Exports, Imports, and Earnings Inequality: Micro-Data and Macro-Lessons from Ecuador

RODRIGO ADÃO (BOOTH), PAUL CARRILLO (GWU), ARNAUD COSTINOT (MIT) DAVE DONALDSON (MIT), DINA POMERANZ (UZH), JULY 2, 2020

Trade and Earnings Inequality

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- **Questions:**
  - Who is *exposed* to international trade, either through exports or imports?
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- **This Paper:**
  - *Theory:* ***Export Channel*** *vs.* ***Import Channel***
  - *Measurement:*
    - New dataset from Ecuador (Customs + VAT + social security + ownership registers)
    - → ***Individual-level exposure*** to exports and imports (labor + capital)
  - *Main Findings:* ***Largest gains from trade for middle class****, mostly through export channel*

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- **Inspired by original factor content approach:**
  - Deardorff and Staiger (1988), Krugman (2000), Leamer (2000)
  - Borjas, Freeman, and Katz (1992), Katz and Murphy (1992), Borjas, Freeman, and Katz (1997)

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- **What we hope to improve on:**
  - Robustness of theoretical foundations, granularity of the data fed into the analysis, tighter relationship between theory and data

Theory

Factor Supply and Factor Demand

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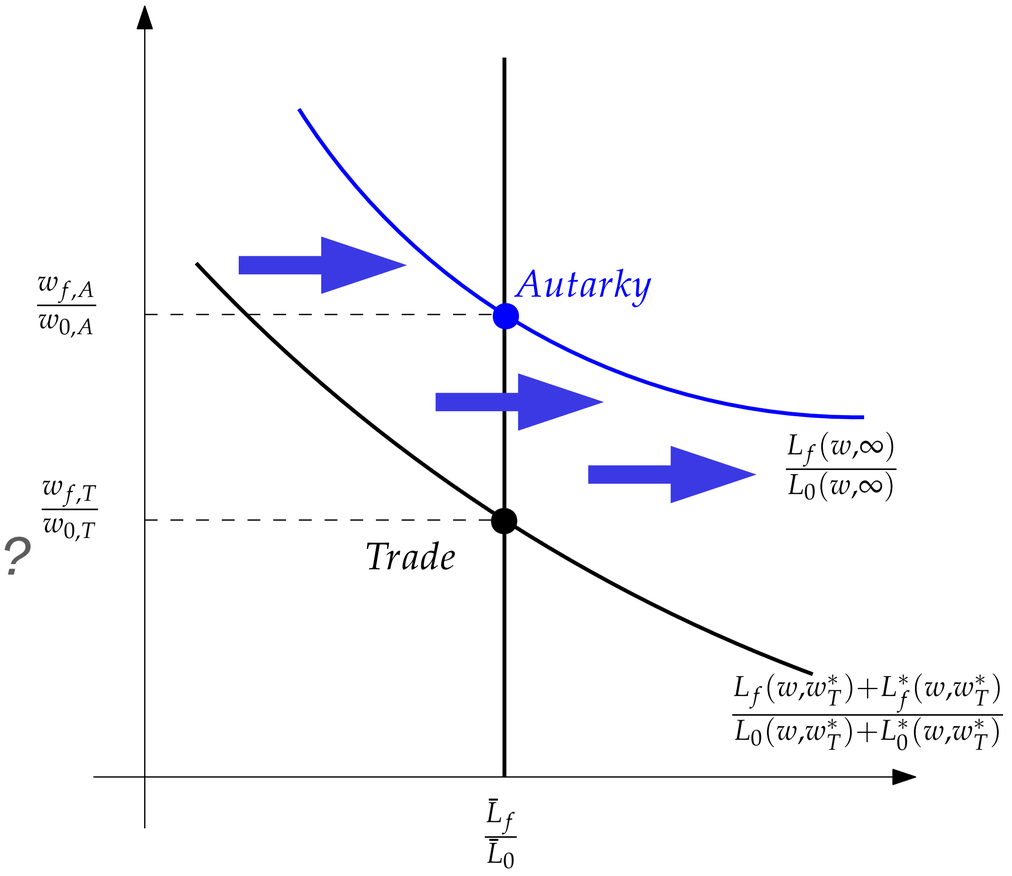

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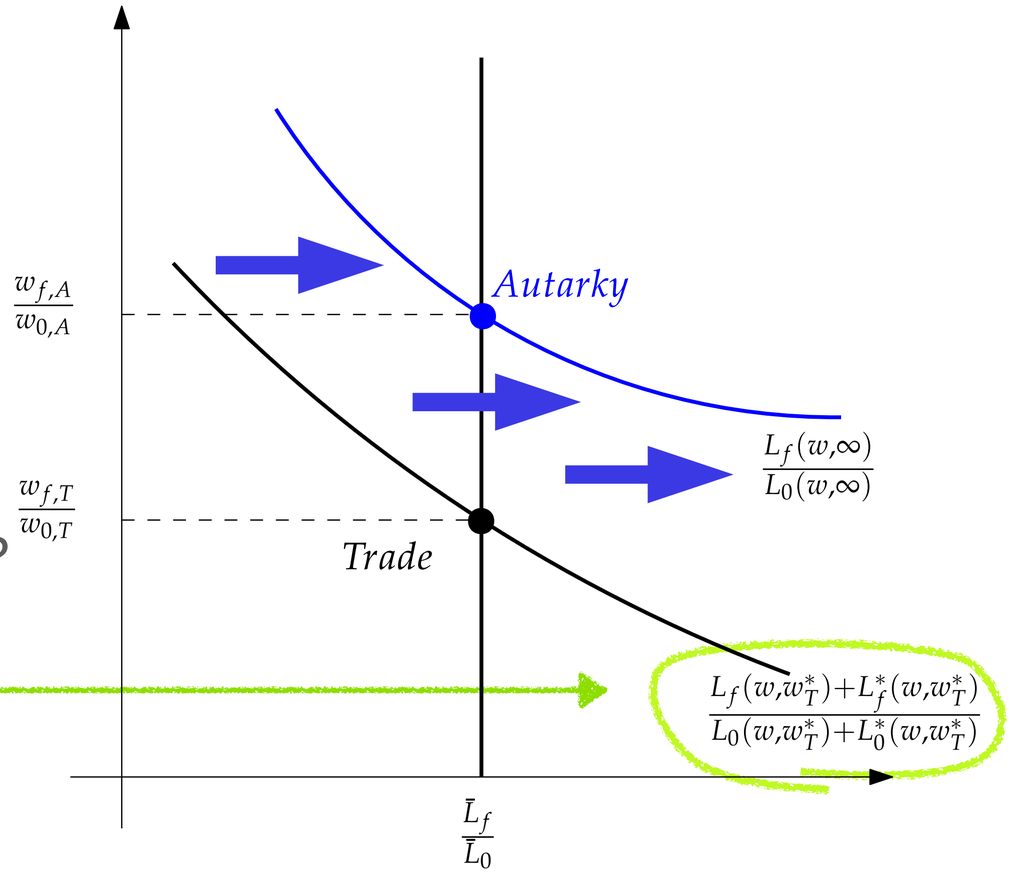

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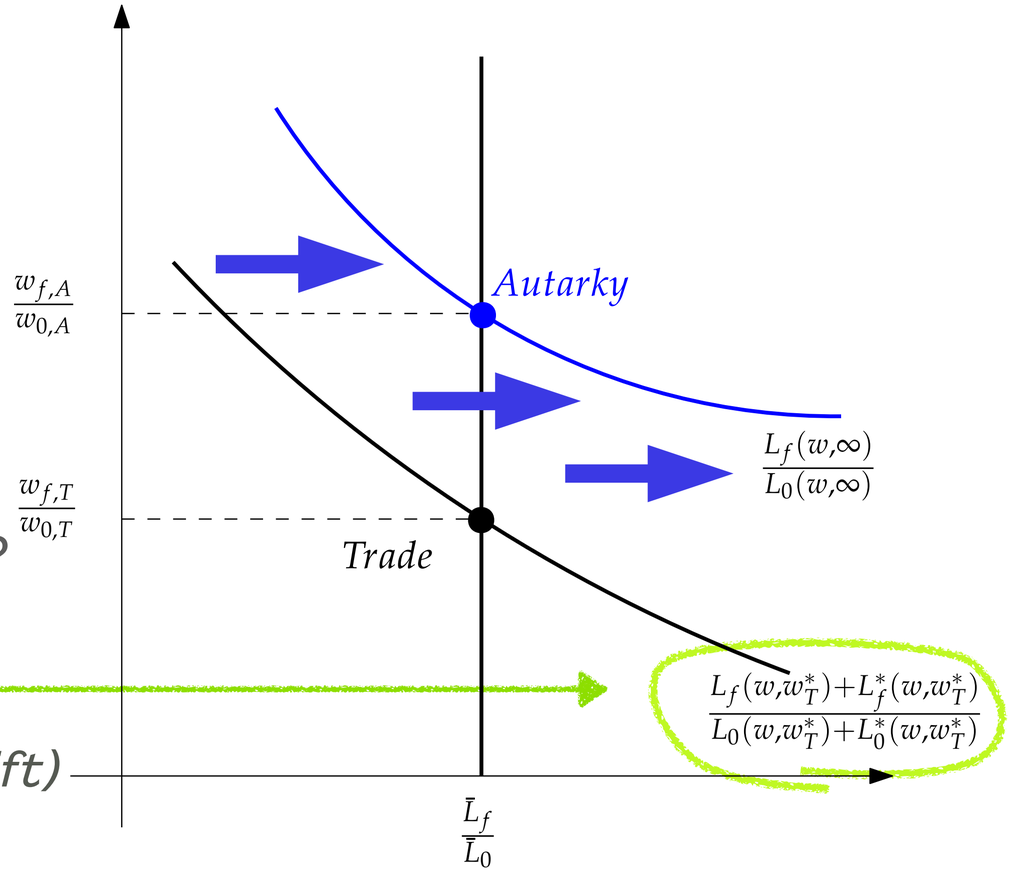

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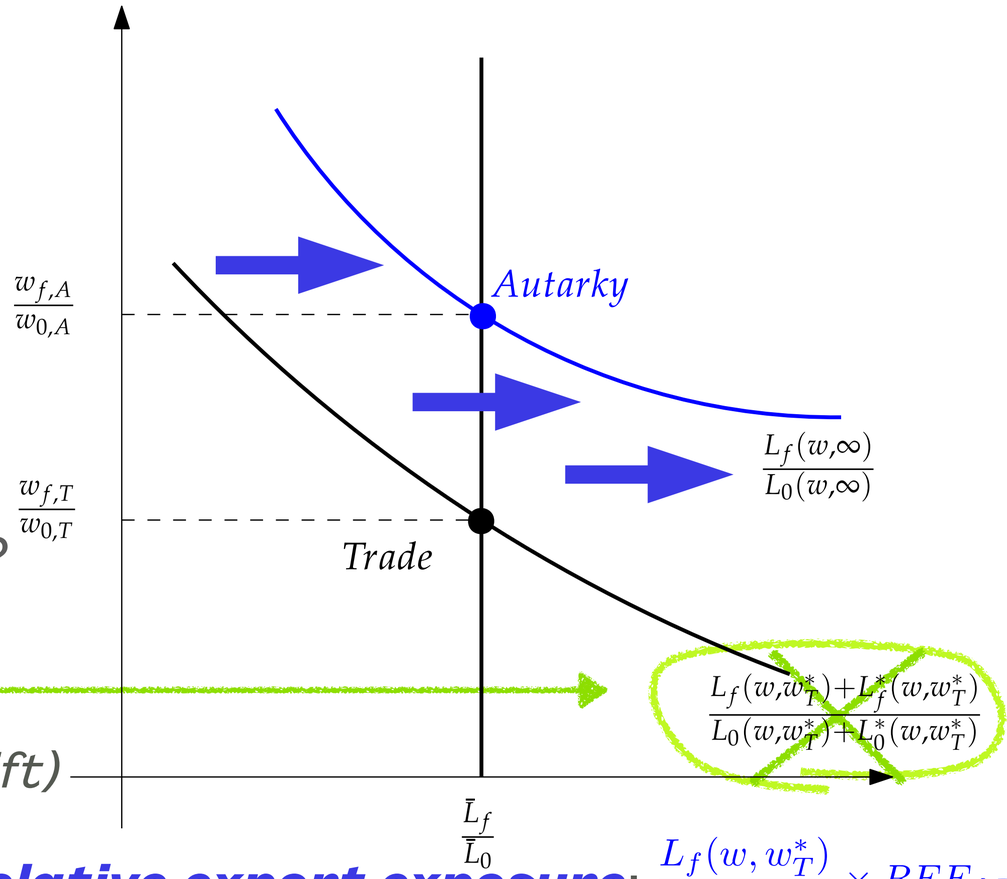

