Financial Development and the Effects of Trade Liberalizations

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Trade and Finance

Trade relies heavily on external finance

- Longer delivery and payment lags
- Needs for substantial investment in order to export

Poor access to finance distorts firms' export decisions

- Quantities of exports (intensive margin)
- Decisions of firms to export (extensive margin)
- Important factor driving export dynamics

  (see Egger and Kesina, 2013; Greeneway et al. 2007; Kohn et al., 2016; Manova, 2008 & 2013; Manova and Yu, 2016; Minetti and Zhu, 2011; Muuls, 2015; among many others)

Financial development can help explain observed world trade patterns

- E.g. the presence of zeros in bilateral trade matrix (Manova, 2013)

Data: Financial Constraints

- **Both exporters and non-exporters face financial constraints**

	Fin. Major Obstacle	**Loans w/ collateral**	**Collateral value**
All firms	31%	73%	204%
Non-exporters	31%	72%	209%
Exporters	30%	81%	154%

Source: Manufacturing firms, Latin America, World Bank Enterprise Survey.

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- **Financial development is heterogeneous**

	LATAM	Mexico	Colombia	Chile
Credit/GDP	26%	17%	30%	71%

Source: Domestic Credit over GDP ('97-'07), World Bank.

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- **Does financial development affect gains from trade liberalizations?**

Trade Liberalizations and Financial Frictions

Trade liberalization fosters GDP growth

(Sachs and Werner, 1995; Wacziarg and Welch, 2008)

- Mainly by encouraging **capital accumulation**
- Effects heterogeneous across countries

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- Reallocation of resources across industries
- Reallocation of resources within industries

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Financial frictions may limit effects of lowering trade barriers

(Caggese and Cunat, 2013; Brooks and Dovis, 2016; Jung, 2015)

- Financial frictions lead to inefficient allocations of resources
- May affect economy's response to lowering trade barriers

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- Study a small open economy with heterogeneous firms and 3 key ingredients
  1. **International trade** subject to variable and fixed costs
  2. **Financial frictions** modeled as collateral constraints
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  - Use Colombian Annual Manufacturing Survey data 1980-1992

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- Calibrate the model to match key features of plant-level data
  - Use Colombian Annual Manufacturing Survey data 1980-1992
- Use model to study impact of **trade liberalization**
  - **Short-run** and **Long-run** effects
  - Quantify importance of financial frictions

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- Large differences between **PE** and **GE**

This Talk

1. Data
2. Model
3. Mechanism
4. Quantitative Results

Data: Colombia

Colombia 1980-2000, Introduction

Colombia implemented deep reforms between 1984 and 1992

- Macroeconomic Adjustment Program (1984-86)
- Economic Modernization Plan (EMP) (adopted in 1990)
- Export Development Program (1992)

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Trade and financial liberalization:

1. Elimination of majority of non-tariff barriers (1984-1986)
2. Tariff and export/import taxes reduction (1988-1992)
3. Liberalization of financial markets (1984-1990)

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2. Tariff and export/import taxes reduction (1988-1992)
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However, according to World Bank report on Colombia in 1992:

> *"Financial markets in Colombia remain characterized by lack of credit and under-developed capital markets. (...) It raises concern that the export response expected from trade liberalization under EMP is* ***seriously constrained by the existing financial sector****."*

Colombia 1980-2000, Tariffs

Substantial reduction in tariffs' level and dispersion

- Tariffs fell from 32% in 1988 to 12% in 1992, stayed constant afterwards
- Dispersion of tariffs fell by roughly 66%

  (Roberts and Tybout, 1997; Eslava et al., 2013)

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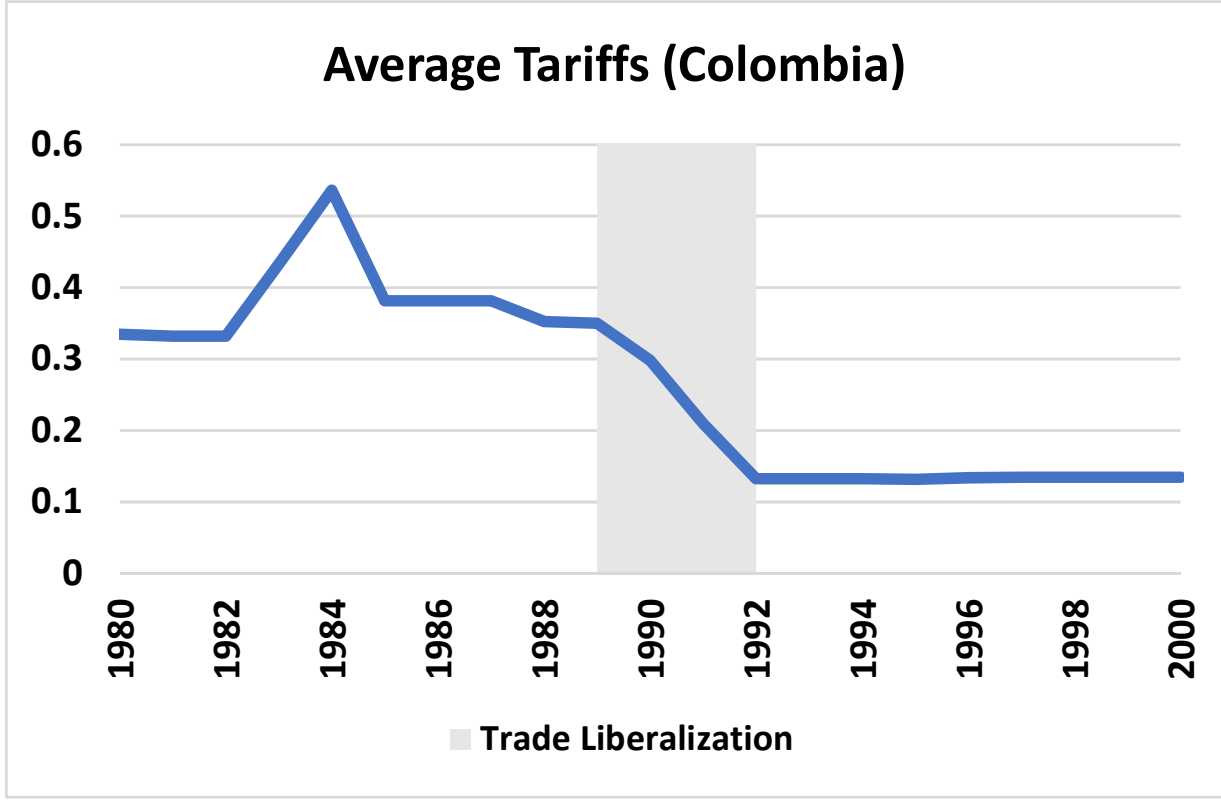


Colombia 1980-2000, Data Analysis

We focus on period 1992-2000 and ask:

1. How did manufacturing exports respond to these policy changes?
2. Did the response differ across industries with different finance-intensity?

To answer these questions, we combine:

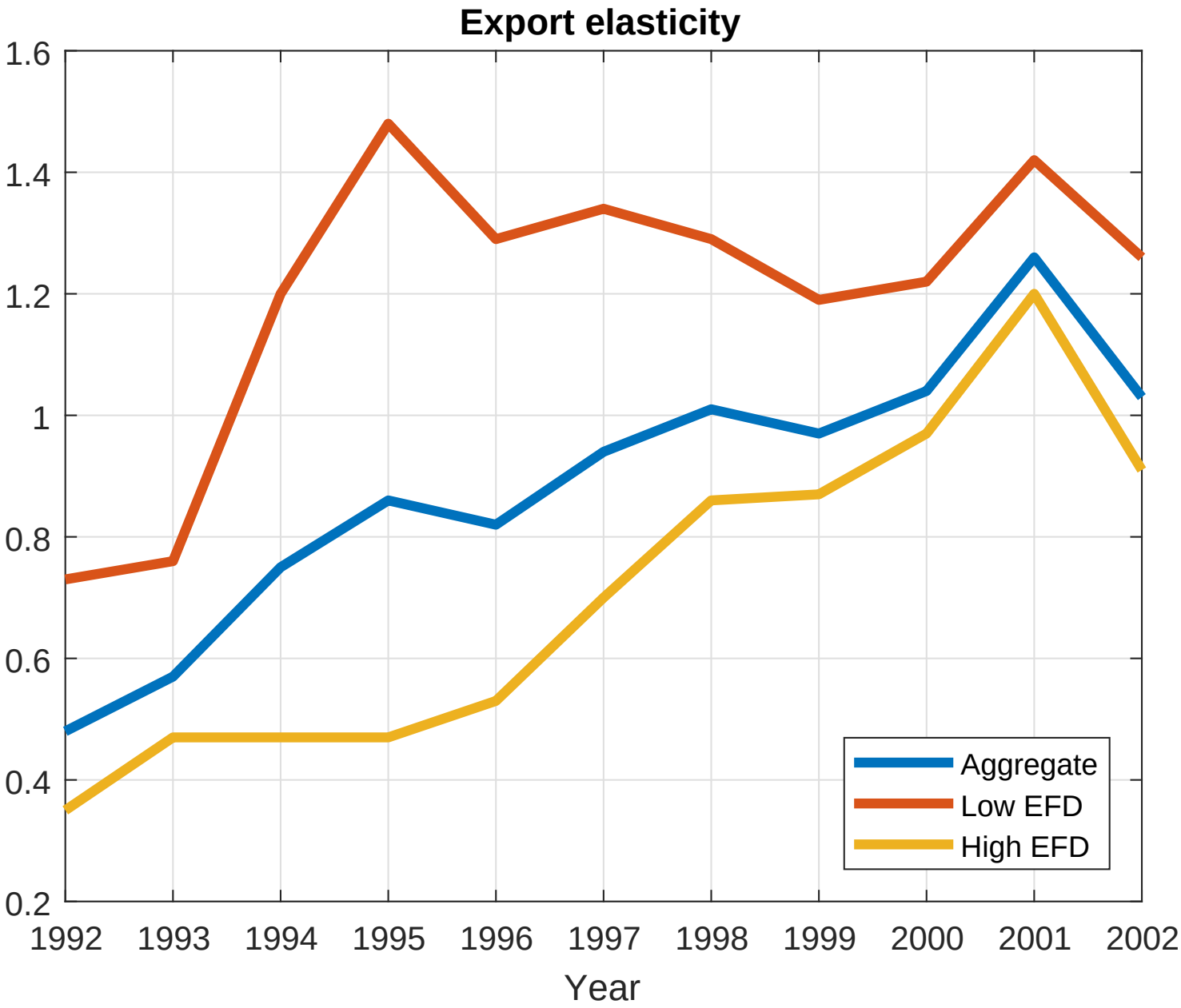
- Tariff data across 4-digit industries from Colombia's National Planning Department
- Trade data across 4-digit industries from Comtrade
- External finance dependence data across 3-digit industries (Rajan-Zingales 98)

We compute trade elasticity for each year

- Across all industries
- Across low EFD industries
- Across high EFD industries

Cross Country Data

Data: Colombia 1980-2000, Export Elasticity



Model

Setup

- **Small open economy**
- **Agents**
  - Workers
  - Entrepreneurs
    - Tradable
    - Non-Tradable
  - Sectoral good producers
    - produce composite tradable and non-tradable goods
  - Final good producers
    - Produce final goods using sectoral composite goods
  - Rest of the word
- **Final goods used for consumption and investment**

Entrepreneurs and Workers

Preferences

$$\sum_{t=0}^{\infty} \beta^t \frac{c^{1-\gamma}}{1-\gamma}$$

Occupational/Sectoral choice

- Individuals choose whether to be **workers** or **entrepreneurs**
  - Workers: Supply labor inelastically to firms
  - Entrepreneurs: Operate a firm either in tradable or in non-tradable sector

Financial markets

- Trade one-period risk-free bond, interest rate r_t
- International financial integration $\Longrightarrow$ r_t taken as given by the domestic economy

Entrepreneurs: Tradable Sector

Technology

- **Individual productivity z_t**

$$\ln z_t = (1-\rho)\,\mu + \rho z_{t-1} + \varepsilon_t, \;\; \varepsilon_t \sim N\left(0, \sigma_\varepsilon^2\right)$$

- **Produce differentiated varieties**
  - Production function: $y = z\left(k_t^{\alpha} n_t^{1-\alpha}\right)^{1-\alpha_m} m_t^{\alpha_m}$
  - Sell goods to domestic final good producers and the rest of the world
- **Accumulate capital k_t internally**

$$k_{t+1} = (1-\delta)\,k_t + x_t$$

- **Hire labor at wage w_t**

Entrepreneurs: Tradable Sector (cont.)

