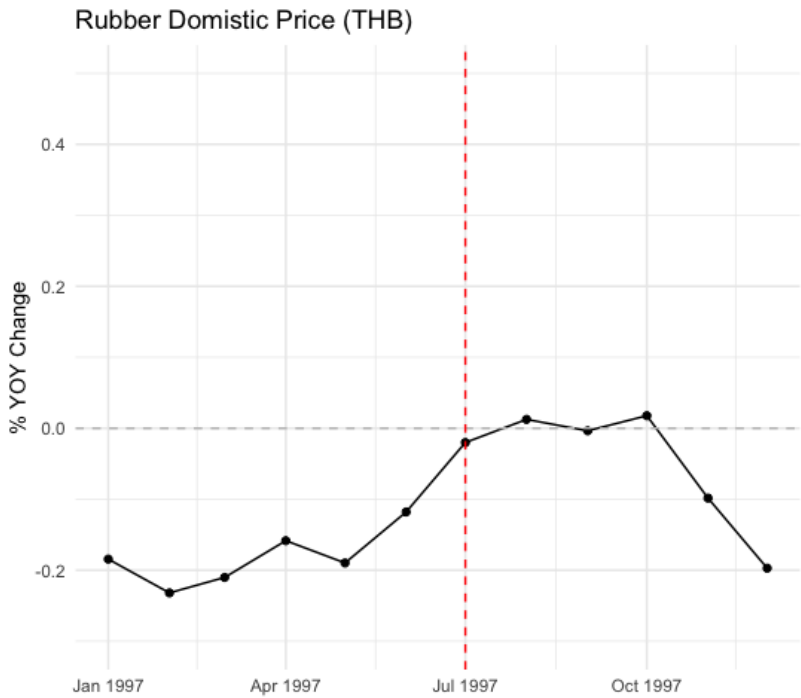




change (%)	1997M6	1997M7	1997M8	1997M9
Rice	0.10	0.27	0.29	0.28
Rubber	-0.23	-0.16	-0.06	0.06

Domestic Prices





change (%)	1997M6	1997M7	1997M8	1997M9
Rice	-0.09	-0.02	-0.1	-0.17
Rubber	-0.12	-0.2	0.01	-0.003

Takeaway

- We observe higher products' prices and inputs' prices after the depreciation. However, the increase in export price is less than the increase in depreciation for rubber.
- Potential Explanations
  - Profit sharing between intermediaries and exporters.
  - Do not increase prices to gain comparative advatage in exporting.
- The increase in input prices is less than the increase in exchange rate.

Correlation of change in prices and change in exchange rate

Correlation ($\%\Delta yoy$)	$\%\Delta\mathcal{E}$	$\%\Delta\mathcal{E} < 0$	$\%\Delta\mathcal{E} > 0$
Rice			
- %Δ Export Price (LCU)	0.35	0.24	0.32
- %Δ Producer Price (LCU)	0.34	0.37	0.27
- %Δ Export Quantity	0.20	-0.03	0.35
Rubber			
- %Δ Export Price (LCU)	-0.10	0.01	0.26
- %Δ Producer Price (LCU)	-0.14	0.08	0.15
- %Δ Export Quantity	0.16	0.21	0.13

Table: Correlation of yoy change in prices and yoy change in exchange rate

Conclusion and Going Forward

Conclusion

- The adjustment of developing countries are asymmetric and firms can adjust factor prices.
- Sector with high market share could adjust the prices during the appreciation episode.

Going Forward

- Model: Embed factor price adjustment mechanism
- Empirical Part: Identification Issue

Pricing Mechanism: Rice

- International traders act as mediators
- Calculate demand, supply and inventory.
- Try to match lowest price supplier with demand.
- If Thai farmers offer high price. This will lead to excess supply of rice and reduce domestic price of rice.

Pricing Mechanism: Rubber

- Cannot set export price due to small number of buyers.
- Price references to Future market in Tokyo or Singapore. Then buyers and sellers negotiate the price.
- Depends on oil prices, global demand for car and trade policy.