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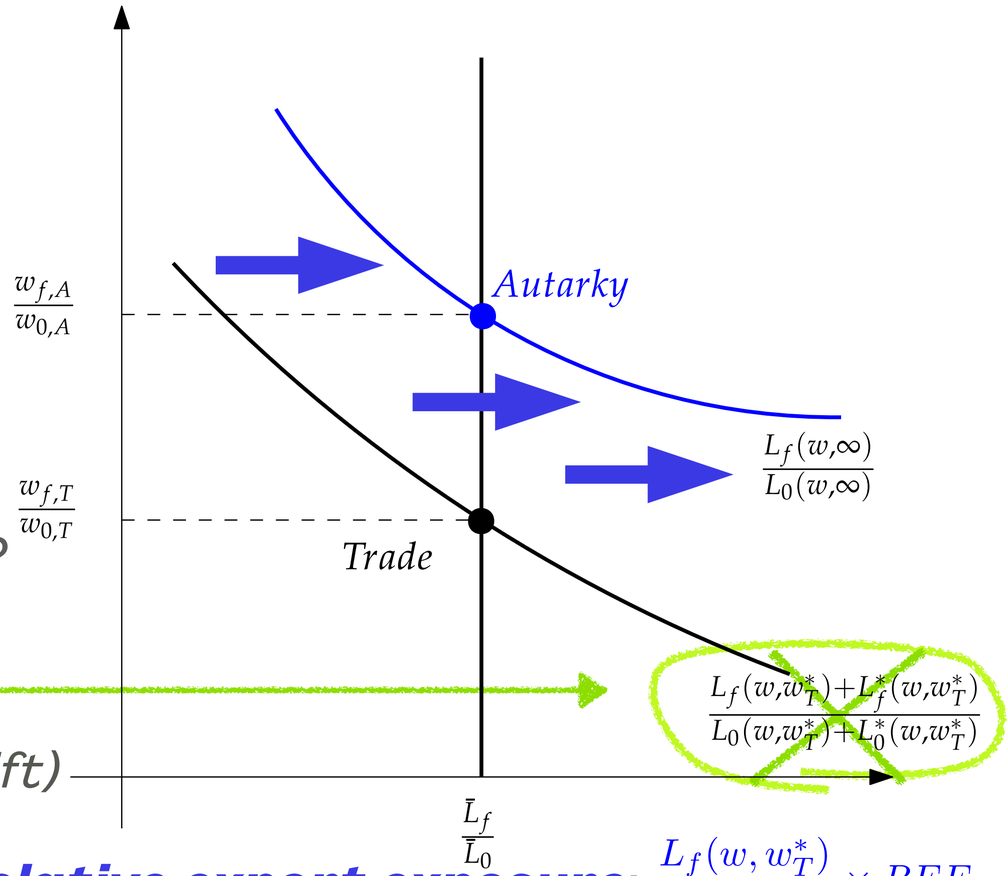

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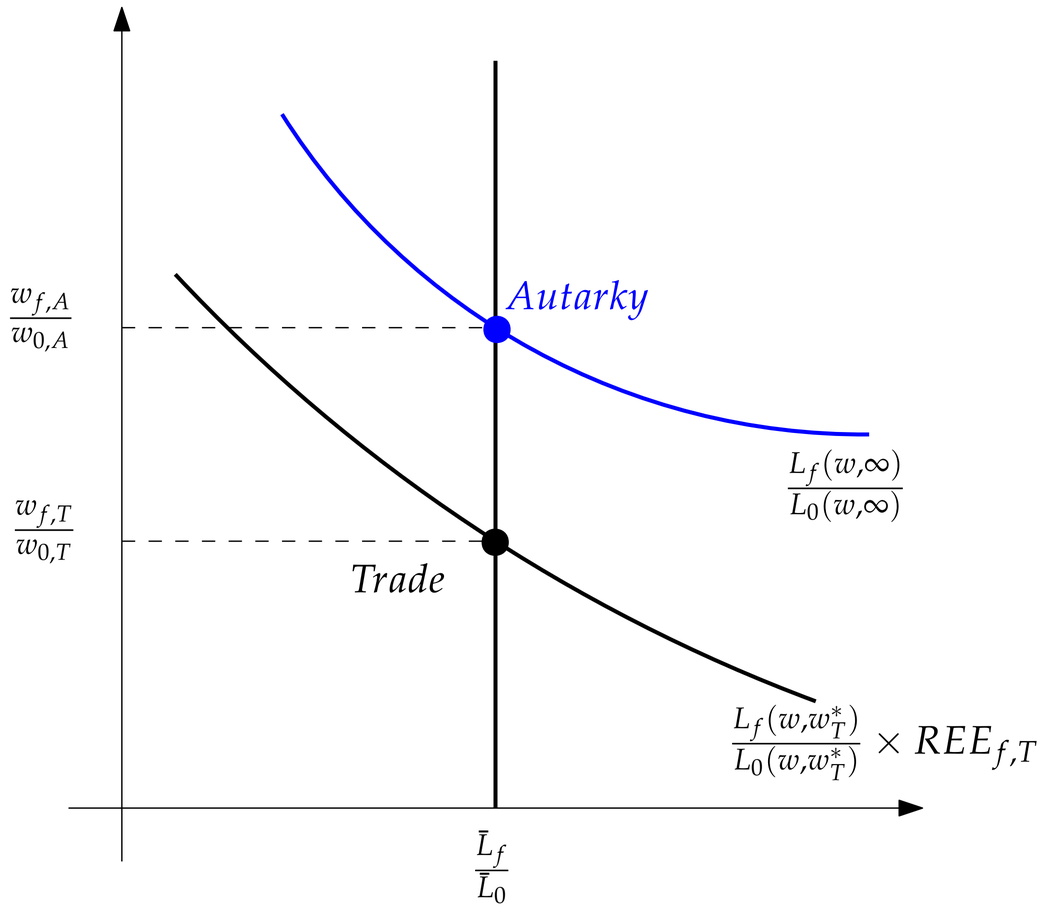

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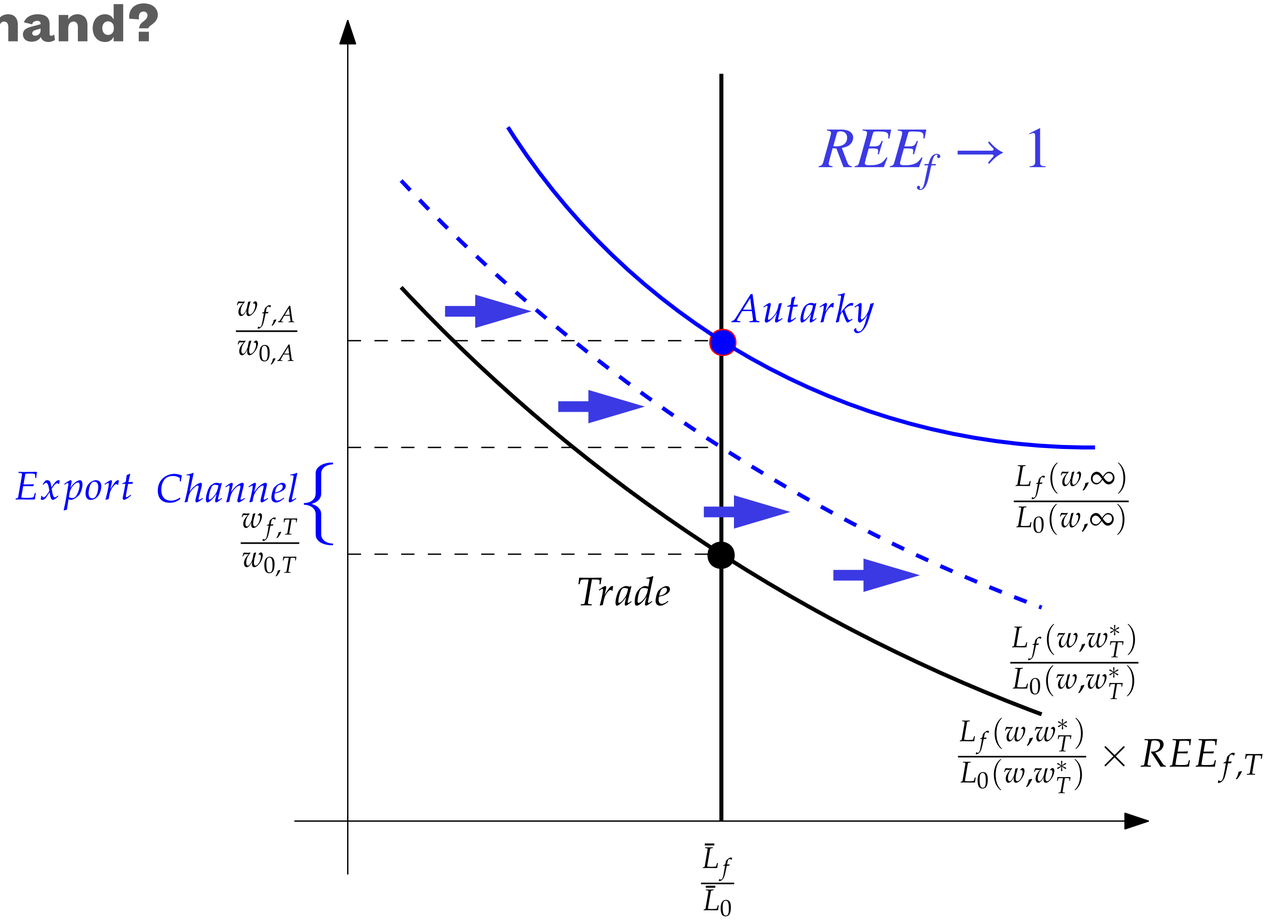

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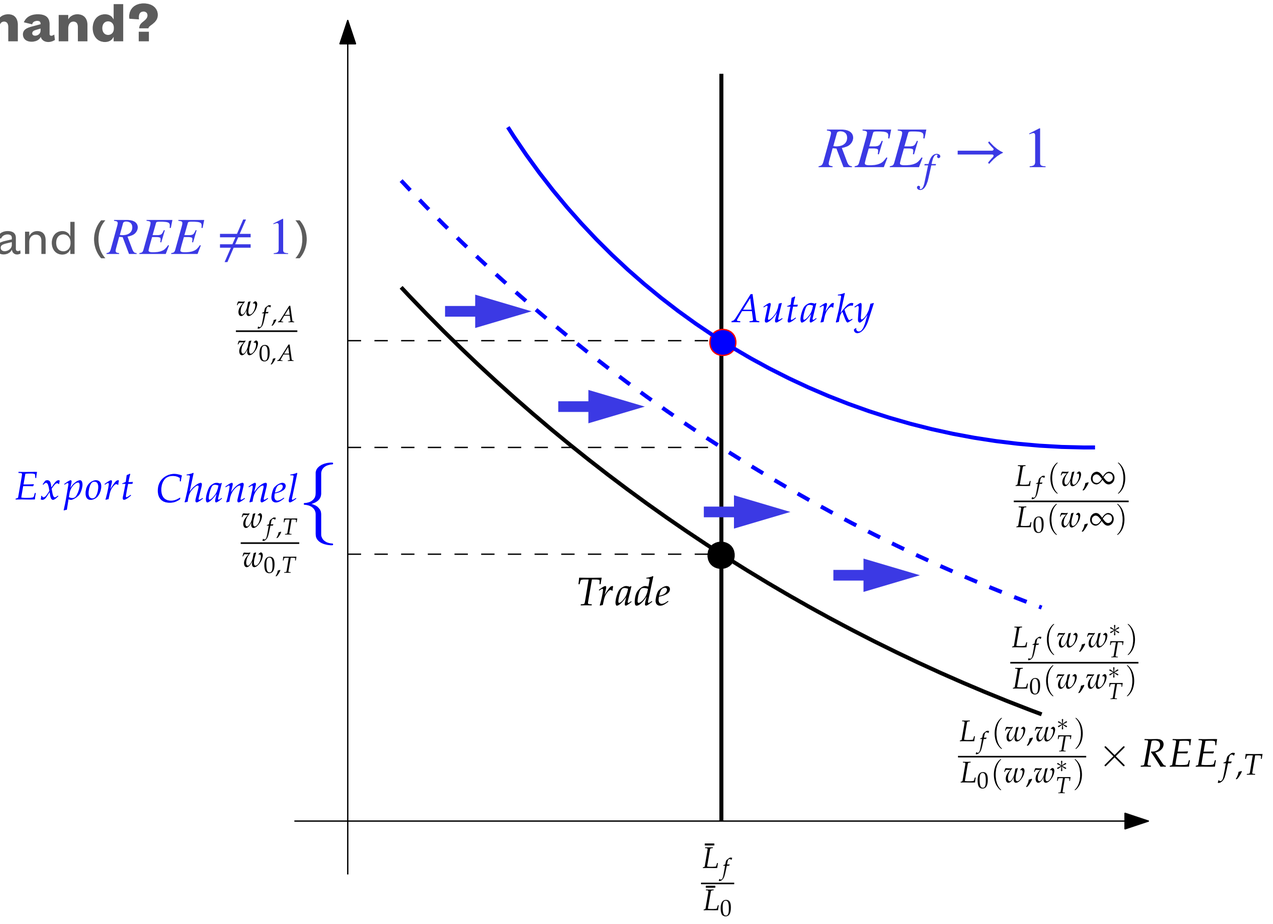