- **International trade:**
  - Face CES demand from the rest of the world: $y_{f,t} = \left(\left(1 + \tau_f\right) p_{f,t}\right)^{-\sigma} Y_{f,t}$
  - To export, need to pay **fixed export cost** $F > 0$ in units of labor
  - Exports are also subject to **variable trade cost** $\tau > 1$
- **Working capital constraints**
  - Need to pay a fraction η of the total labor in advance
- **Borrowing constraints**
  - Can borrow up to fraction θ of total capital value at repayment
  - Therefore: $d_{t+1} \leq \theta k_{t+1}$

Entrepreneurs: Non-Tradable Sector

Technology

- Same productivity as in the tradable sector:

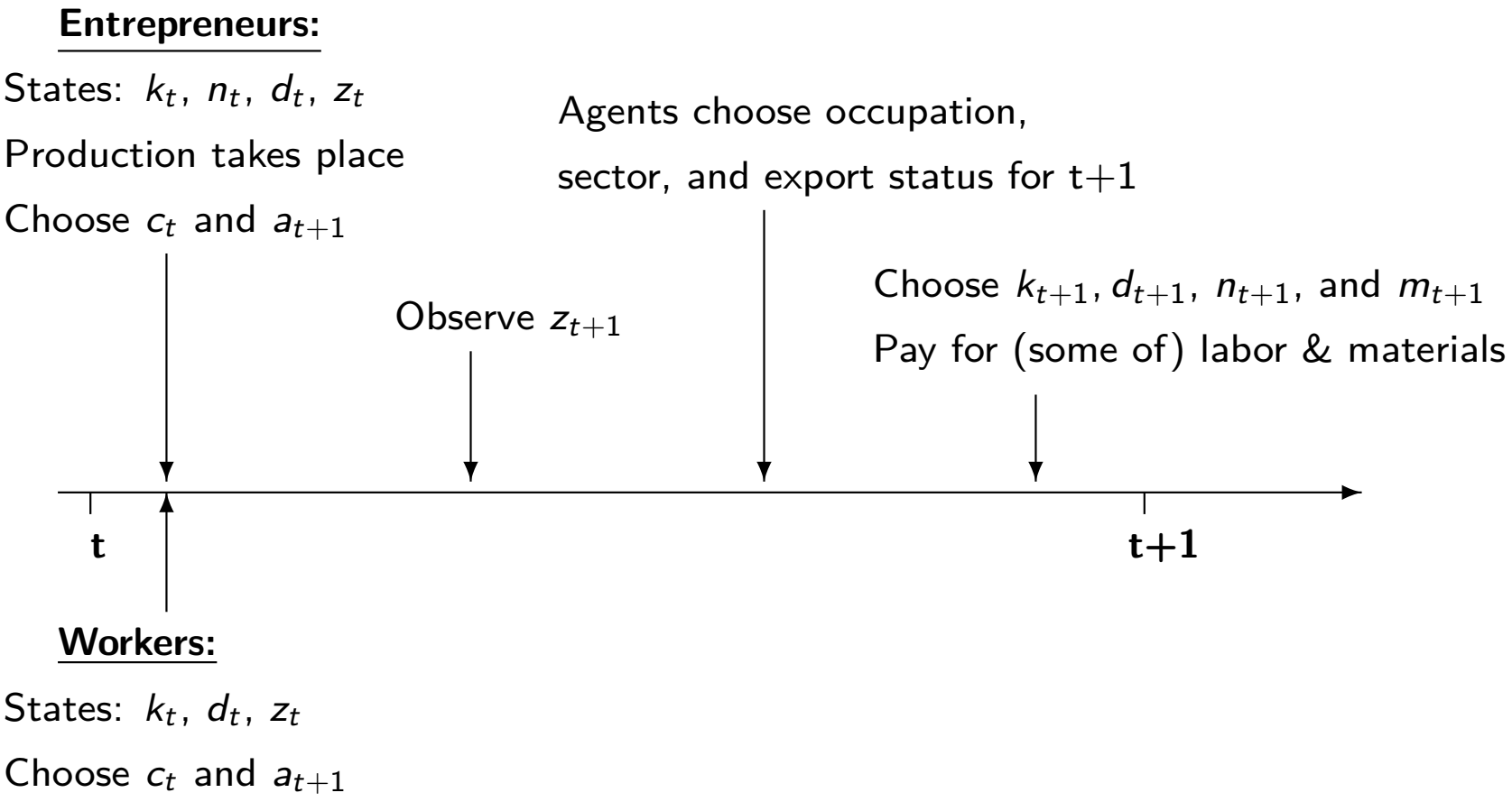
$$\ln z_t = (1-\rho)\,\mu + \rho z_{t-1} + \varepsilon_t, \;\; \varepsilon_t \sim N\left(0, \sigma_\varepsilon^2\right)$$

- Produce differentiated variety only for the domestic market:

$$y_{NT} = z_t k^{\alpha_{NT}} n^{1-\alpha_{NT}}, \quad \alpha_{NT} < \alpha$$

- Accumulate capital internally and hire labor at wage w_t
- Face working capital and financing constraints
  - Need to pay a fraction η of labor in advance
  - $d_{t+1} < \theta k_{t+1}$

Timeline


Entrepreneurs:
States: k_t, n_t, d_t, z_t
Production takes place
Choose c_t and a_{t+1}
Observe z_{t+1}
Agents choose occupation,
sector, and export status for t+1
Choose k_{t+1}, d_{t+1}, n_{t+1}, and m_{t+1}
Pay for (some of) labor & materials
t
t+1
Workers:
States: k_t, d_t, z_t
Choose c_t and a_{t+1}

Sectoral Goods Producers

Sectoral goods producers

- Purchase varieties in their sector to produce composite sectoral good

Producers of composite tradable good

- Aggregate domestic and foreign tradable varieties

$$\max P_T Y_T - \int_{i \in \mathcal{S}_T} p_{h,T}(i) y_{h,T}(i) di - (1 + \tau_m) \xi p_m y_m$$

$$s.t. \quad Y_T = \left[\int_{i \in \mathcal{S}_T} (y_{h,T}(i))^{\frac{\sigma-1}{\sigma}} + y_m^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

- Y_T used as input in production of final good and domestic tradable varieties

Producers of composite non-tradable good

- Aggregate non-tradable varieties

$$\max P_{NT} Y_{NT} - \int_{i \in \mathcal{S}_T} p_{NT}(i) y_{NT}(i) di$$

$$s.t. \quad Y_{NT} = \left[\int_{i \in \mathcal{S}_{NT}} (y_{NT}(i))^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

Final Good Producers and Rest of the World

Final good producers

- Aggregate sectoral goods to produce final good:

$$\max Y - P_T Y_{T,F} - P_{NT} Y_{NT,F}$$
$$s.t. Y = Y_T^{\nu} Y_{NT}^{1-\nu}$$

- P_T and P_{NT} expressed in units of domestic final good

Rest of the world

- Supply foreign aggregate variety: Perfectly elastic at price p_m
- Demand domestic varieties: Exogenous CES demand

Recursive Formulation

Recursive Formulation: Entrepreneurs (Dynamic Problem)

Let $v_s(k, d, z)$ be the value of being an entrepreneur in sector $s \in \{T, NT\}$

$$\begin{aligned} v_s(k, n, d, z) &= \max_{c, a'} \frac{c^{1-\gamma}}{1-\gamma} + \beta \mathbb{E}\left[g\left(a', z'\right)\right] \\ &\text{subject to} \\ c + a' + d &= (1-\delta)k + \pi_s(k, n, z) \\ a' &\geq 0 \\ s &\in \{T, NT\} \end{aligned}$$

Let $v_w(k, d, z)$ be the value of being a worker

$$v_w(k, d, z) = \frac{c^{1-\gamma}}{1-\gamma} + \beta \mathbb{E}\left[g\left(a', z'\right)\right]$$

$$\text{subject to}$$

$$c + a' + d = (1-\delta)k + w$$

$$a' \geq 0$$

Here, $g\left(a', z'\right)$ is the value function of an agent choosing his occupation for the next period.

Recursive Formulation: Entrepreneurs (Static Problem)

Static profits in tradable sector:

$$
\begin{aligned}
\pi_T(k,n,z) &= \max p_h y_h + e\xi p_f y_f - (1-\eta)\, wn - e(1-\eta) wF \\
&\quad \text{subject to} \\
\tau y_f + y_h &= z\left(k^{\alpha} n^{1-\alpha}\right)^{1-\alpha_m} m^{\alpha_m} \\
y_h &= \left(\frac{p_h}{P_T}\right)^{-\sigma} Y_T \\
y_f &= \left((1+\tau_f)\, p_f\right)^{-\sigma} Y_f
\end{aligned}
$$

Recursive Formulation: Entrepreneurs (Static Problem)

Static profits in non-tradable sector:

$$\begin{aligned}
\pi_{NT}(k, n, z) &= \max p_{NT} y_{NT} - (1-\eta) w n_{NT} \\
&\quad \text{subject to} \\
y_{NT} &= z k^{\alpha} n^{1-\alpha} \\
y_{NT} &= \left(\frac{p_{NT}}{P_{NT}}\right)^{-\sigma} Y_{NT}
\end{aligned}$$

Recursive Formulation: Occupational Choice

Occupational choice Before the occupation choice agents observe their next period productivity z'

$$g(a', z') = \max\{g_w(a', z'), g_{NT}(a', z'), g_T(a', z')\},$$

where,

- $g_w(a', z')$ is the value of being a worker
- $g_{NT}(a', z')$ is the value of being an entrepreneur in non-tradable sector
- $g_T(a', z')$ is the value of being an entrepreneur in tradable sector

Recursive Formulation: Saving Allocation Decision

$g_s(a,z)$ is the value of being an entrepreneur in sector $s \in \{T, NT\}$ at the time of saving allocation decision

$$\begin{aligned} g_s\left(a', z'\right) &= \max_{k', d', e', n'} v_s\left(k', d', z'\right) \\ &\quad \text{subject to} \\ a' &= k' + \eta_s w n' + e' \eta_s w F_s - \frac{d'}{1+r} \\ d' &\leq \theta_s k' \\ s &\in \{T, NT\} \end{aligned}$$

$g_w(a,z)$ is the value of being a worker at the time of saving allocation decision

$$\begin{aligned} g_w\left(a', z'\right) &= \max_{k', d'} v_w\left(k', d', z'\right) \\ a' &= k' - \frac{d'}{1+r} \end{aligned}$$

Competitive Equilibrium

A **recursive stationary competitive equilibrium** of this economy consists of prices $\{w, \xi, P_T, P_{NT}\}$, policy functions $\{d', k', e, c, n, y_h, y_f, p_h, p_f, y_{NT}, p_{NT}, Y_T, Y_{NT}, y_m\}$, value functions v, g_w, g_T, g_{NT}, and g, as well as a measure $\phi(\mathcal{S}) \to [0, 1]$ such that:

1. Policy and value functions solve entrepreneurs', workers', and producers' problems problem;
2. Markets for each variety clear;
3. Markets for tradable and non-tradable composite good clear; and in particular
$$Y_T = Y_T^F + \int_{\mathcal{S}} [m_h(s) + m_f(s)] \phi(s)\, ds$$
4. Labor market clears:
$$\int_{\mathcal{S}} [n_h(s) + n_f(s) + n_{NT}(s) + e(s) F] \phi(s)\, ds = \int_{\mathcal{S}} 1_{\{w=1\}} \phi(s)\, ds$$
5. Final good market clears:
$$\int_{\mathcal{S}} [c(s) + x(s)] \phi(s)\, ds = Y$$
6. Measure ϕ is stationary.