Export Share: Rubber

Export Share (Value)	Concentrated Latex	Ribbed Smoked Sheet	Technically Specified Rubber	Total
Thailand	75.8	63.0	22.0	28.5
Indonesia	0.5	8.5	20.6	17.6
Vietnam	5.7	9.4	8.7	8.7
Malaysia	4.1	0.2	8.3	7.1

Table: Export Share of Rubber (International Trade Center, 2016)

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Export Share: Rice

Export Share (Value)	Total
India	38.9
Vietnam	12.9
Thailand	11.9
Pakistan	8.6
USA	6.1
China	4.6

Table: Export Share of Rice (USDA, 2020)

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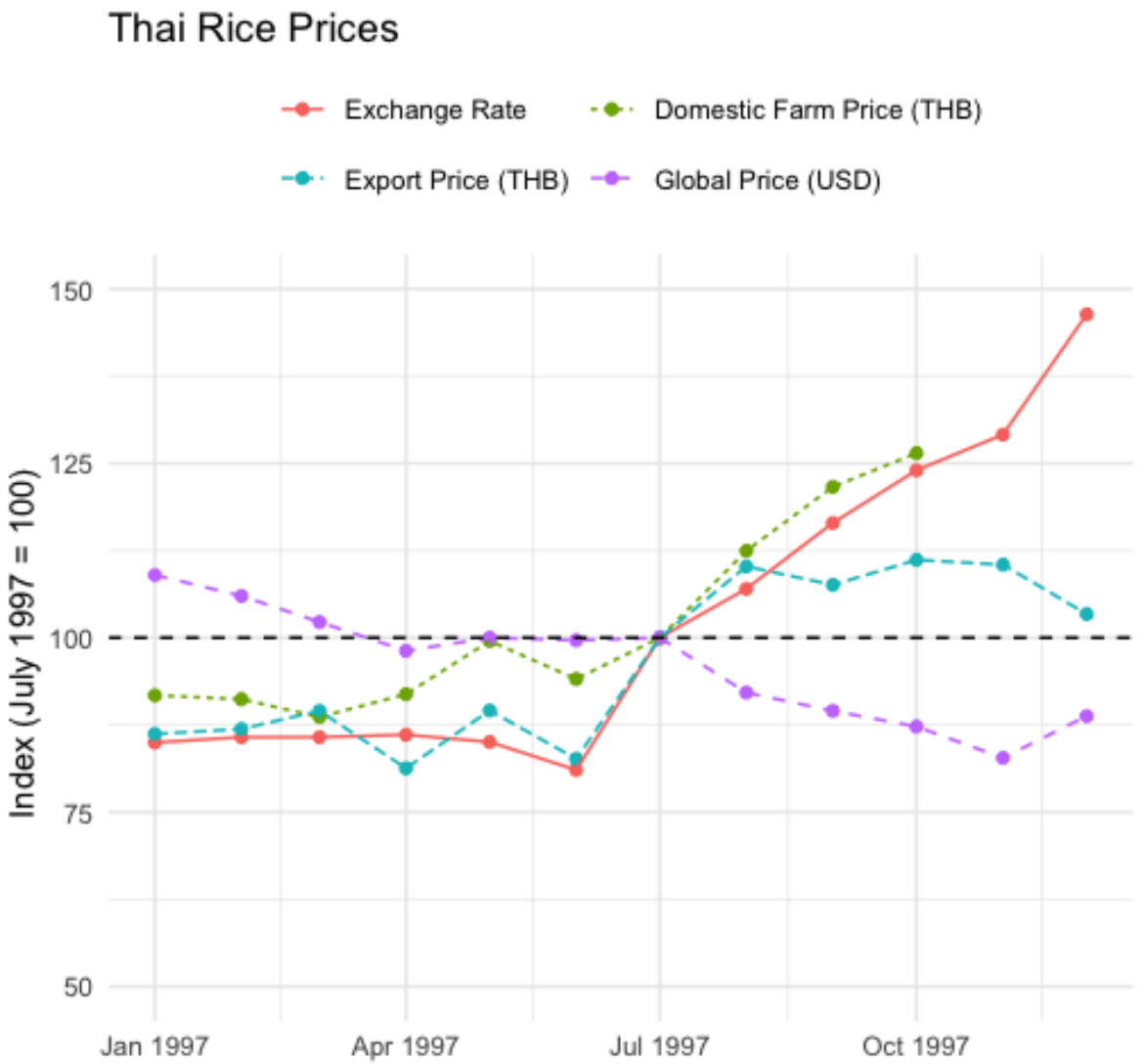
Rice Prices


Thai Rice Prices
Exchange Rate
Domestic Farm Price (THB)
Export Price (THB)
Global Price (USD)
Index (July 1997 = 100)
150
125
100
75
50
Jan 1997
Apr 1997
Jul 1997
Oct 1997

Rubber Prices