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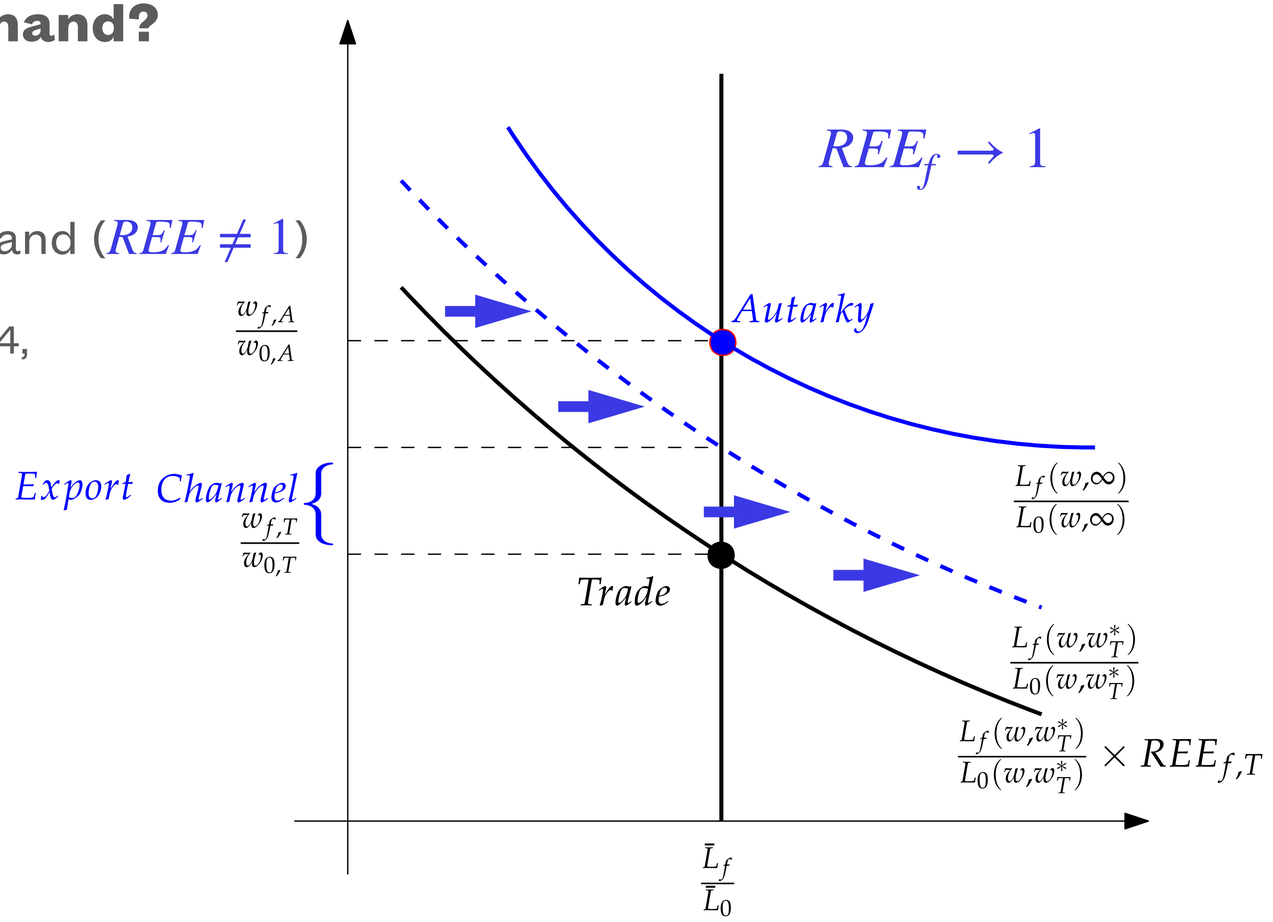

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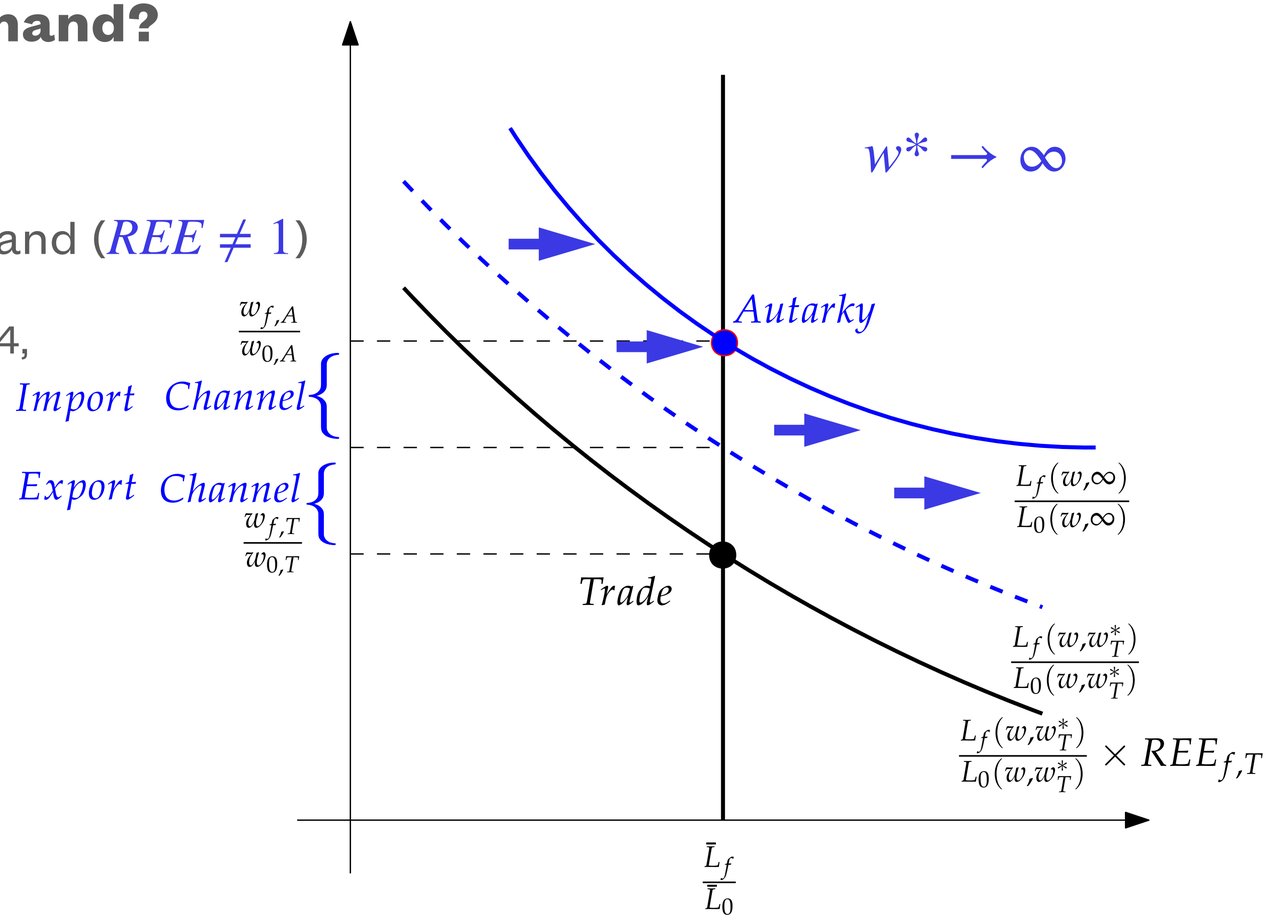

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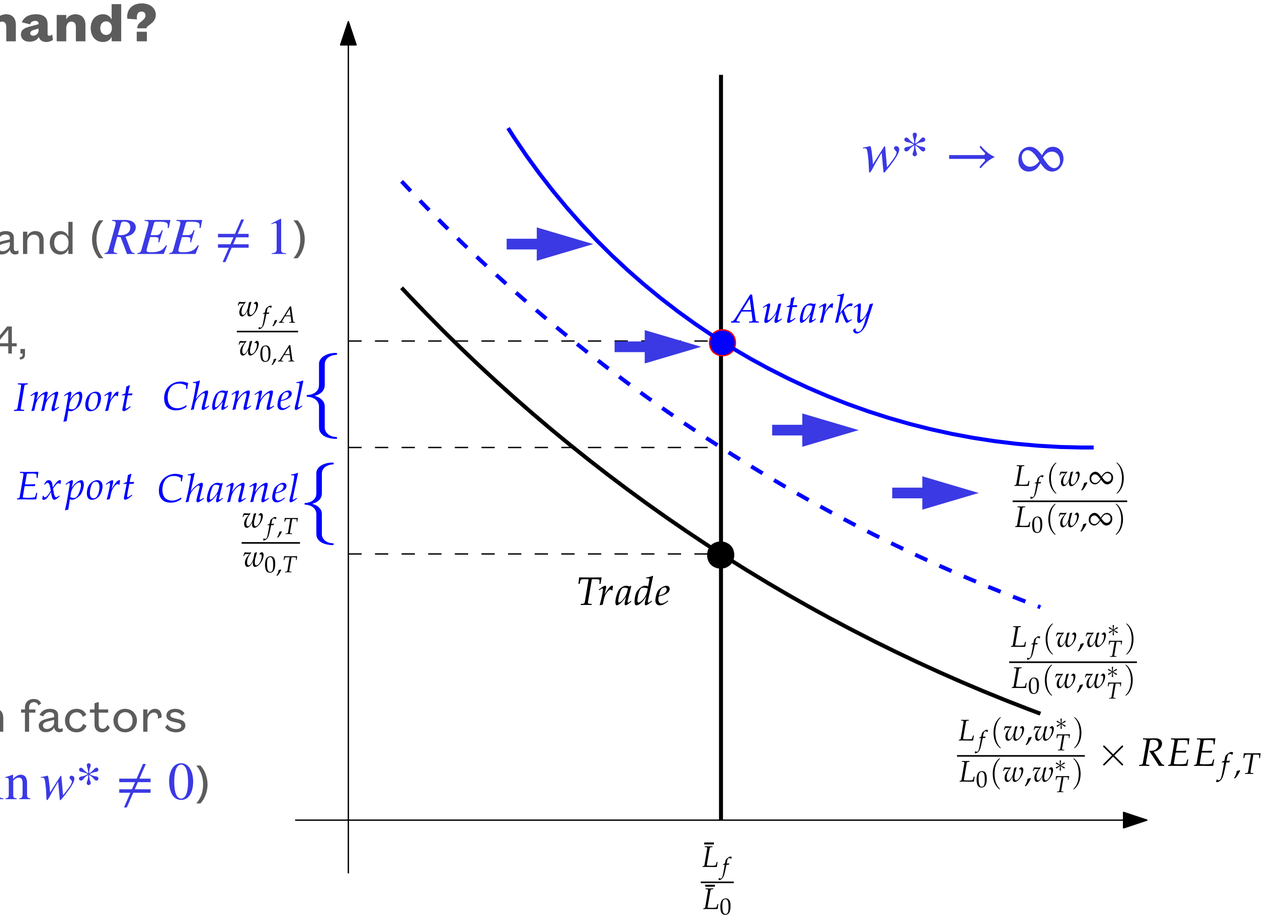