Mechanism

Financial Frictions and Trade Liberalization

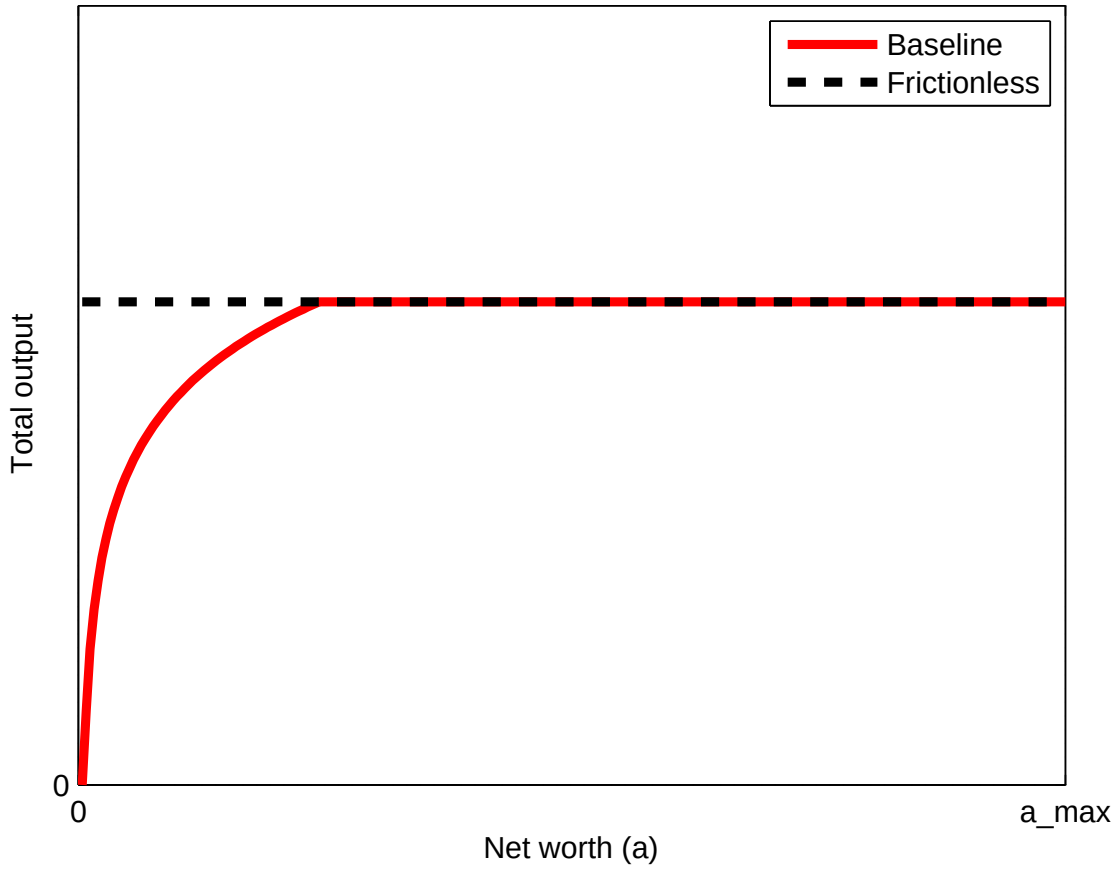
Following a trade liberalization ($\tau_f \downarrow$), exports become more profitable:

1. Encourages existing exporters to increase their foreign sales
2. Encourages some of the domestic producers to begin exporting
3. Encourages some of the non-tradable producers to switch sectors

Financial Frictions limit these adjustments by:

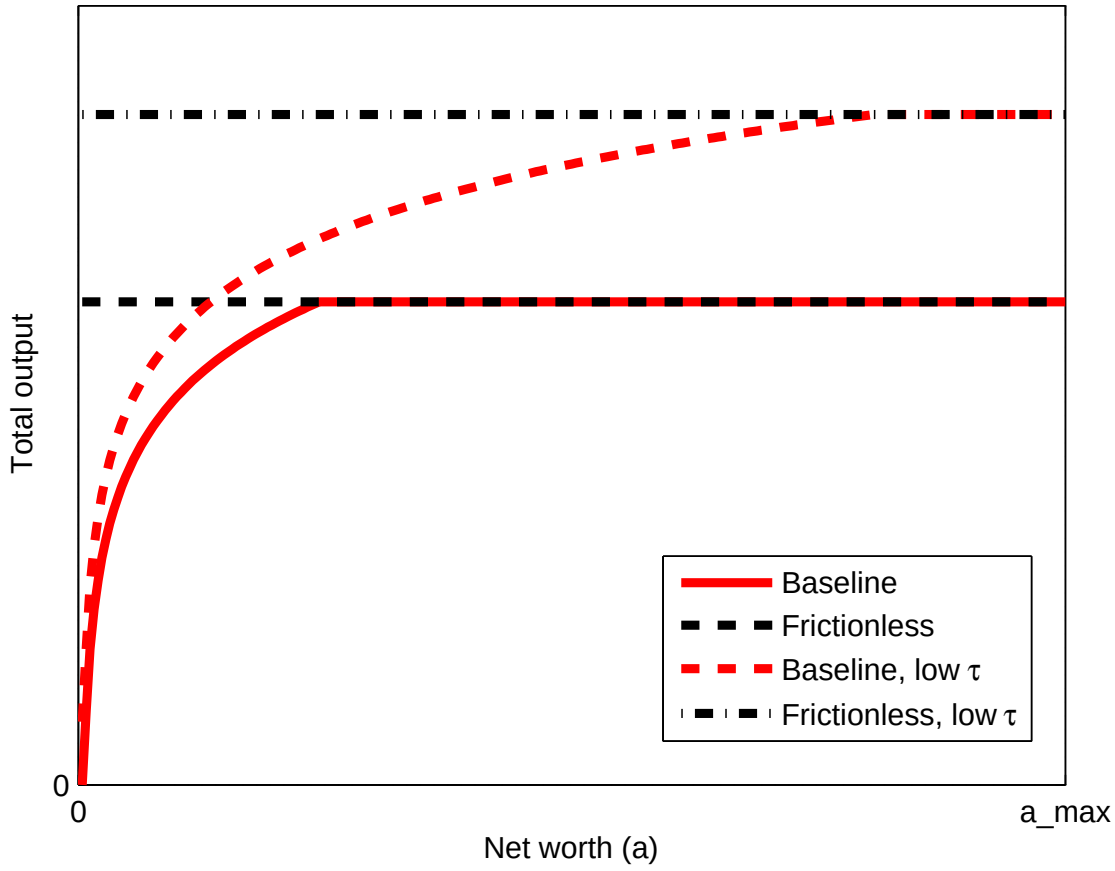
1. Distorting production decisions
2. Distorting export-entry decisions
3. Distorting occupational/sectoral choices

Financial Frictions and Intensive Margin



- Financial frictions
  - Reduce firms' scale
  - Lower response to trade liberalization along intensive margin

Financial Frictions and Intensive Margin



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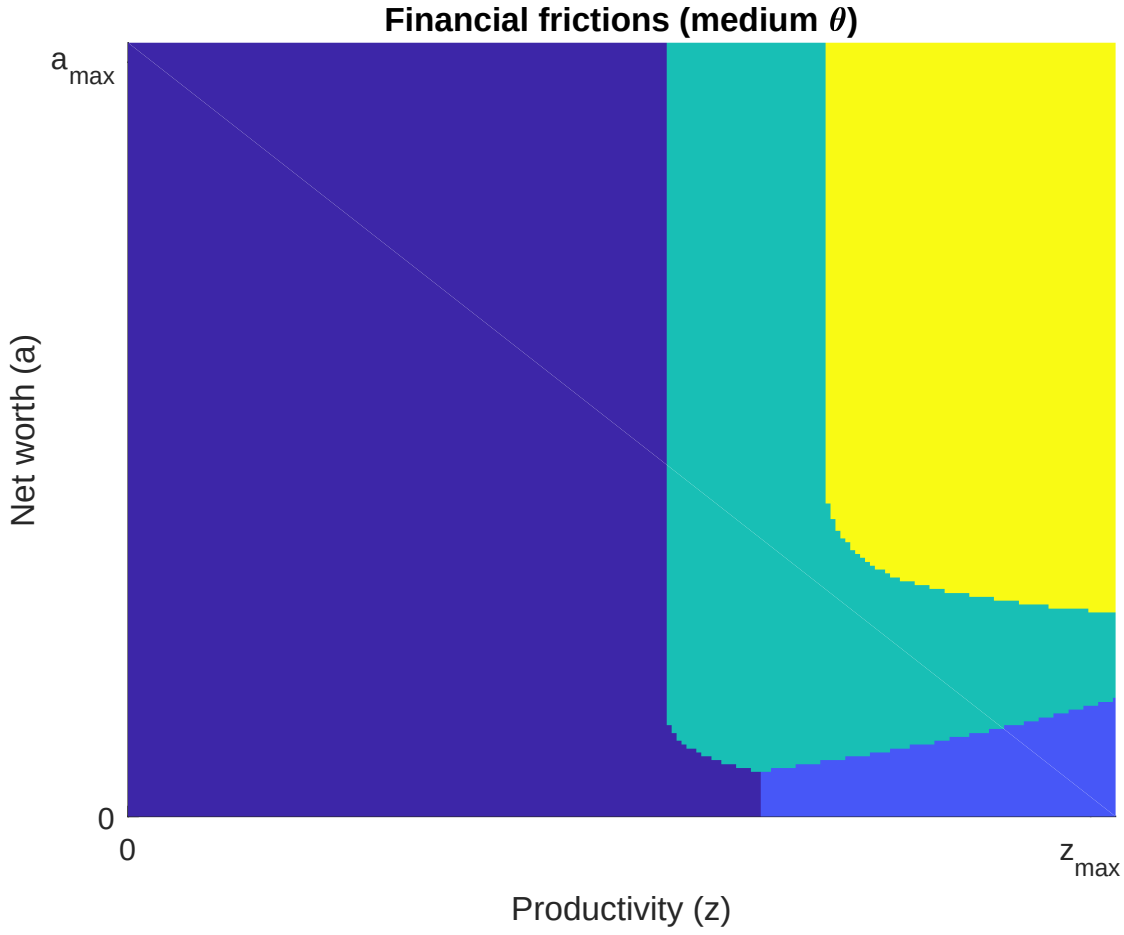

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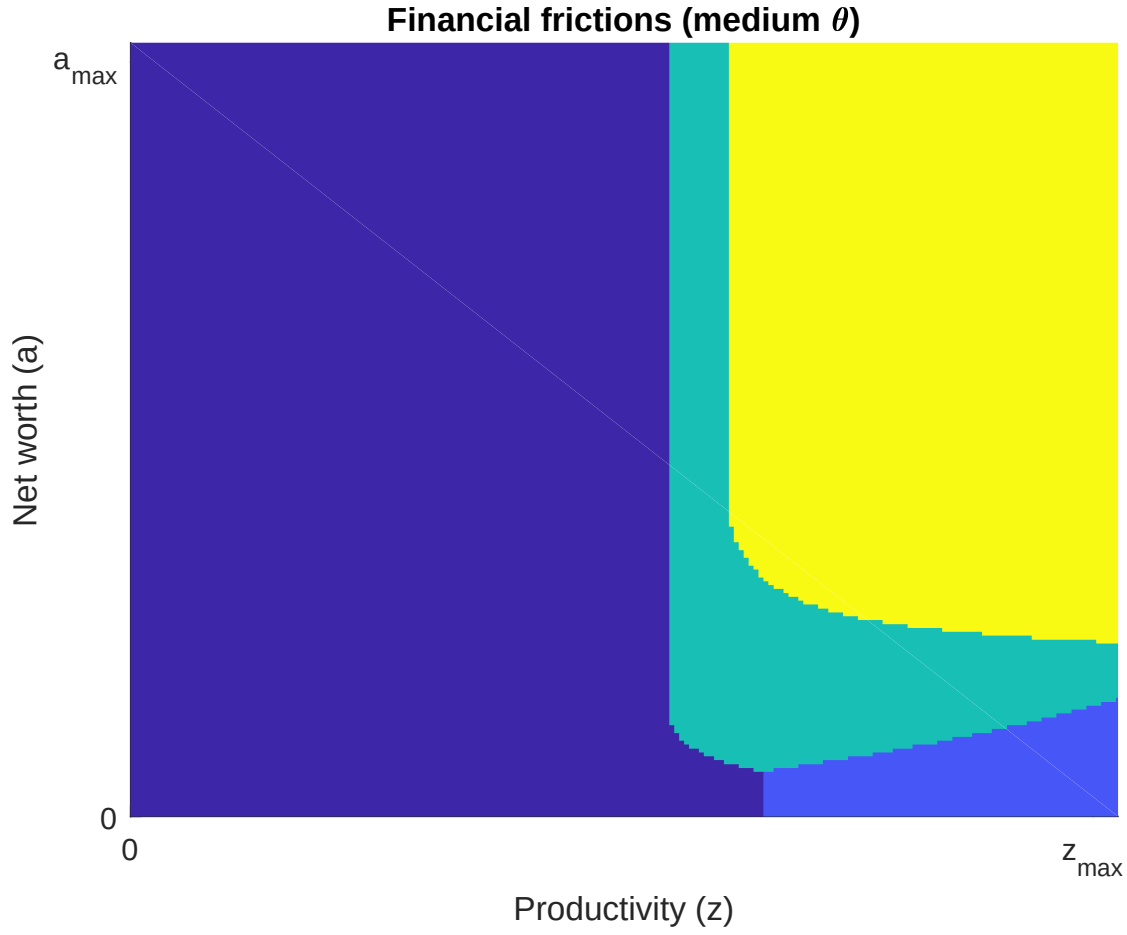

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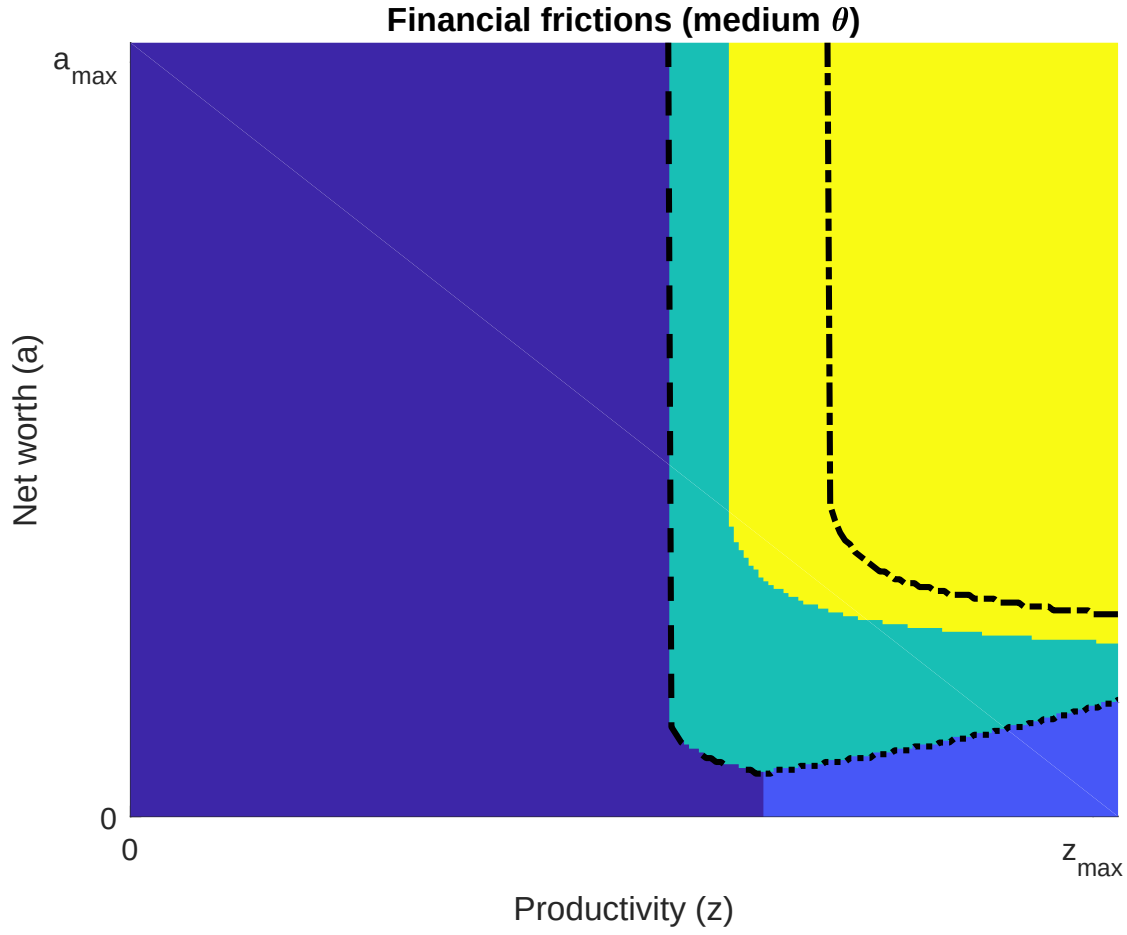

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Financial Development and Trade Liberalizations

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How do financial frictions affect gains from trade liberalizations?

1. They limit the response of firms to change in trade barriers
   - Prevent existing exporters to adjust their scale optimally
   - Discourage entry into export markets

   $\Longrightarrow$ Lower static gains from trade liberalizations in less fin. developed economies

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   $\Longrightarrow$ Lower static gains from trade liberalizations in less fin. developed economies

2. Lowering tariffs leads to higher export profits
   - Constrained exporters can accumulate net worth faster than before
   - This allows them to relax their borrowing constraints and increase their exports

   $\Longrightarrow$ Larger dynamic gains from trade liberalizations in less fin. developed economies

Reallocation channel

The aggregate exports are given by:

$$X = \int_{a=0}^{\infty} \int_{\underline{z}(a)}^{\infty} p_X(a,z) x(a,z) \phi(a,z)\, dz\, da$$

Interested in $\partial \log X / \partial \log(\tau_f)$

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Frictionless economy:

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$$\frac{\partial \log X}{\partial \log(\tau_f)} = \sigma + \frac{p_x(\underline{z}) x(\underline{z}) \phi_x(\underline{z})}{X} \frac{\partial \underline{z}}{\partial \log(\tau_f)}$$

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Economy with financial frictions:

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Economy with financial frictions:

$$\frac{\partial \log X}{\partial \log(\tau_f)} = \sigma \left(1 - \frac{\alpha(1-\alpha_m)}{1-\alpha+\sigma\alpha} \times \textit{Exp. Intensity} \times \frac{X^c}{X} \right)$$

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Interested in $\partial \log X / \partial \log(\tau_f)$

Frictionless economy:

$$\frac{\partial \log X}{\partial \log(\tau_f)} = \sigma + \frac{p_x(\underline{z}) x(\underline{z}) \phi_x(\underline{z})}{X} \frac{\partial \underline{z}}{\partial \log(\tau_f)}$$

Economy with financial frictions:

$$\begin{aligned} \frac{\partial \log X}{\partial \log(\tau_f)} =& \sigma \left(1 - \frac{\alpha(1-\alpha_m)}{1-\alpha+\sigma\alpha} \times \textbf{\textit{Exp. Intensity}} \times \frac{\boldsymbol{X^c}}{\boldsymbol{X}} \right) \\ &+ \int_{a=0}^{\infty} \frac{\partial \underline{z}(a)}{\partial \log(\tau_f)} \frac{p_x\left(\underline{z}(a), a\right) x\left(\underline{z}(a), a\right) \phi\left(\underline{z}(a), a\right)}{X} \, dz \, da \end{aligned}$$

Quantitative Analysis

Quantitative Analysis

Question: Is the level of financial development **quantitatively important** for the aggregate effects of a trade liberalization?

How we answer this question?

- Consider a trade liberalization in Colombia
  - A drastic drop in tariffs between 1988-1992
- Use then Annual Manufacturing Survey to evaluate the effects of trade liberalization
  - Survey of all manufacturing firms with 10+ workers
  - Choose parameters to match moments from Colombian plant-level data for 1982-1988
- Examine the effect of lowering tariffs
  - Compare the final steady states for different levels of θ
  - Compare transitional dynamics for different levels of θ

Calibration

Table: **Pre-Assigned Parameters**

Parameter	Value	Description	Parameter	Value	Description
γ	2	Risk aversion	α	0.6	Share of capital in T sector
β	0.8	Discount factor	α_{NT}	0.2	Share of capital in NT sector
σ	4	Elasticity of substitution	α_m	0.4	Share of intermediate inputs
δ	0.06	Capital depreciation rate	η	0	Working capital
r	0.06	Interest rate	τ_m	0.32	Imports tariffs
ρ	0.9	Persistence of prod. shocks	τ_f	0.32	Exports tariffs
ν	0.47	Share of tradables in GDP	P_f	1	Foreign price index

Calibration

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ν	0.47	Share of tradables in GDP	P_f	1	Foreign price index

Table: **Calibrated Parameters**

Parameter	Value	Target moment	Target value	Model
F	9.5	Share of exporters	0.11	0.11
τ	4.5	Weighted Avg. Export Intensity	0.54	0.54
σ_ε	0.245	exporter (domestic) sales premium	5.68	5.58
θ	0.21	Credit / GDP	0.15	0.15

Experiments

- **Compute the effect of a decrease in τ_f from 0.32 to 0.12**
  - Partial equilibrium
  - General equilibrium

- **Agents learn about the change in τ_f one period in advance**

- **Contrast economies with different levels of θ**
  - Calibrated θ $\quad (\theta = 0.21)$
  - High θ $\quad (\theta = 0.6)$

  Otherwise economies are identical

Baseline economy

Aggregate Effects of Trade Liberalization

Steady State effects:

RER

Wage

P_{NT}

GDP

Consumption

Investment (K)

Exports

Credit/GDP

Share of Firms

Share of T. Firms

Share of NT. Firms

Share of Exporters (in T)

Aggregate Effects of Trade Liberalization

Steady State effects:

	Baseline (PE)
RER	0.0%
Wage	0.0%
P_{NT}	0.0%
GDP	20.9%
Consumption	14.1%
Investment (K)	35.8%
Exports	191%
Credit/GDP	26.1%
Share of Firms	0.9%
Share of T. Firms	9.2%
Share of NT. Firms	-3.7%
Share of Exporters (in T)	144%

Aggregate Effects of Trade Liberalization

Steady State effects:

	Baseline (PE)	**Baseline (GE)**
RER	0.0%	-10.9%
Wage	0.0%	4.0%
P_{NT}	0.0%	2.6%
GDP	20.9%	3.1%
Consumption	14.1%	3.4%
Investment (K)	35.8%	1.9%
Exports	191%	35.9%
Credit/GDP	26.1%	-3.4%
Share of Firms	0.9%	-5.1%
Share of T. Firms	9.2%	-16.8%
Share of NT. Firms	-3.7%	1.4%
Share of Exporters (in T)	144%	51.9%

Baseline Economy: Financial Frictions and Misallocation

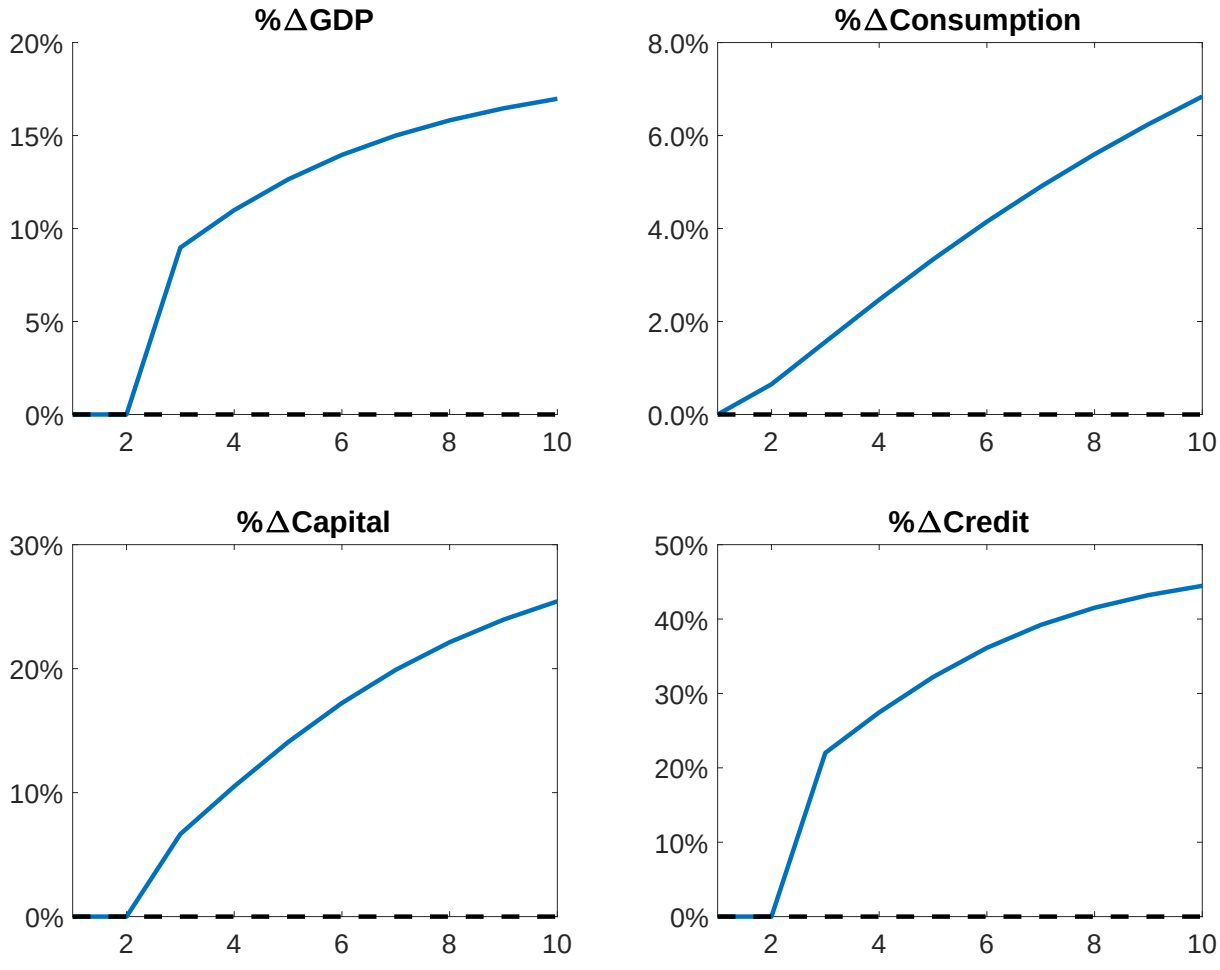
	Firms and Exporters
Share of Firms	13.8%
Share of Tradable Frims	4.84%
of which: Share of Exporters	10.8%
	Share Constrained
Scale	70.0%
Sector Entry	9.0%
Export Entry	4.49%
Firm Entry	20.0%