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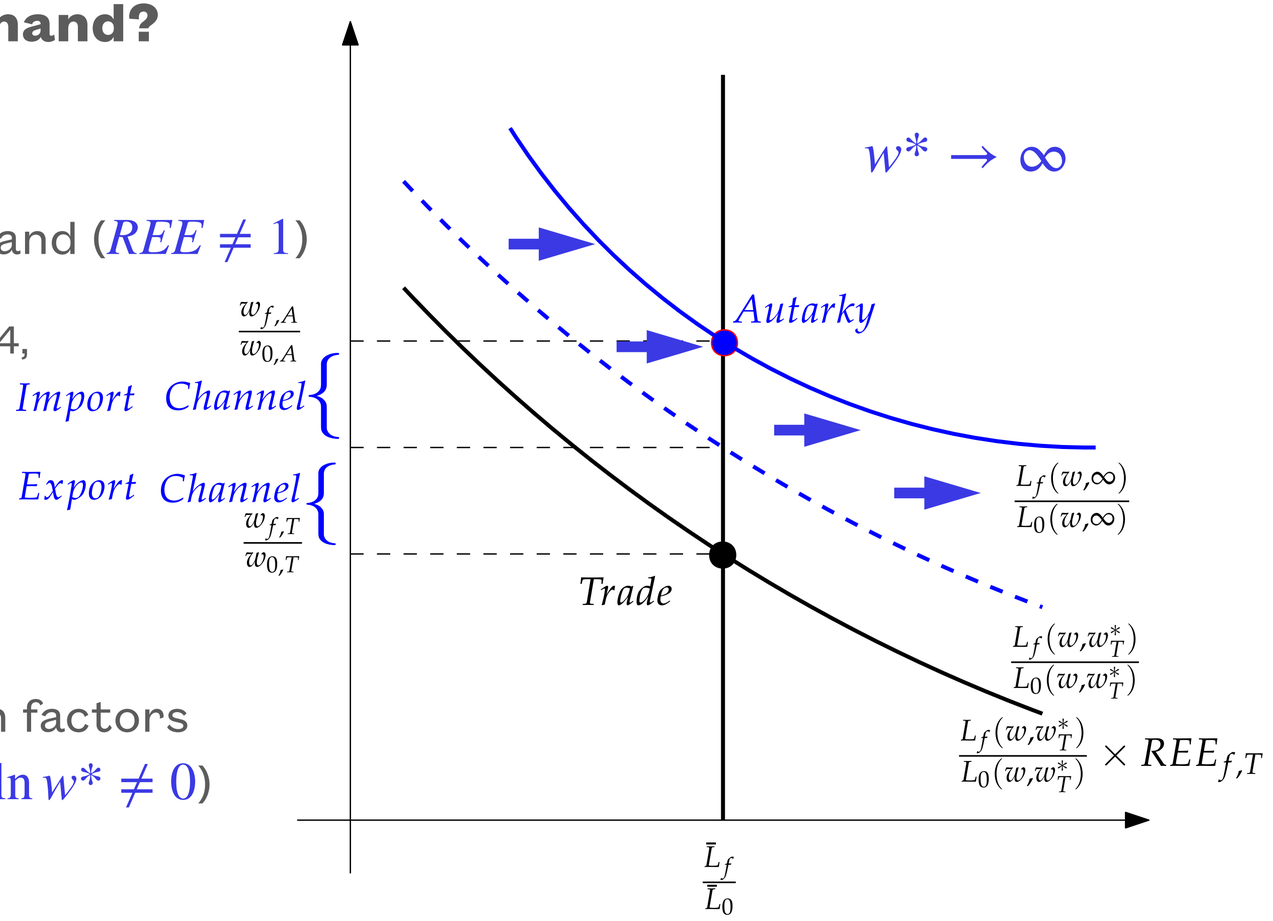

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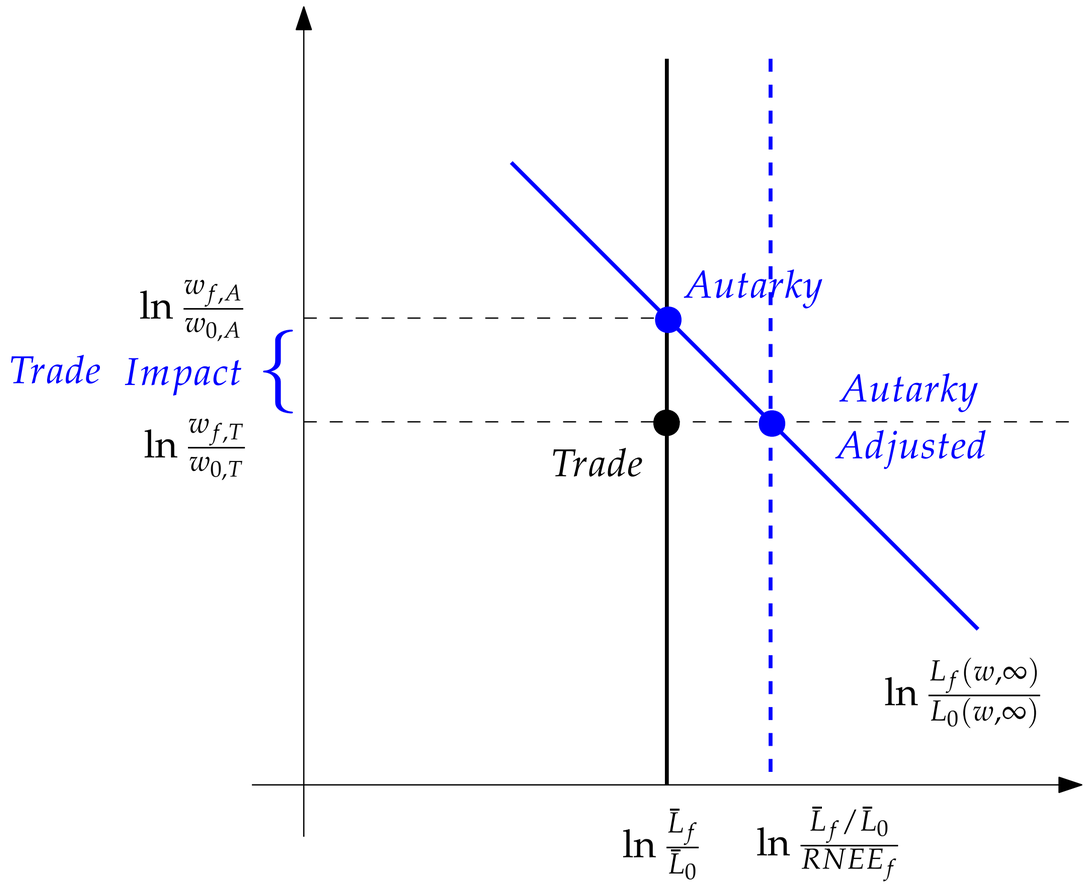

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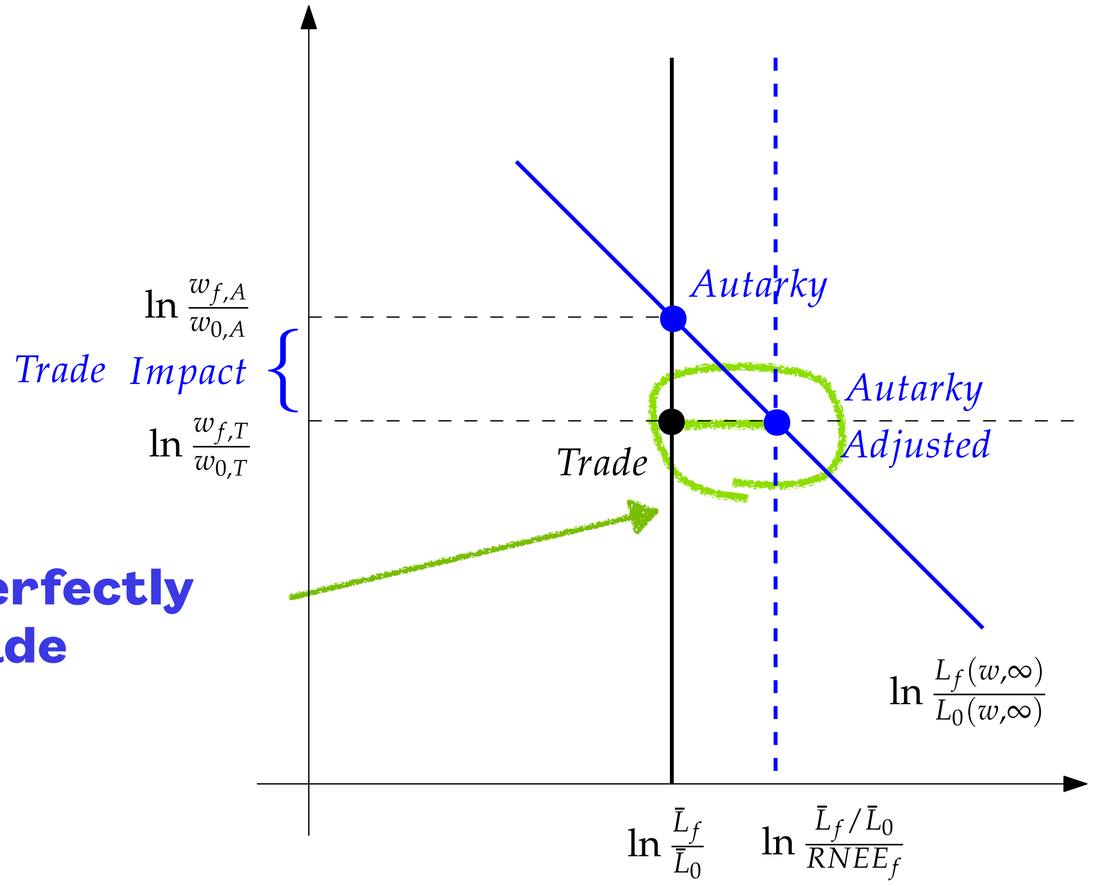

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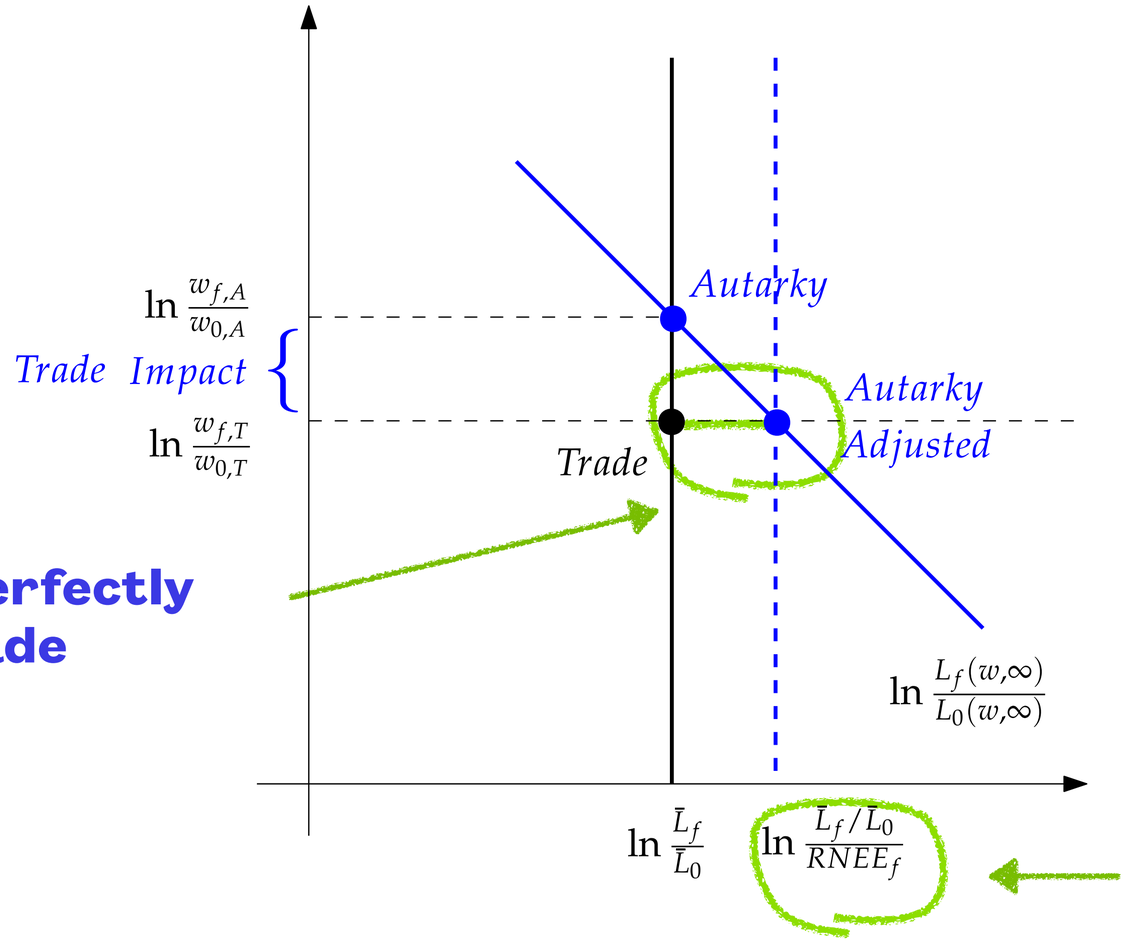