Baseline Economy: Financial Frictions and Misallocation

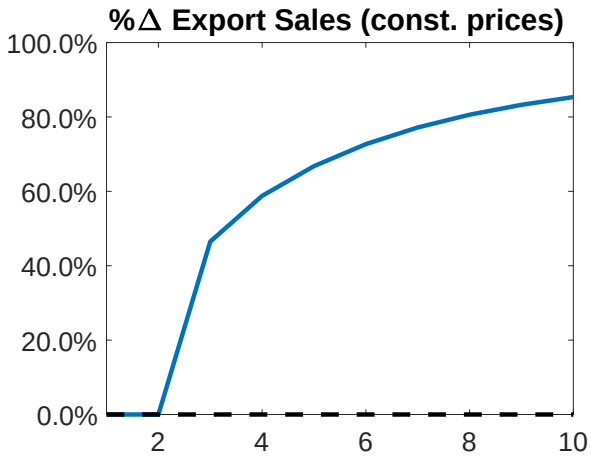
	Firms and Exporters
Share of Firms	13.8%
Share of Tradable Frims	4.84%
of which: Share of Exporters	10.8%

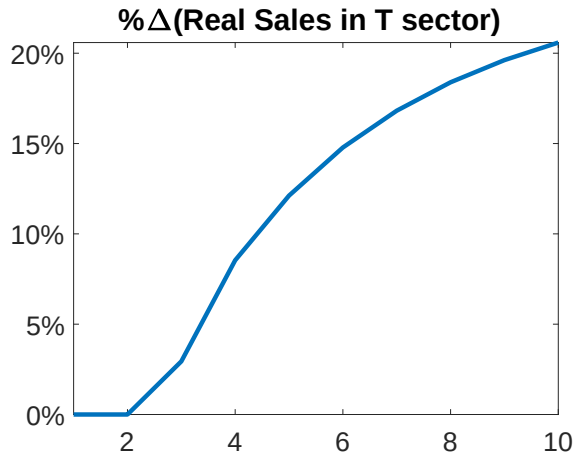
	Share Constrained	TFP Losses
Scale	70.0%	3%
Sector Entry	9.0%	20%
Export Entry	4.49%	22%
Firm Entry	20.0%	23%

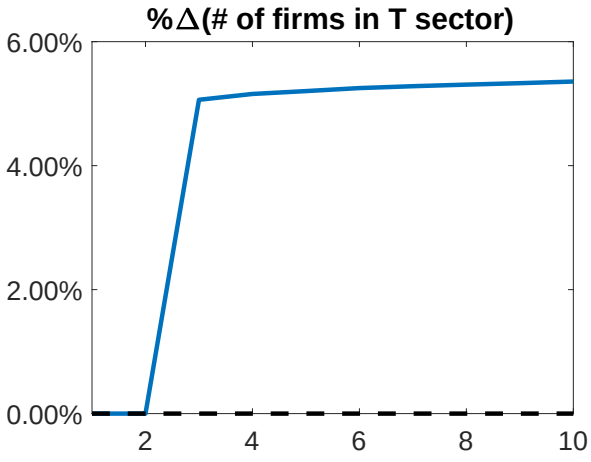
Aggregate Effects of Trade Liberalization (PE)

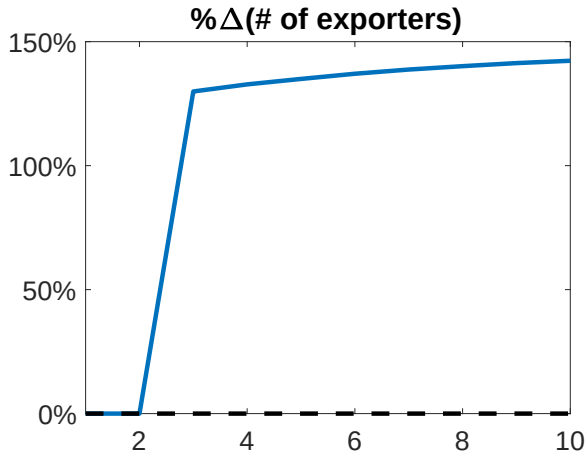


Aggregate Effects of Trade Liberalization (PE)

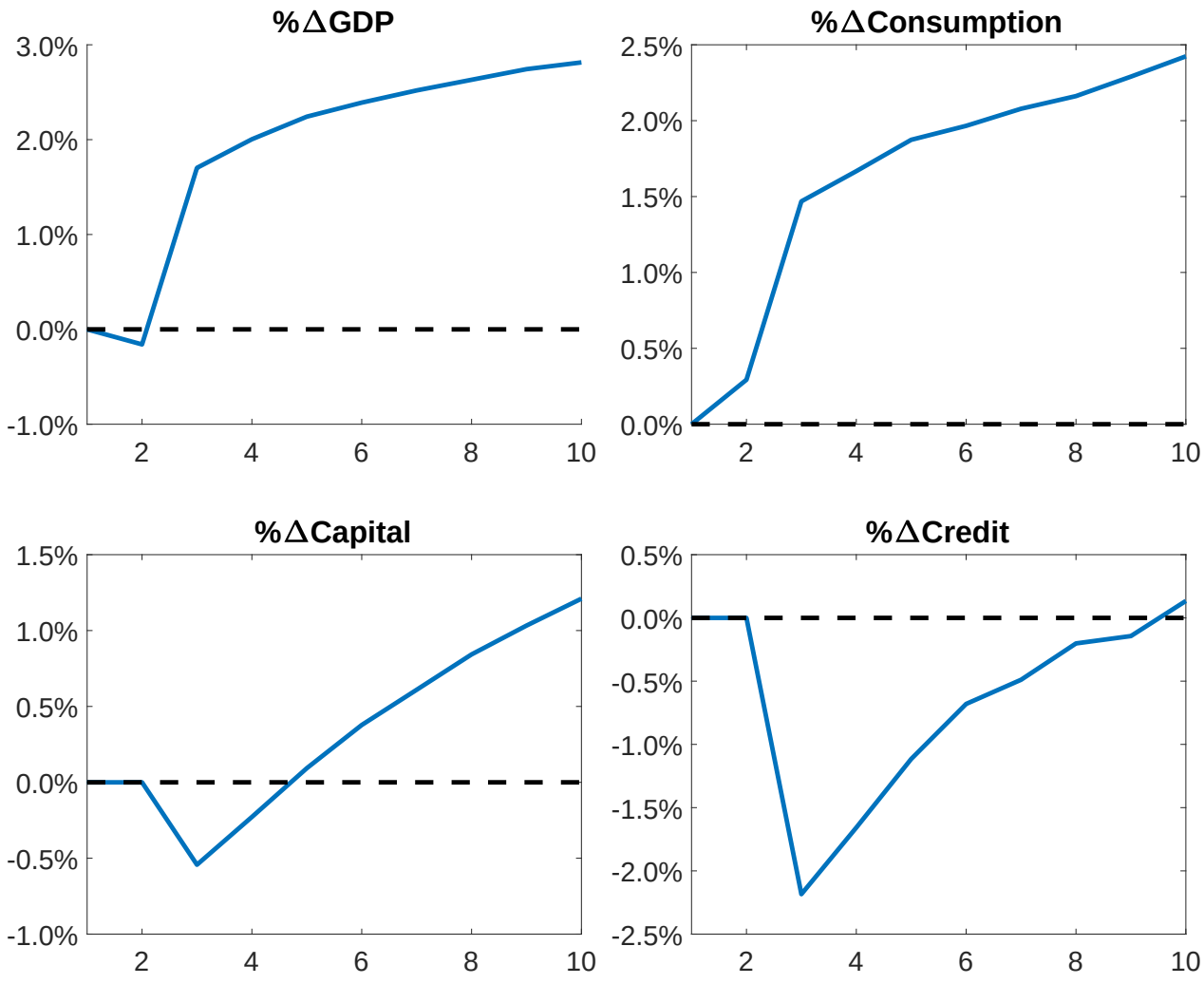




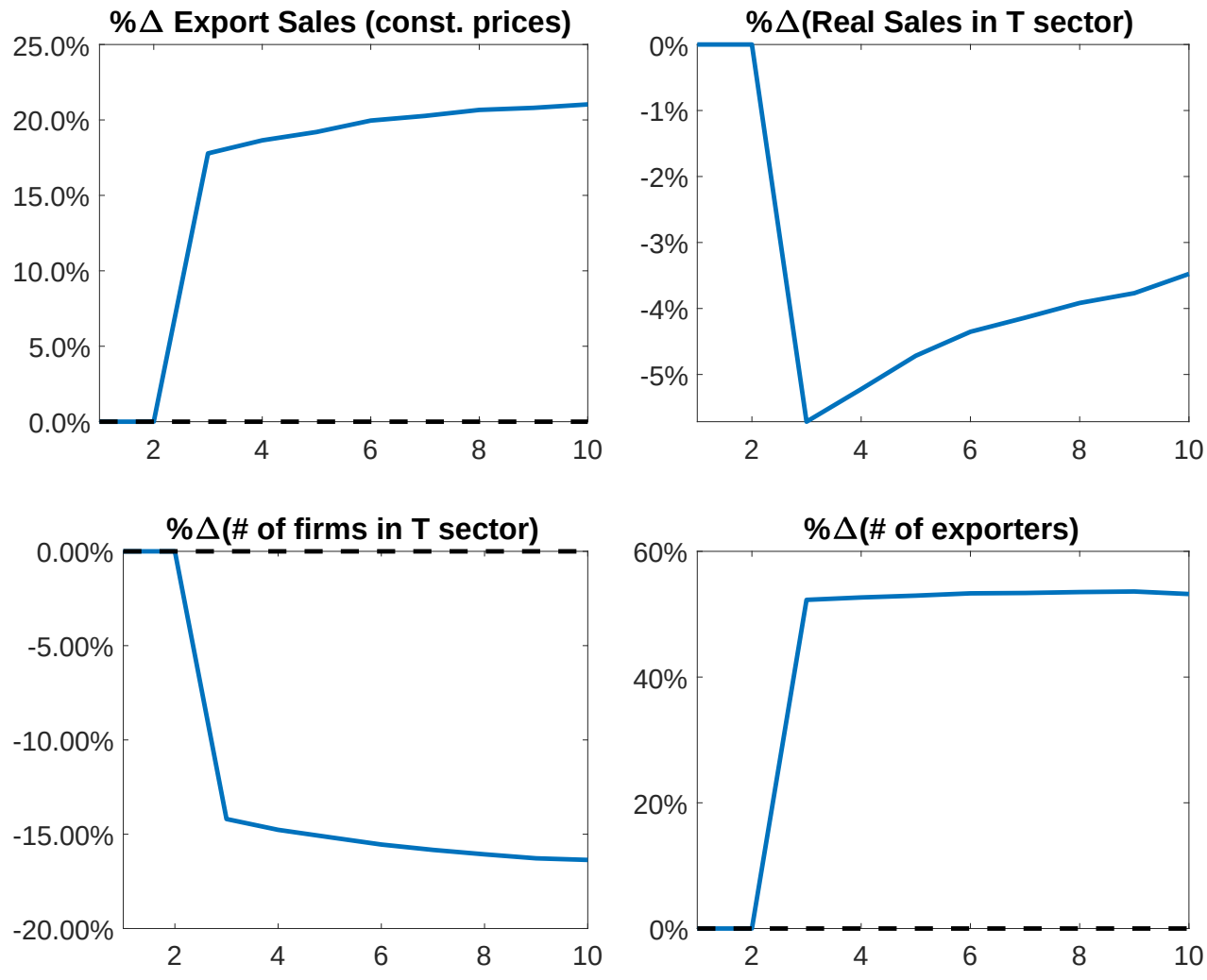




Aggregate Effects of Trade Liberalization (GE)



Aggregate Effects of Trade Liberalization (GE)



The Effect of Financial

Development

Aggregate Effects of Trade Liberalization

Comparison of Steady States Effects (PE):

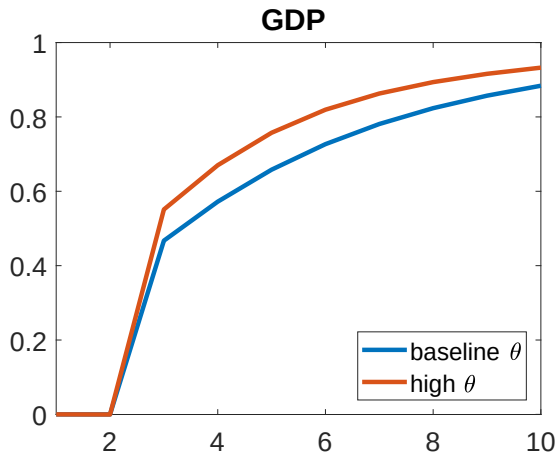
	Baseline	**High Credit**
RER	0.0%	
P_{NT}	0.0%	
Wage	0.0%	
GDP	20.9%	
Consumption	14.1%	
Investment (K)	36.0%	
Exports	198%	
Credit/GDP	26.1%	
Share of Firms	0%	
Share of T. Firms	9.2%	
Share of NT. Firms	-3.7%	
Share of Exporters	144%	