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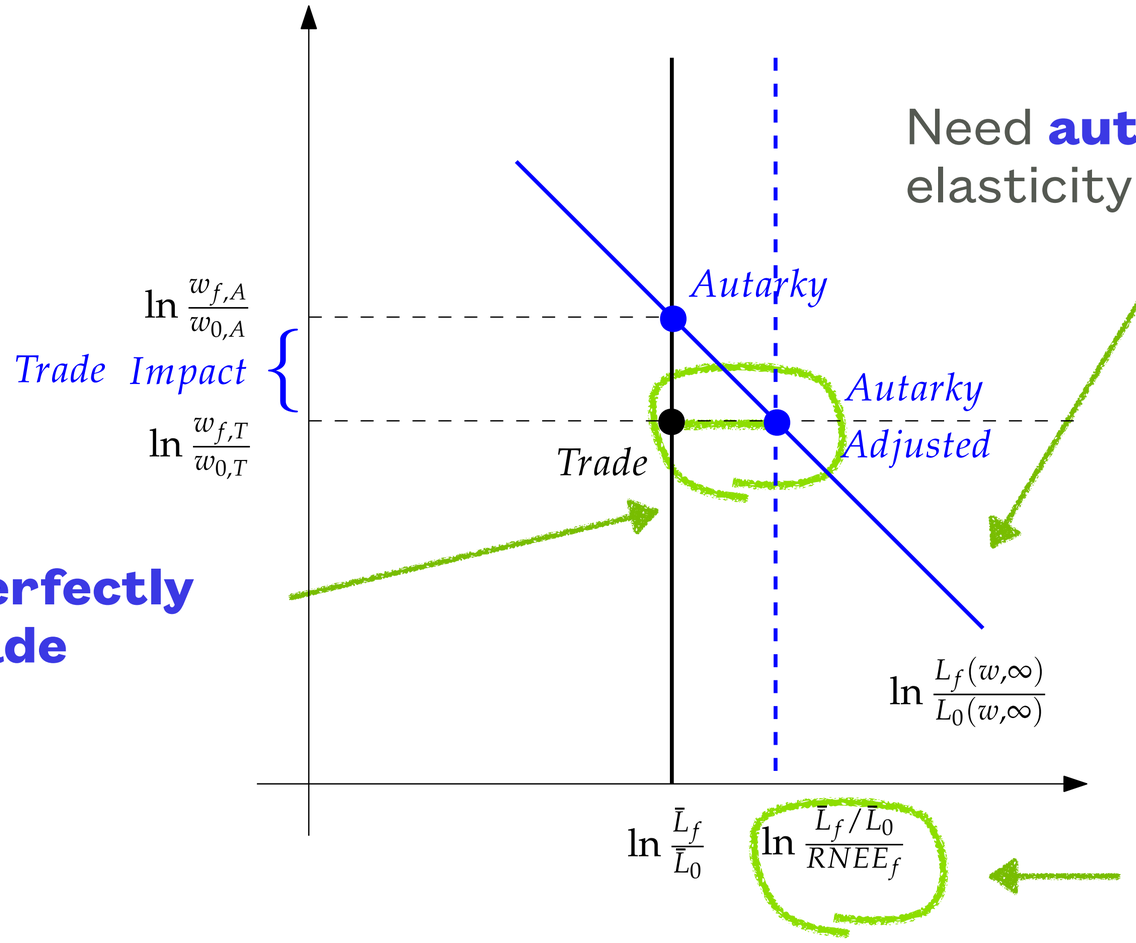

Need **autarky elasticity**: not the elasticity under trade

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Parametric Model of Domestic Factor Demand

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- **Assumptions:**
  - Nested CES preferences: CES between firms within sectors (σ) + Cobb-Douglas between sectors
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- **Export Exposure (EE_f):**

$$\{EE_f\} = \frac{(\text{Matrix Factor shares}) \times (\text{Leontief Inverse}) \times (\text{Vector of Gross Exports})}{\text{Total Factor Earnings}}$$

  - Granular version of Leontief's factor content of exports (definition of factor + IO matrix)
  - Model does not restrict ***levels*** of firm demand and supply → EE_f ***unrestricted***
  - Higher EE_f → Higher relative factor demand → Higher relative price under trade

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$$\frac{\partial \ln RD_f}{\partial \ln w^*} = (\sigma - 1)(IE_f^C - IE_0^C) + (\varepsilon - 1)(IE_f^L - IE_0^L)$$

  - IE_f^C measures **consumer expenditure switching** in response to cheaper foreign factors (***data!***)
    - If no intermediates → IE_f^C = Average import share across sectors, weighted by factor f's share of domestic demand in each sector
    - If $\sigma > 1$, higher IE_f^C → Lower relative factor demand → Lower relative price under trade

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  - IE_f^L measures **firm expenditure switching** in response to cheaper foreign factors (***data!***)
    - If no intermediates → $IE_f^L = 0$
    - If $\varepsilon > 1$, higher IE_f^L → Lower relative factor demand → Lower relative price under trade

Measurement

Administrative Microdata in Ecuador (2008-2015)

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Firms

- **Corporate Income Tax**
  - Firm revenues, costs, profits
- **VAT (matched firm-to-firm data)**
  - Transactions between all formal firms
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  - Share of each private firm owned by each taxpayer
  - Profits of firms = return on “capital” (self-employed treated as labor)

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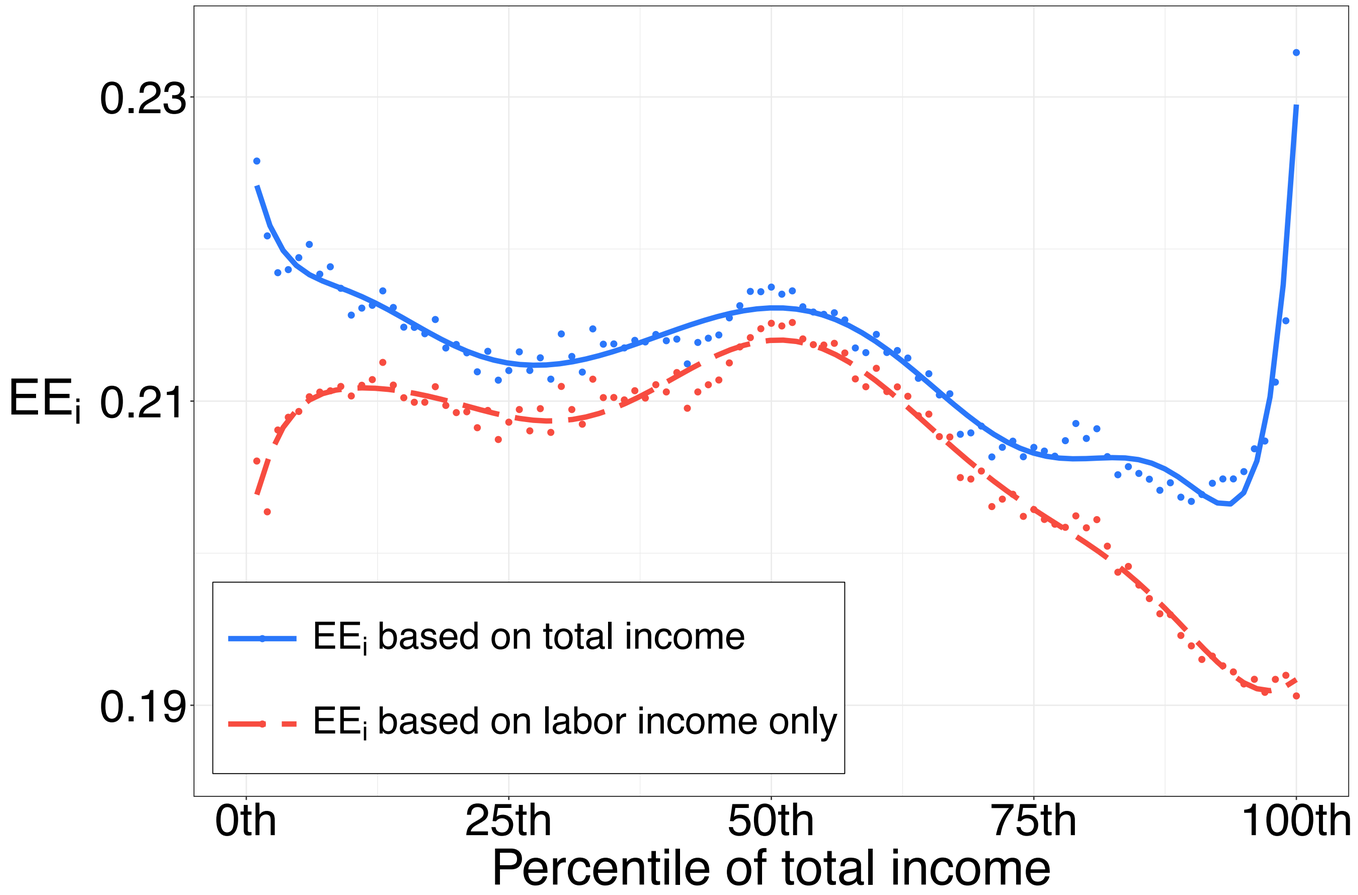
Factors = 73 Labor groups (24 Province x 3 Education + others) + 1 Capital

Export Exposure (EE_i) Across Income Distribution



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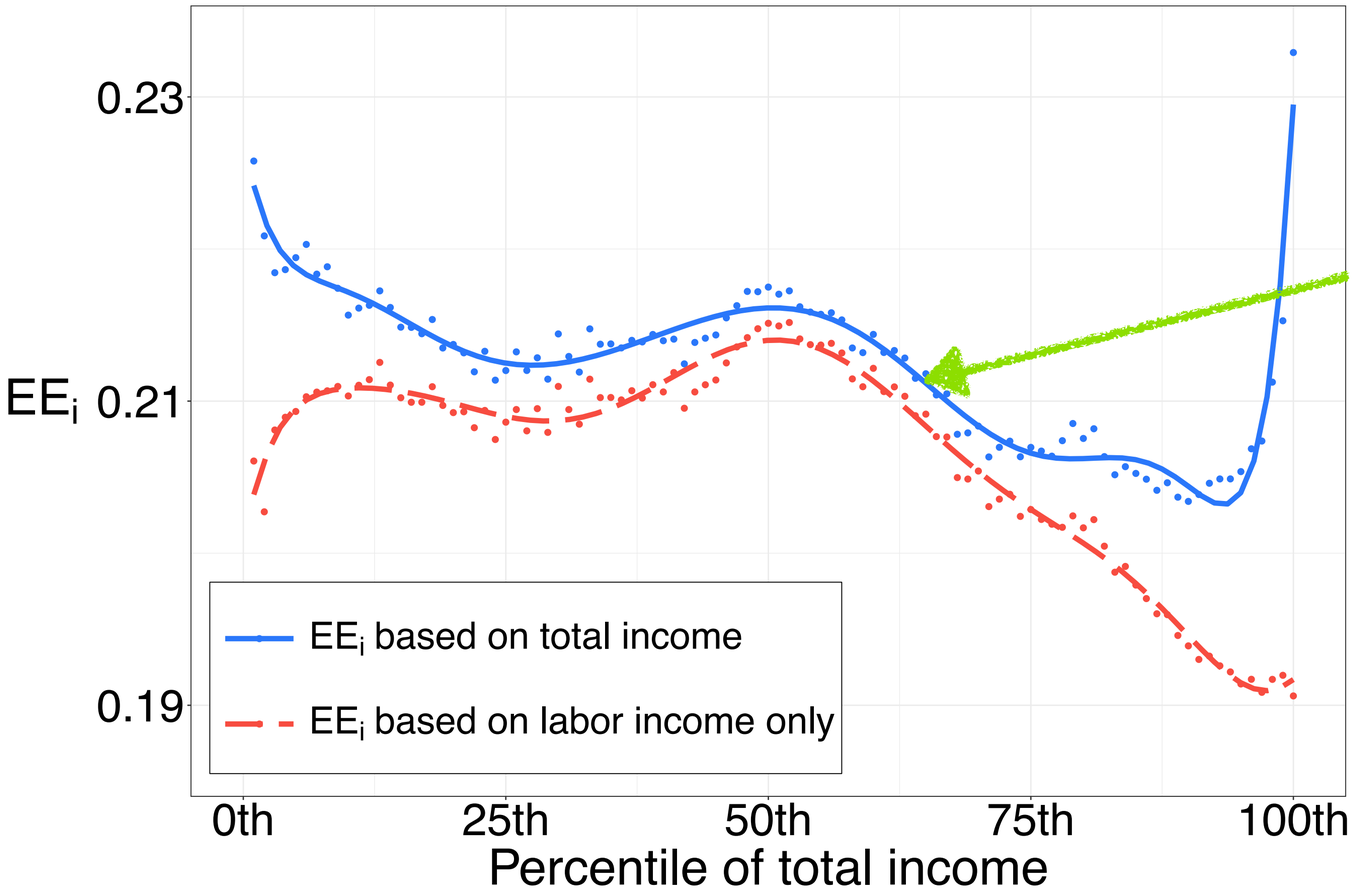

Inverted U-shape for workers...

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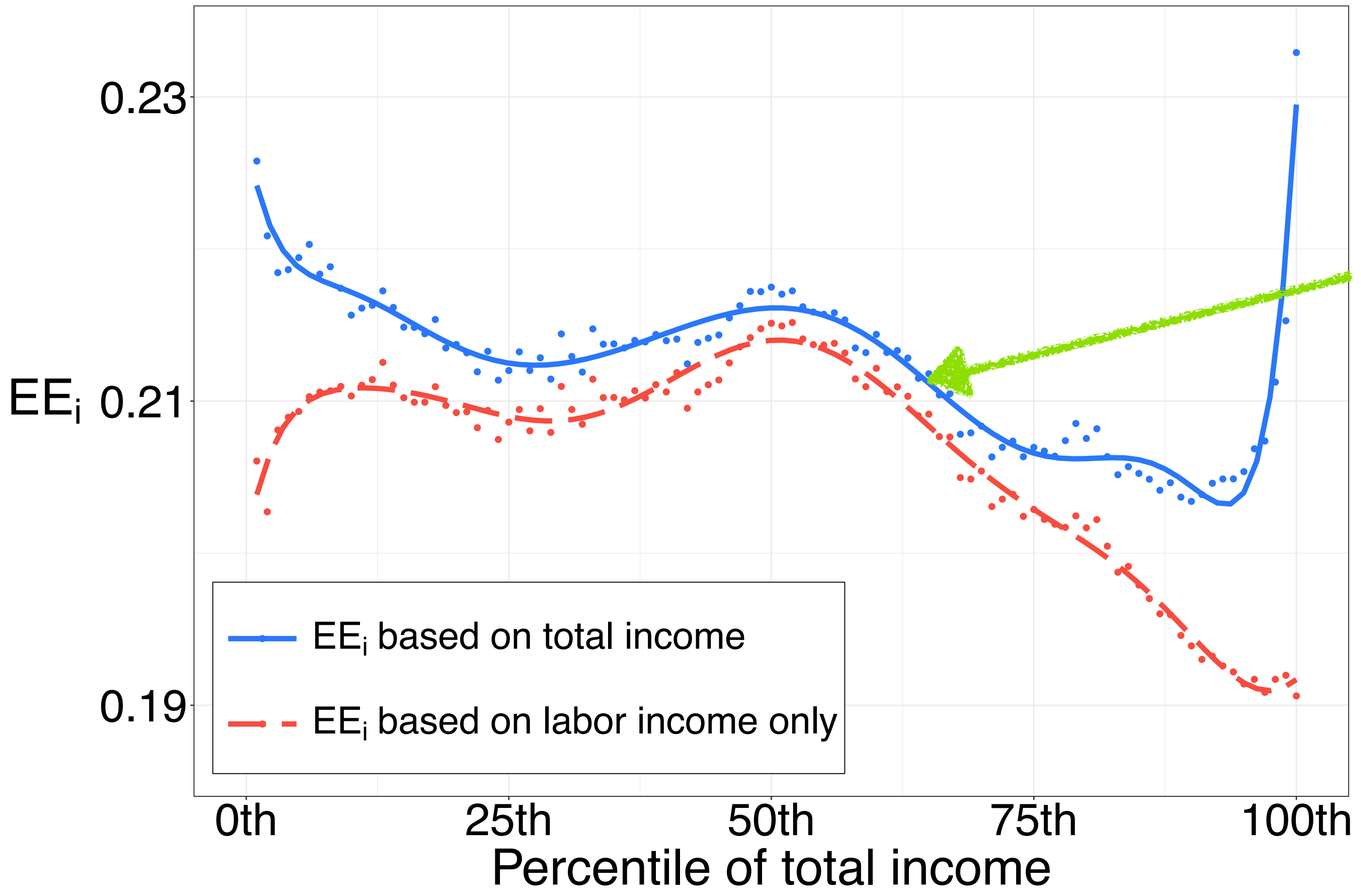

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...but capitalists highly exposed as well

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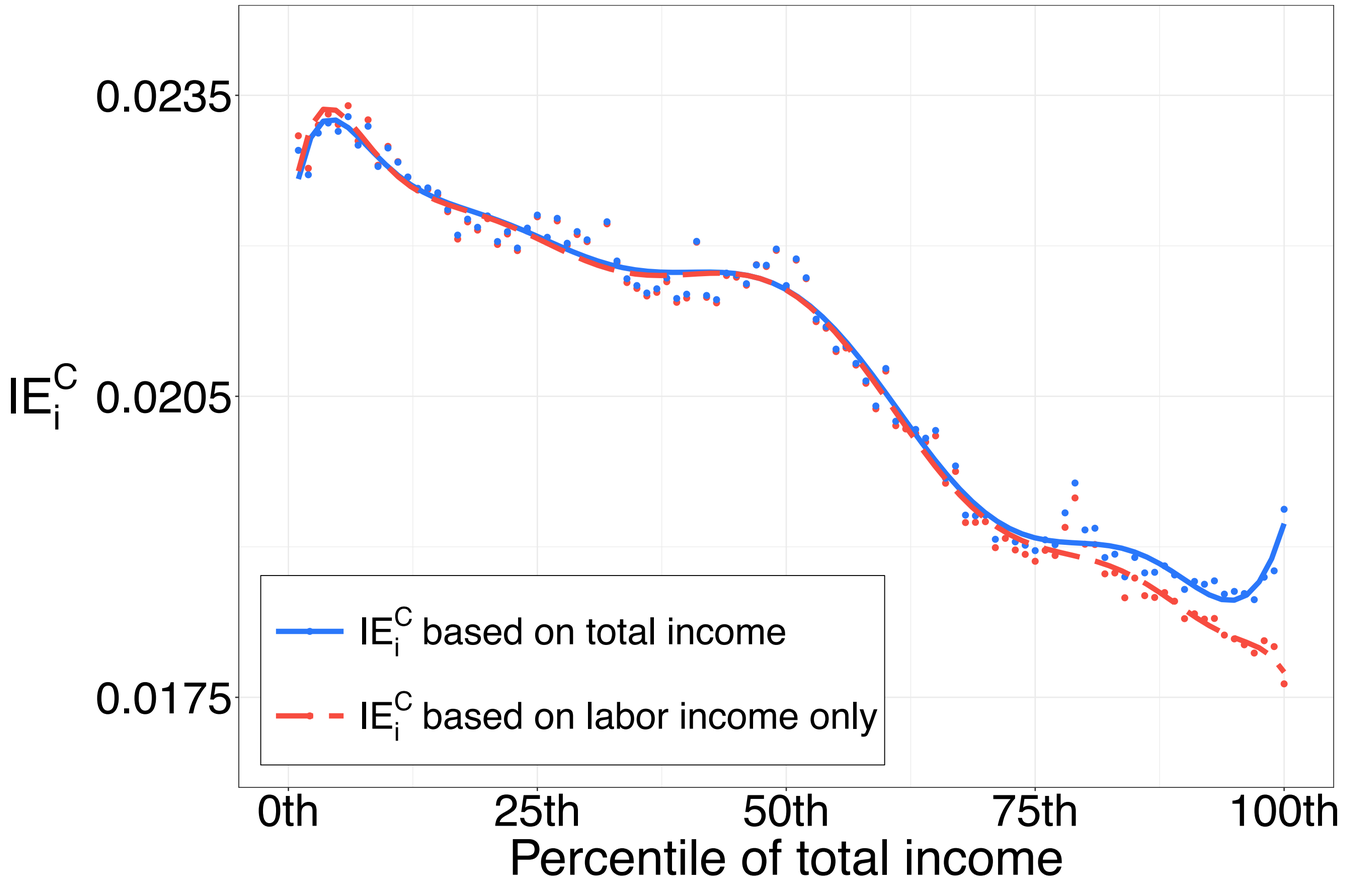

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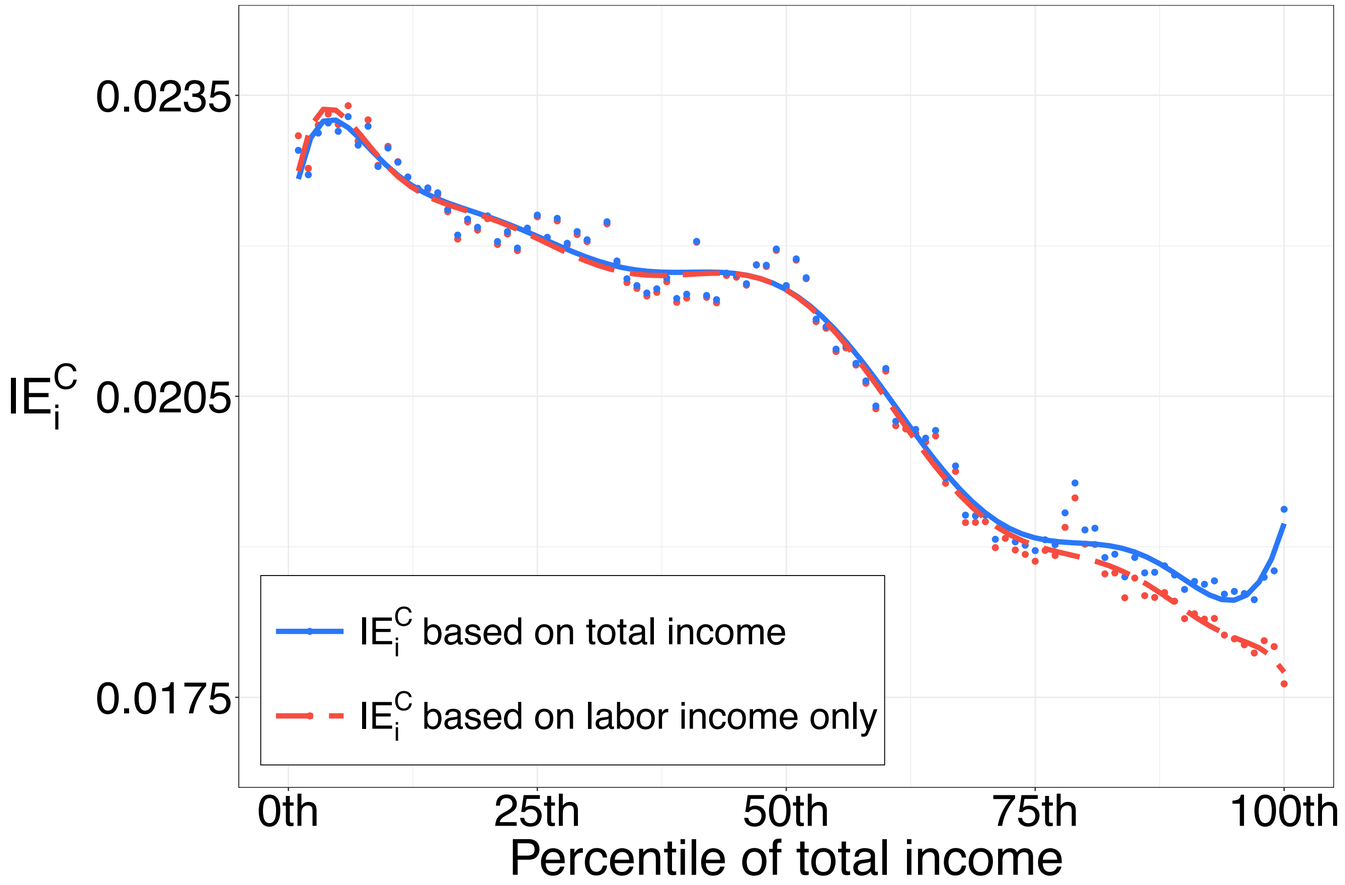
Pro-rich through most of the income distribution…



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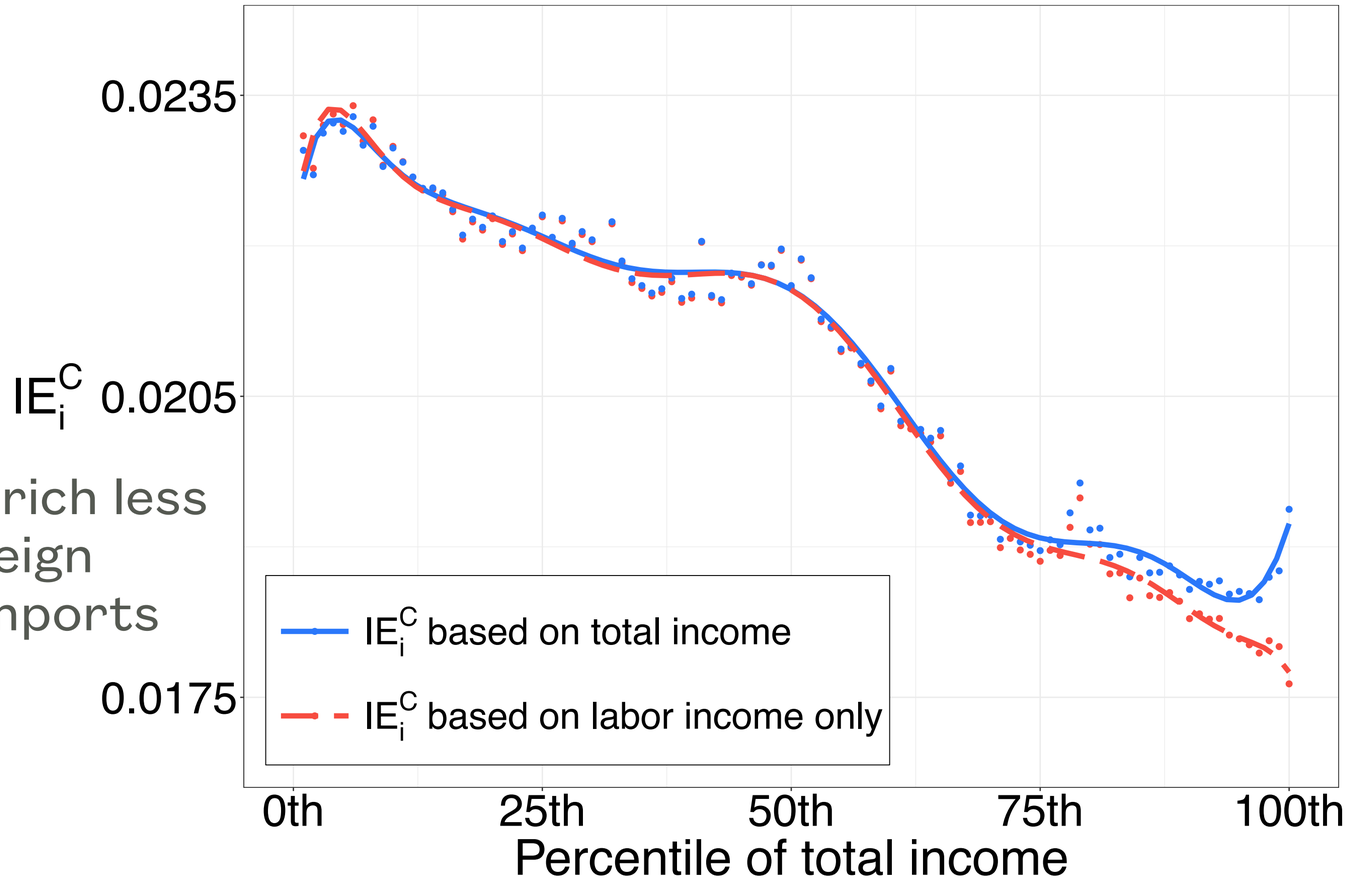