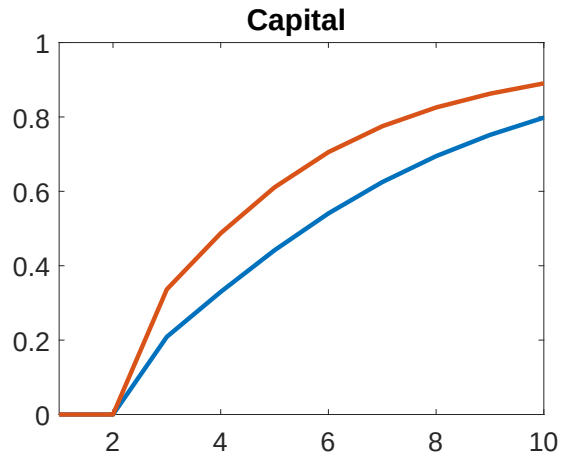
Aggregate Effects of Trade Liberalization

Comparison of Steady States Effects (PE):

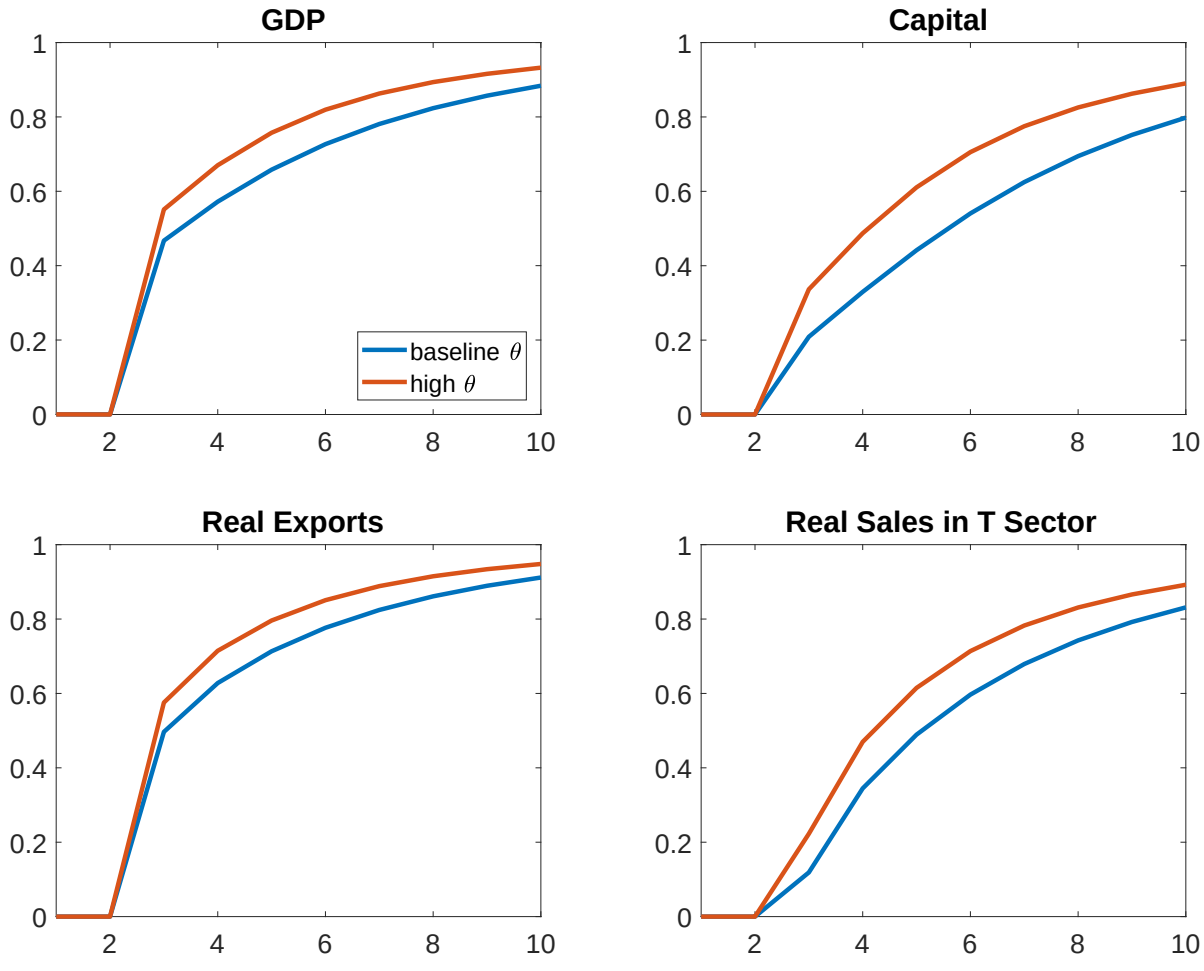
	Baseline	**High Credit**
RER	0.0%	0.0%
P_{NT}	0.0%	0.0%
Wage	0.0%	0.0%
GDP	20.9%	19.6%
Consumption	14.1%	12.5%
Investment (K)	36.0%	32.3%
Exports	198%	189%
Credit/GDP	26.1%	25.0%
Share of Firms	0%	0%
Share of T. Firms	9.2%	8.0%
Share of NT. Firms	-3.7%	-3.5%
Share of Exporters	144%	136%

Aggregate Effects of Trade Liberalization (PE)





Aggregate Effects of Trade Liberalization (PE)



Aggregate Effects of Trade Liberalization

Comparison of Steady States Effects (GE):

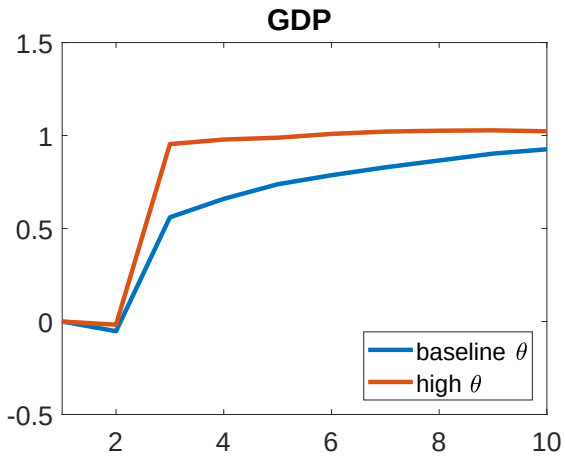
	Baseline	**High Credit**
RER	-10.9%	
P_{NT}	2.6%	
Wage	4.0%	
GDP	3.1%	
Consumption	3.4%	
Investment (K)	2.1%	
Exports	35.4%	
Credit/GDP	-3.1%	
Share of Firms	-4.1%	
Share of T. Firms	-15.2%	
Share of NT. Firms	2.3%	
Share of Exporters	48.8%	

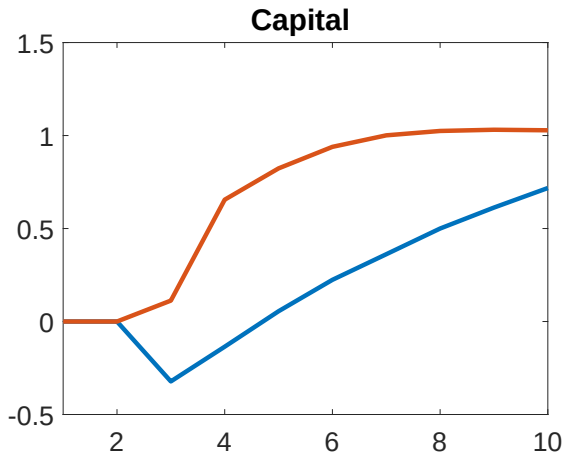
Aggregate Effects of Trade Liberalization

Comparison of Steady States Effects (GE):

	Baseline	**High Credit**
RER	-10.9%	-10.9%
P_{NT}	2.6%	2.0%
Wage	4.0%	3.2%
GDP	3.1%	2.3%
Consumption	3.4%	2.9%
Investment (K)	2.1%	1.1%
Exports	35.4%	34.3%
Credit/GDP	-3.1%	-2.6%
Share of Firms	-4.1%	-3.9%
Share of T. Firms	-15.2%	-15.2%
Share of NT. Firms	2.3%	2.7%
Share of Exporters	48.8%	48.2%

Aggregate Effects of Trade Liberalization (GE)





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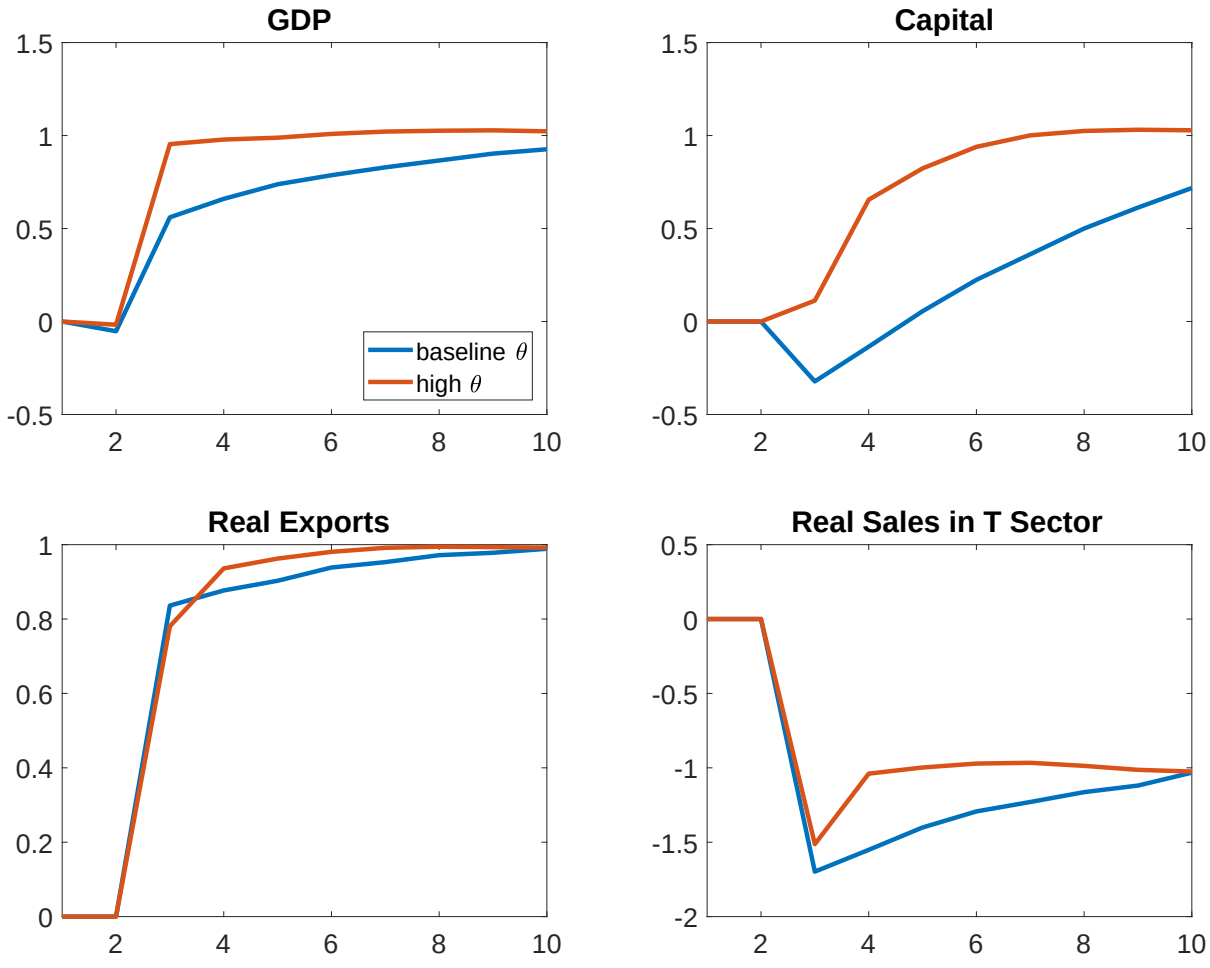

Conclusions

Question: To what extent the aggregate effects of a trade liberalization depend on country's financial development?

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How do we answer this question:

- Study a small open GE economy with heterogeneous firms and 3 key ingredients
  1. **International trade** subject to variable and fixed costs
  2. **Financial frictions** modeled as collateral constraints
  3. Endogenous **occupation/sector/export** choices

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- **Findings:**
  - Financial frictions have modest effects on long run effects of trade liberalizations
  - Financial frictions substantially decrease short-run effects of trade liberalizations and decrease the speed of adjustment towards new steady state

Thank you

Data: Trade Liberalizations

- **Q: What is the effect of trade liberalization on trade flows?**

Back

Data: Trade Liberalizations

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- **Export trade liberalization:**
  - For each country, examine changes in tariffs charged by export destinations
  - Compute average trade-weighted tariffs faced by exports
  - 28 episodes $\Rightarrow \geq 0.75$ percentage point fall in average tariffs within 3 years

Back

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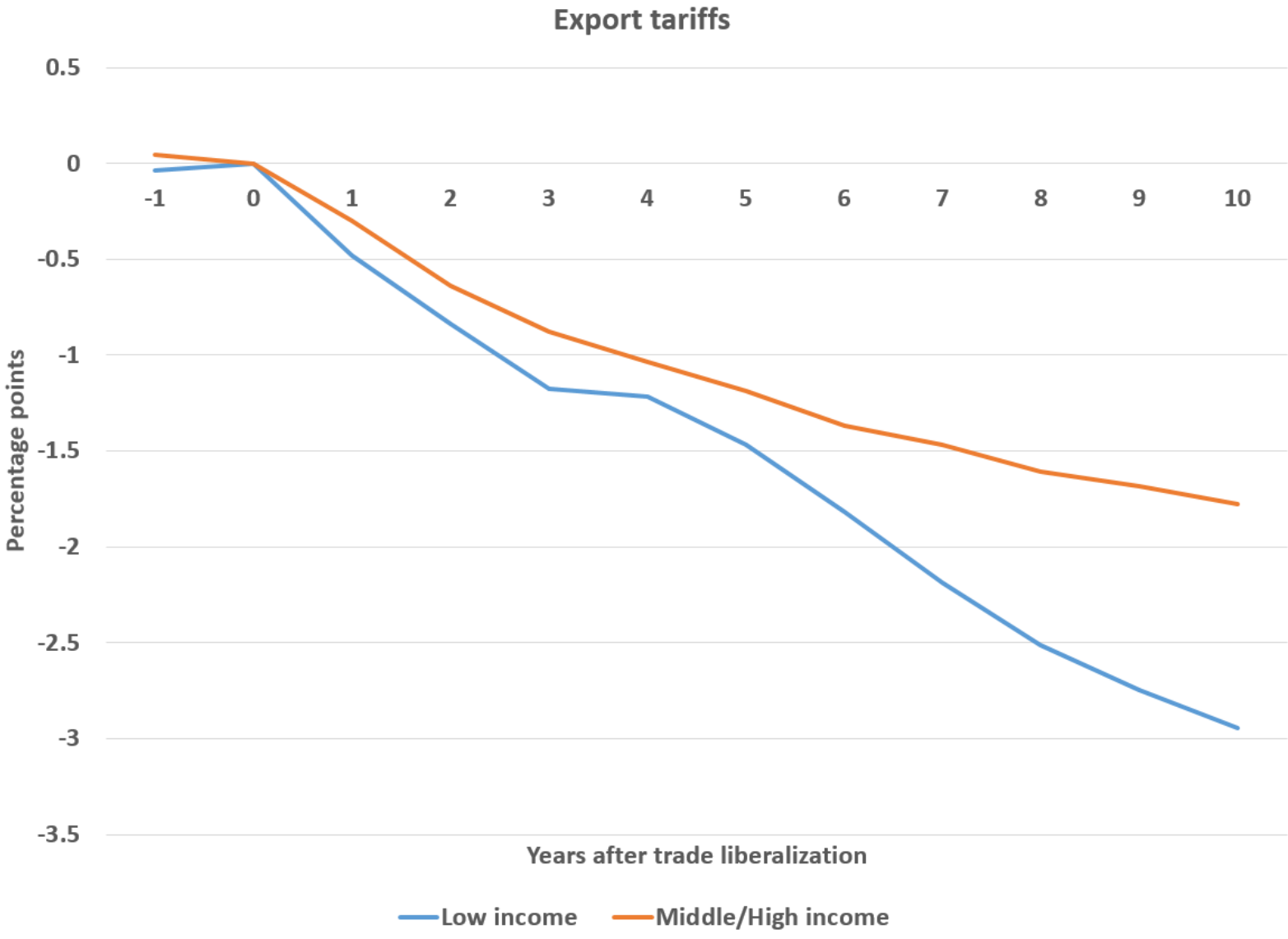
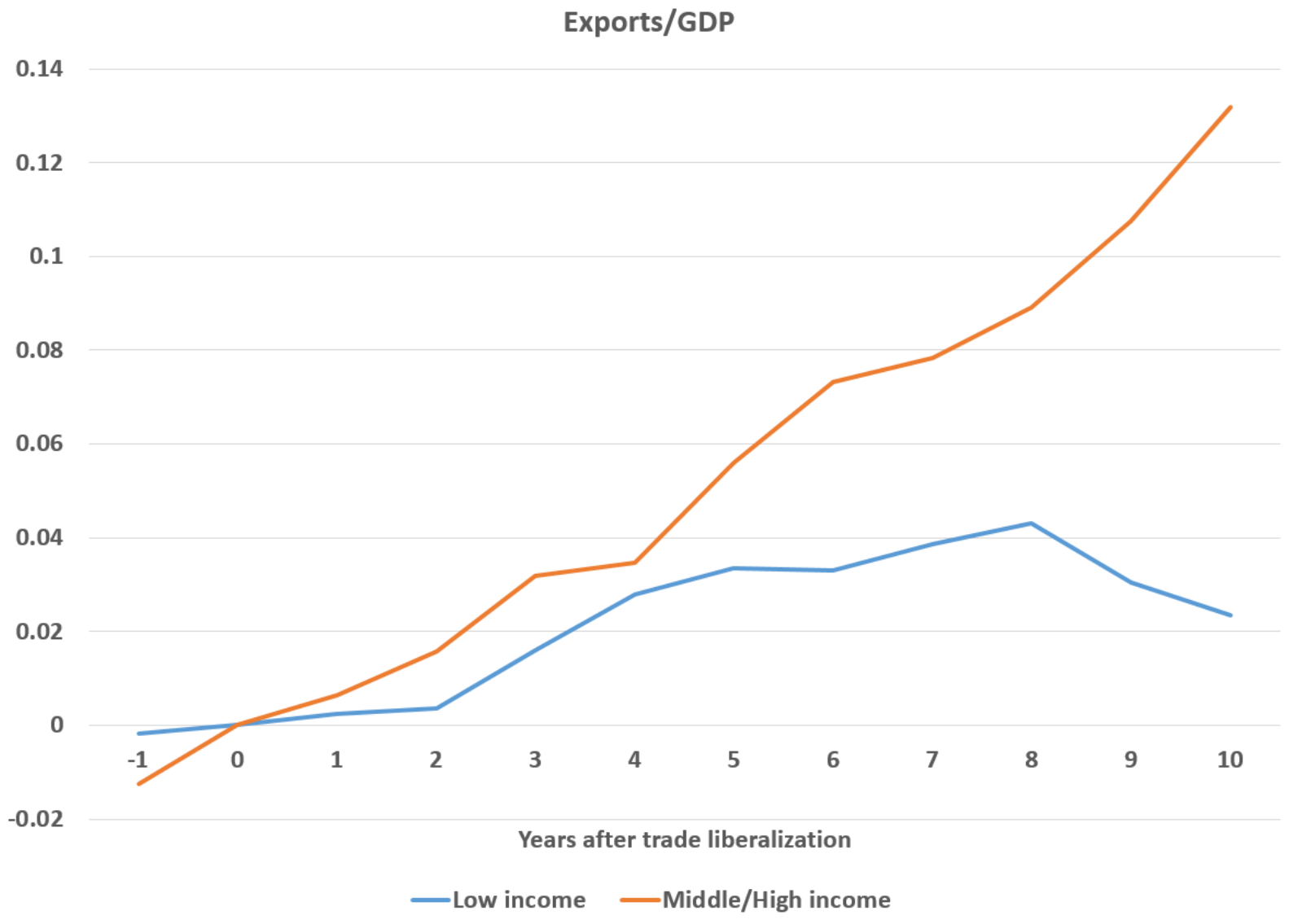
- **Contrast countries based on economic development at liberalization period:**
  - Low income: $<$ \$5000 (constant 2011 dollars)
  - Middle/High income: $\geq$ \$5000 (constant 2011 dollars)