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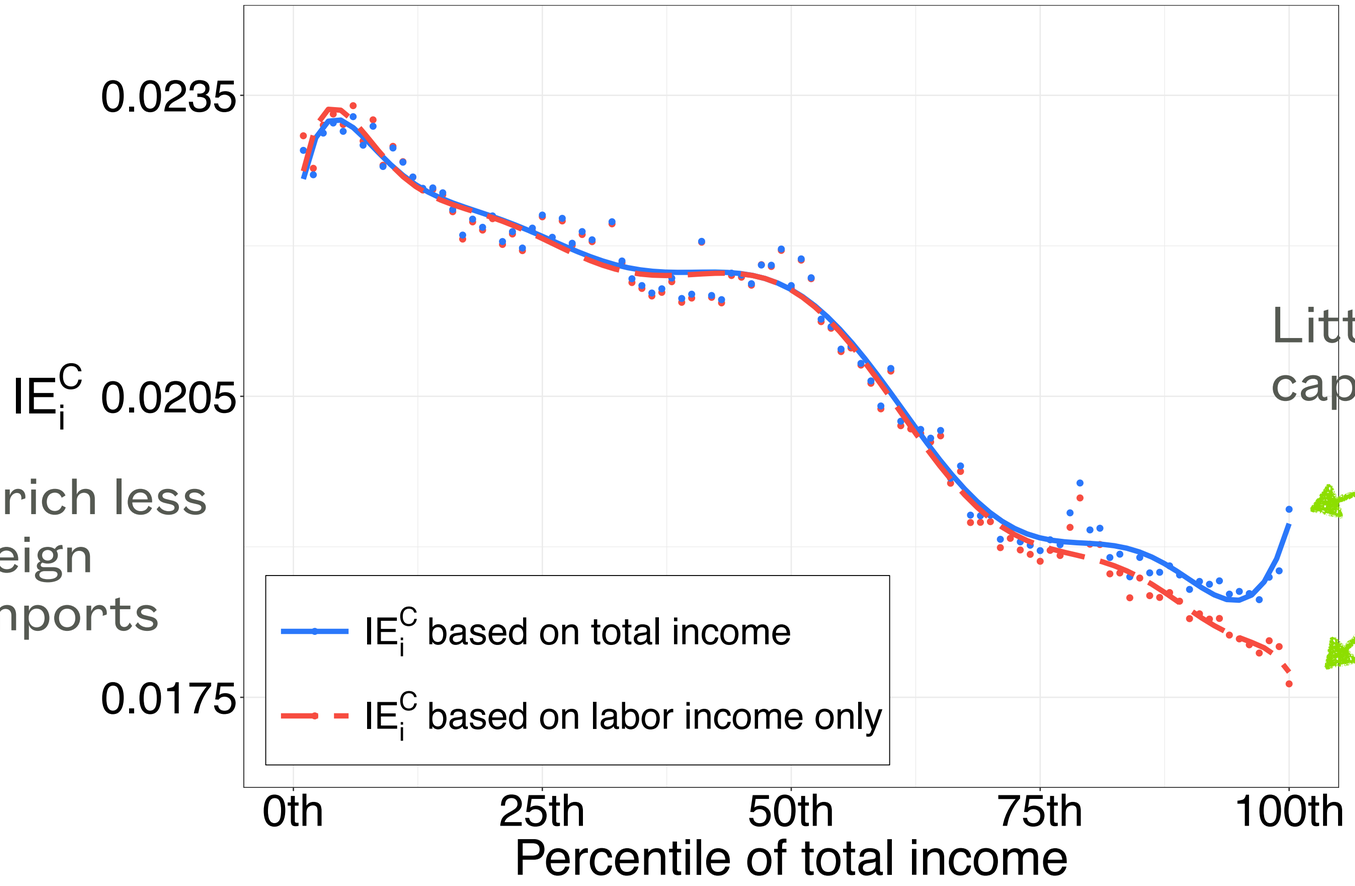

Little difference between capital and labor

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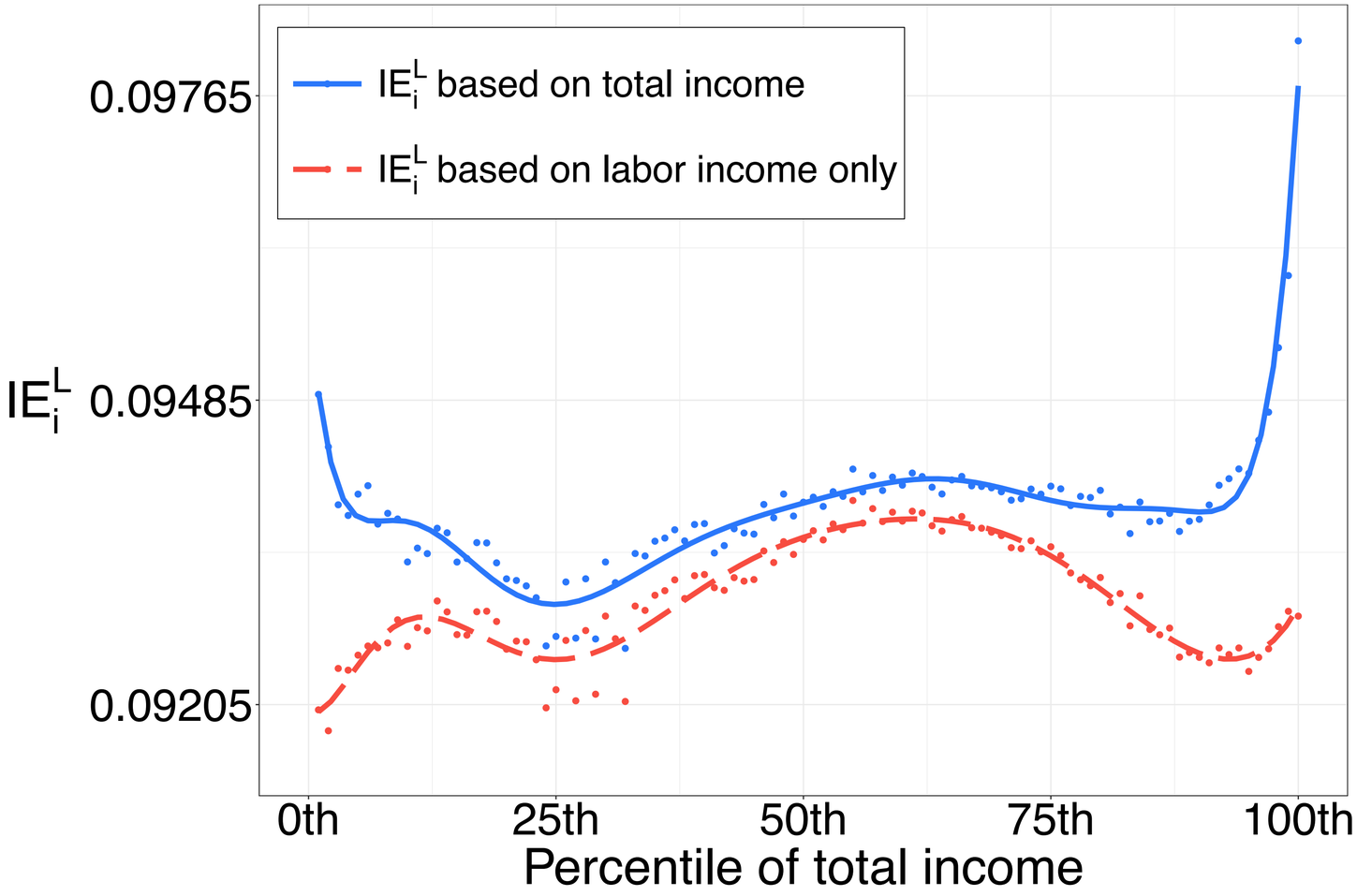

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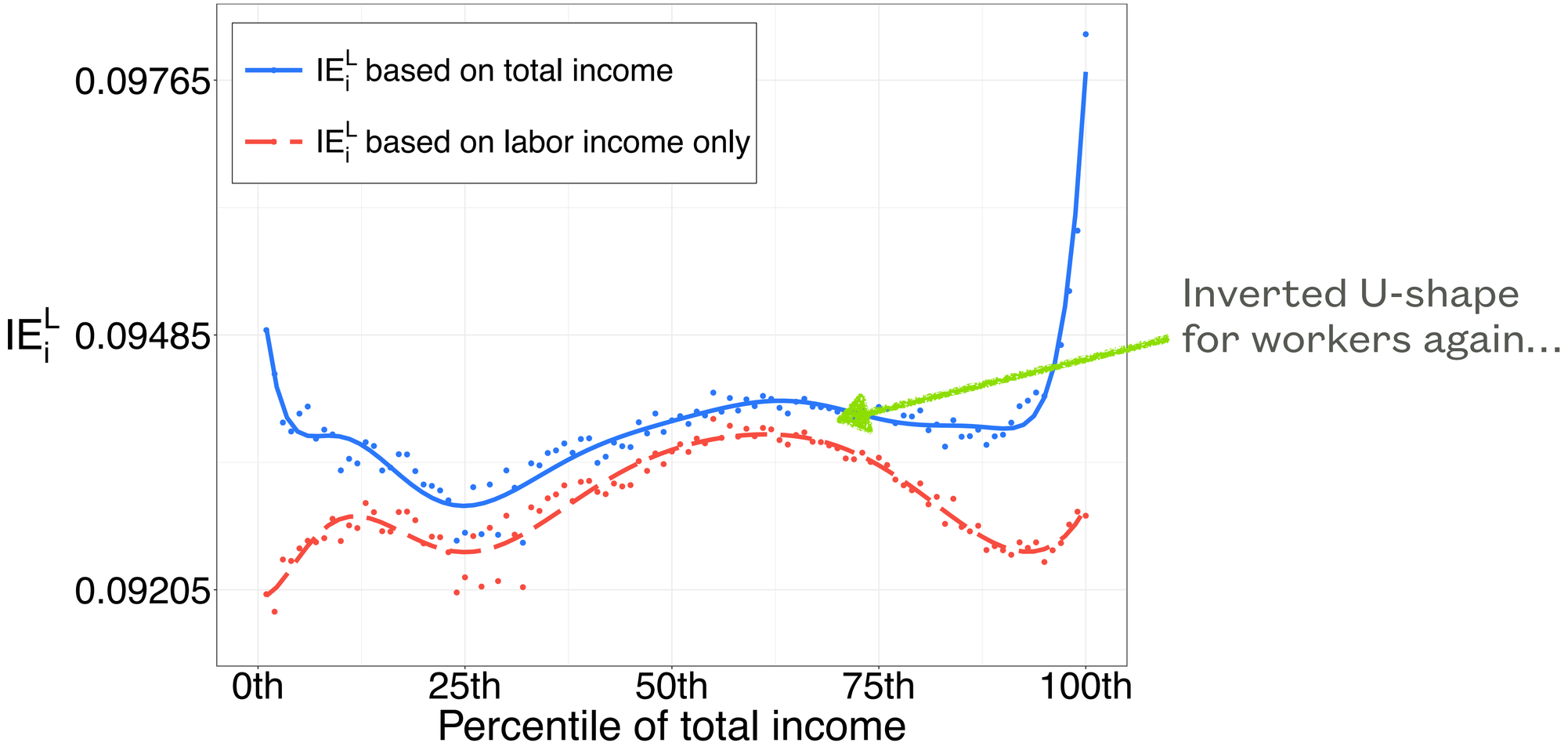