Back

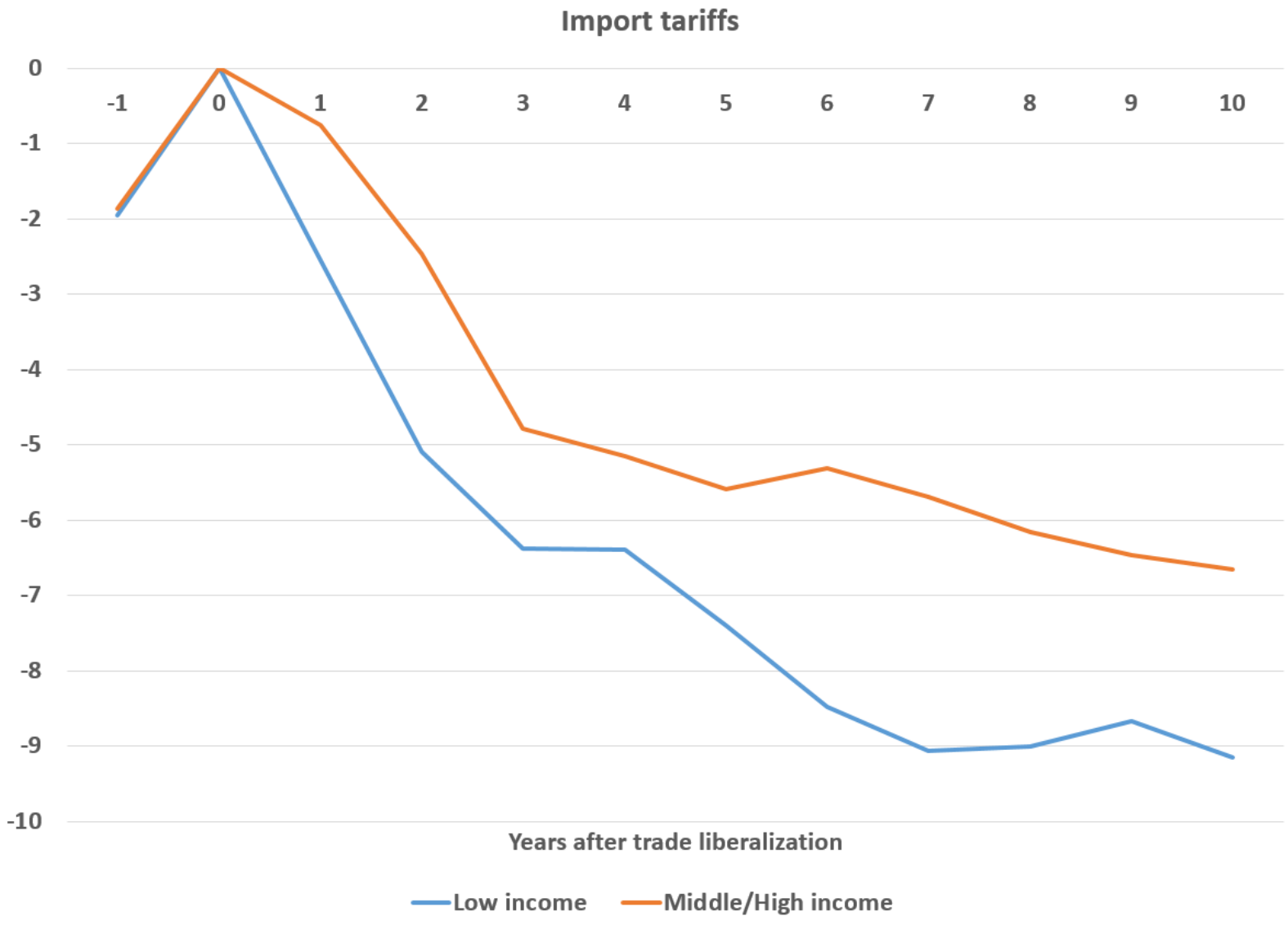
Export Tariffs



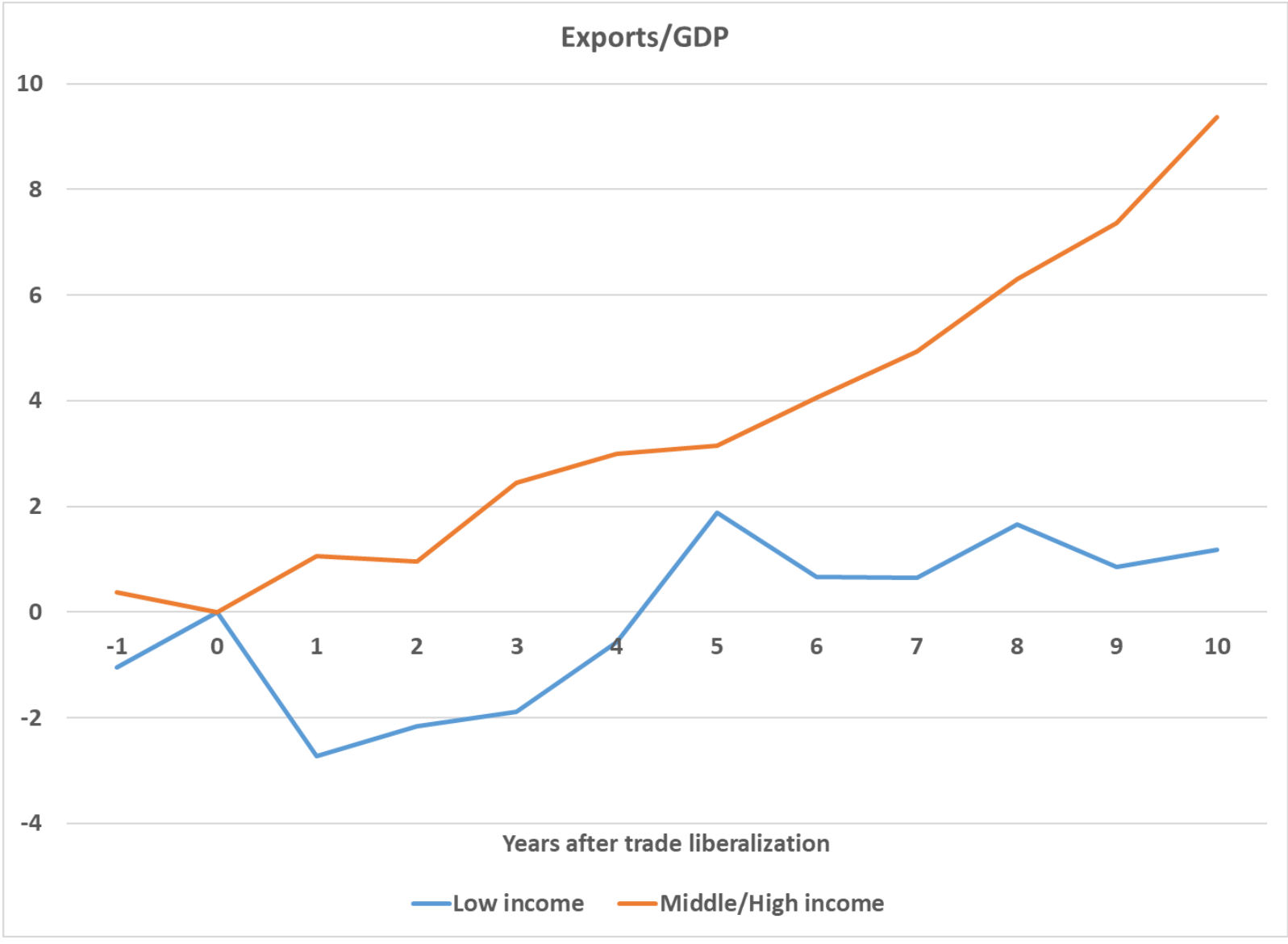
Export/GDP


Exports/GDP
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
-1
0
1
2
3
4
5
6
7
8
9
10
Years after trade liberalization
Low income
Middle/High income

Import Tariffs



Exports/GDP


Exports/GDP
10
8
6
4
2
0
-2
-4
-1
0
1
2
3
4
5
6
7
8
9
10
Years after trade liberalization
Low income
Middle/High income

Data: Colombia 1980-2000, Data Analysis (cont.)

To measure the trade elasticities across all industries, we estimate:

$$\ln \text{Exports}_t - \ln \text{Exports}_{1988} = \alpha + \sum_{t=1988}^{2002} \beta_t \times \text{Year}_t \times (\ln \text{Tariff}_t - \ln \text{Tariff}_{1988})$$

where. . .

- Year_t is a dummy equal to 1 in year t
- β_t are year-specific trade-elasticities

Data: Colombia 1980-2000, Data Analysis (cont.)

To measure the trade elasticities across all industries, we estimate:

$$\ln \text{Exports}_t - \ln \text{Exports}_{1988} = \alpha + \sum_{t=1988}^{2002} \beta_t \times \text{Year}_t \times (\ln \text{Tariff}_t - \ln \text{Tariff}_{1988})$$

where...

- Year_t is a dummy equal to 1 in year t
- β_t are year-specific trade-elasticities

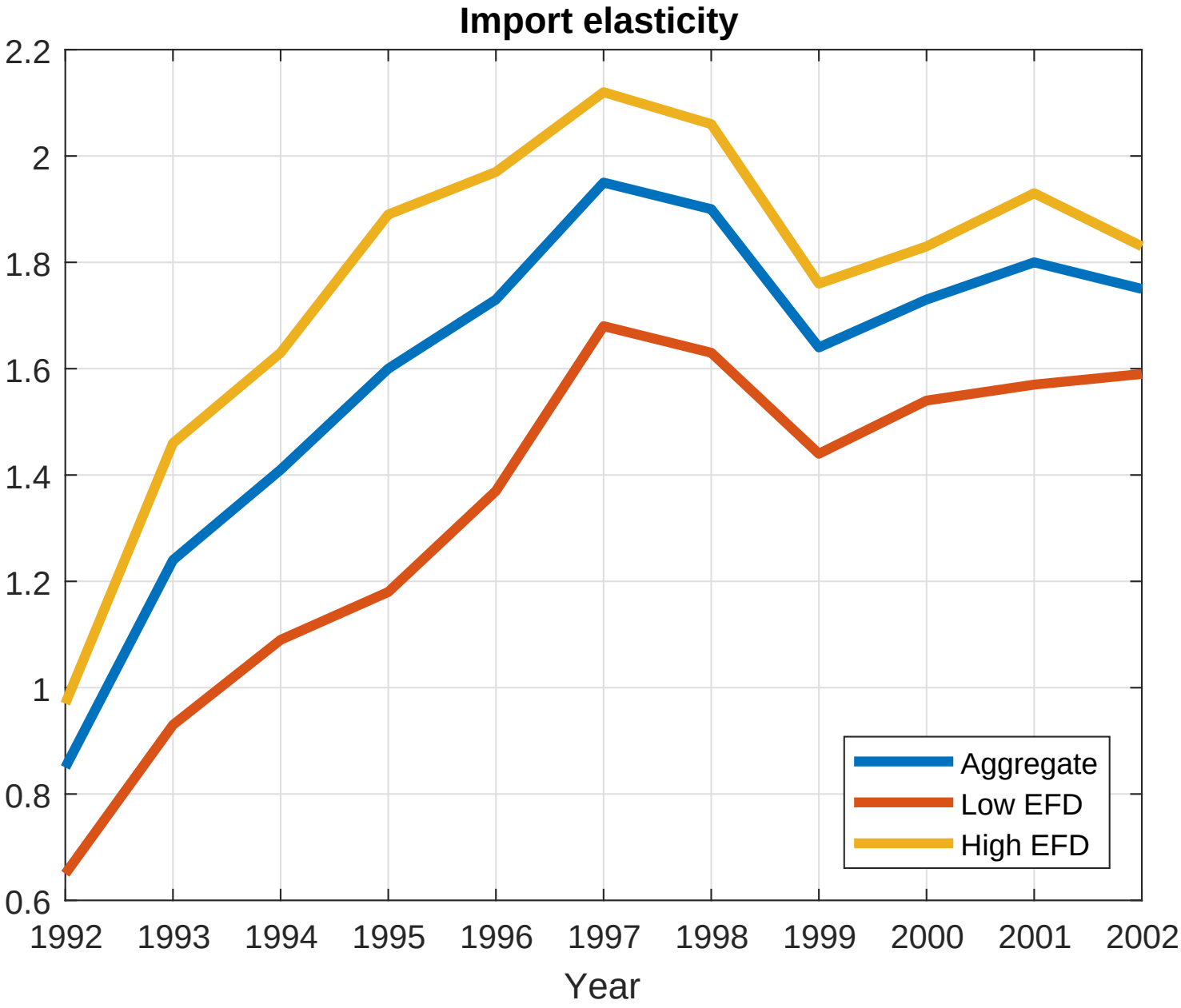
To measure the elasticities across low and high EFD industries:

$$\ln \text{Exports}_t - \ln \text{Exports}_{1988} = \alpha + \sum_{t=1988}^{2002} (\beta_t + \gamma_t \times \text{HighEFD}_t) \times \text{Year}_t \times (\ln \text{Tariff}_t - \ln \text{Tariff}_{1988})$$

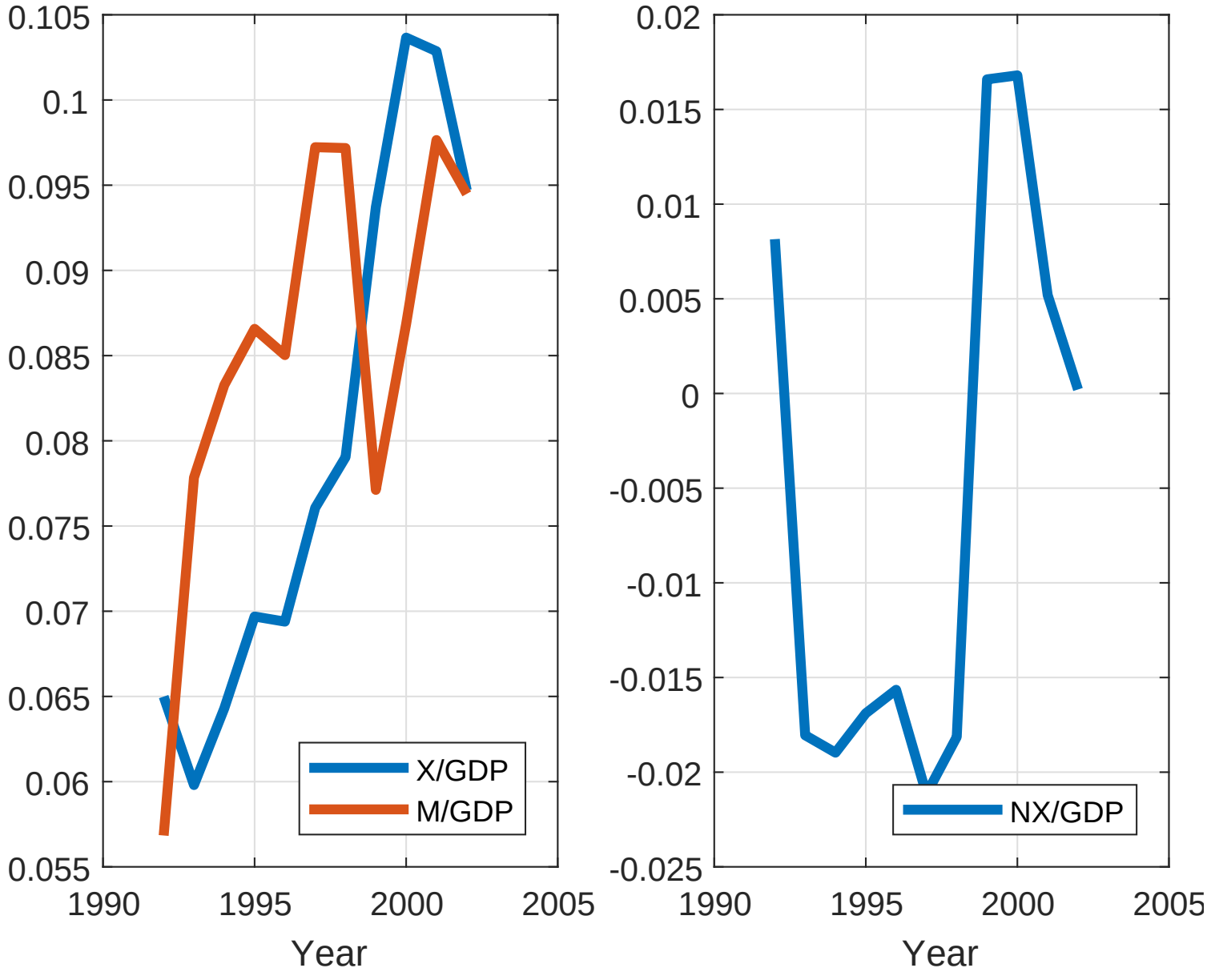
where...

- HighEFD is a dummy equal to 1 if the industry has high EFD
- Trade elasticity for low EFD industries: β_t
- Trade elasticity for high EFD industries: $\beta_t + \gamma_t$

Data: Colombia 1980-2000, Import Elasticity



Data: Colombia 1980-2000, Trade Dynamics



Data: Colombia 1980-2000, GDP