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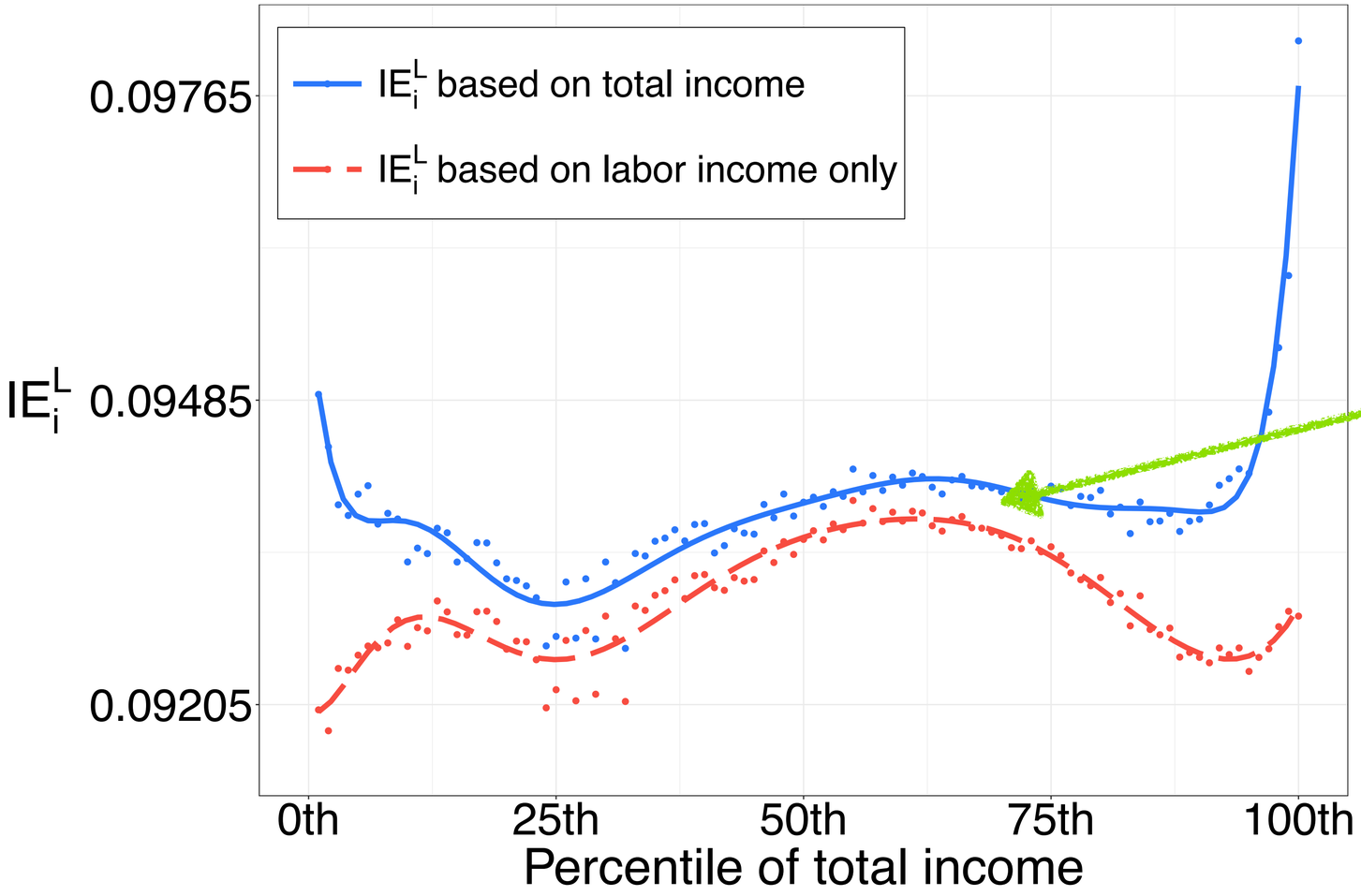

Inverted U-shape for workers again…

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Estimation

Ecuador’s Factor Demand System

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- **3 micro-elasticities:** η, ε, and σ
  - Standard nested CES demand estimation using firm-level micro-data
  - Generic example ("factor/good" j, "firm/consumer" m, time t):

$$\ln(\textbf{expenditure})_{jm,t} = (1-\epsilon) \times \ln(\textbf{price})_{jm,t} + (\textbf{fixed effect})_{m,t} + (\textbf{demand residual})_{jm,t}$$

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- **OLS biased** (simultaneity) → **IV**
  - Shift-share variation based on **foreign demand/supply shocks** (CEPII BACI data)
  - Control for (sum of shares)x(time fixed effect) (Borusyak-Hull-Jaravel '19)

Elasticity of substitution between...	Para-meter	Estimate (SE)	Expenditure measure	Price measure	IV based on $\sum_v (\textbf{shift})_{v,t} \times (\textbf{share})_{v,t_0}$	Unit of observation (N)	Fixed effects (clustering)	First-stage F-stat

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domestic and foreign intermediates	ε	1.10 (0.19)	firm expenditure on domestic/foreign intermediates	intermediates price (domestic price inferred from factor prices of suppliers)	(foreign price of product) × (firm import of product)	firm-year (7,232)	firm-year (firm)	31.4

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domestic and foreign intermediates	ε	1.10 (0.19)	firm expenditure on domestic/foreign intermediates	intermediates price (domestic price inferred from factor prices of suppliers)	(foreign price of product) × (firm import of product)	firm-year (7,232)	firm-year (firm)	31.4
domestic firms (within-industry)	σ	1.37 (0.18)	consumer expenditure on firm	firm price (as inferred from factor prices of suppliers)	(foreign demand for product) × (firm use of factors that export product)	firm-year (80,216)	industry-year & firm (firm)	13.7

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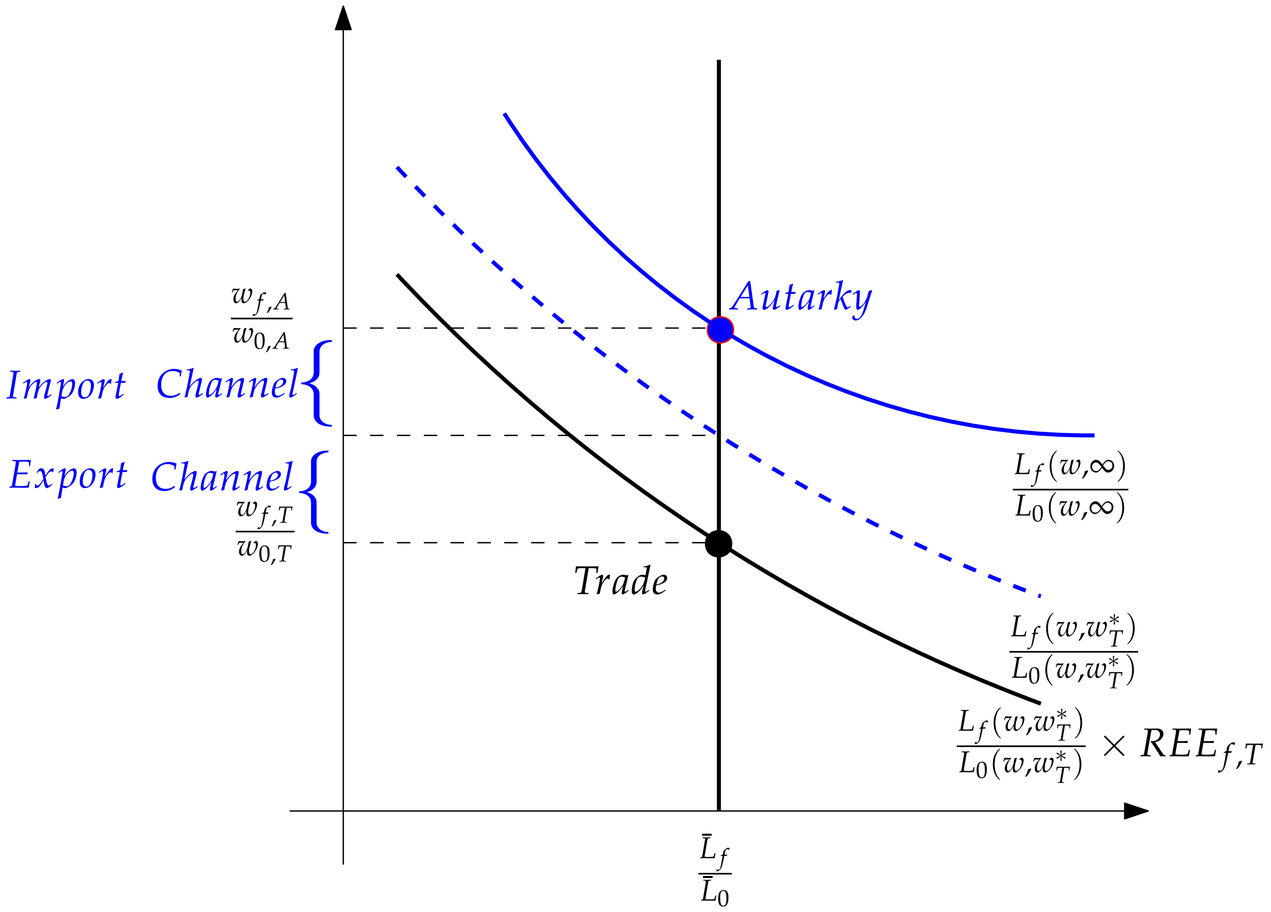
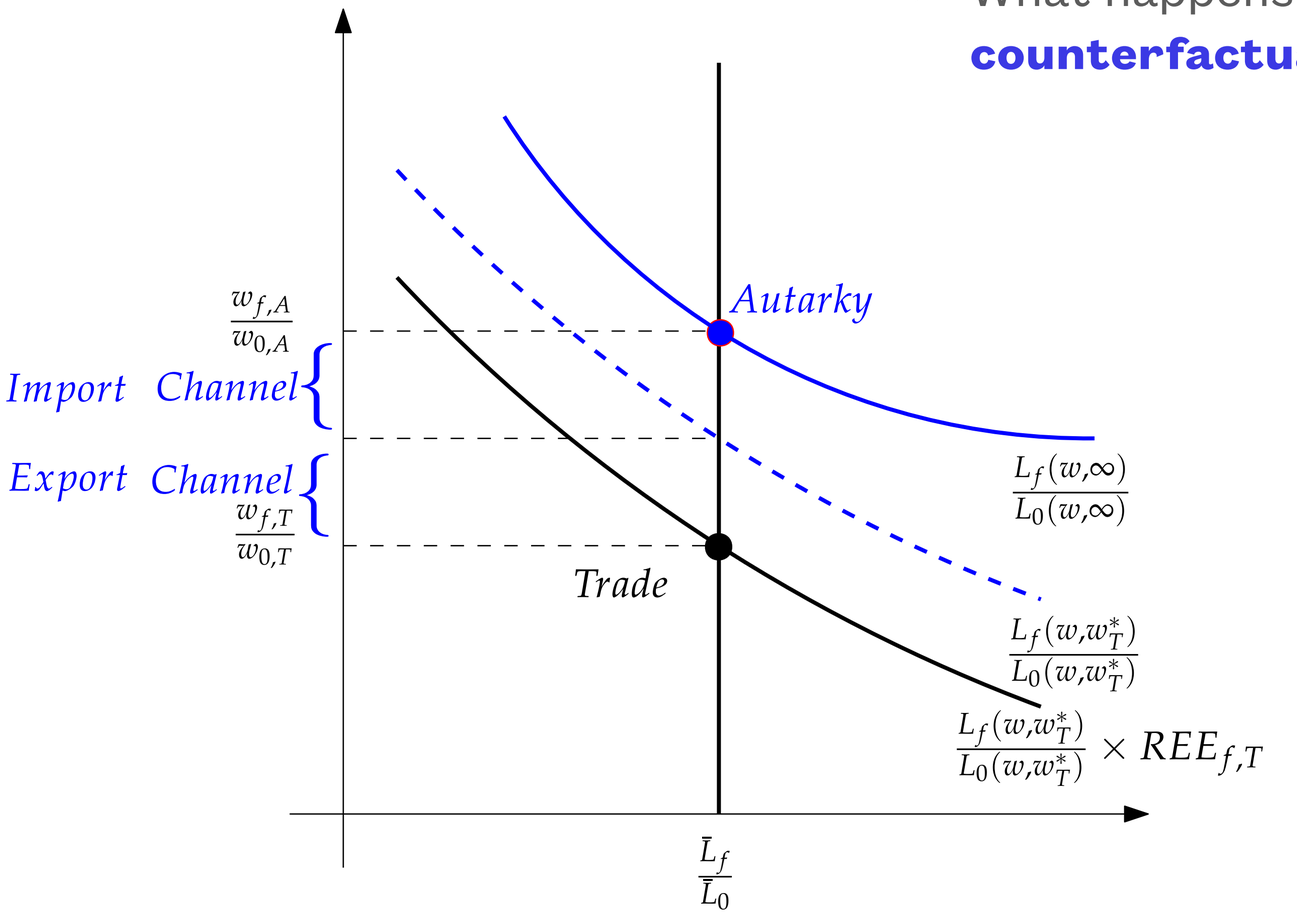
Counterfactuals

Counterfactual Experiment



Counterfactual Experiment



- What happens to factor prices as we go from **counterfactual autarky to trade** equilibrium?

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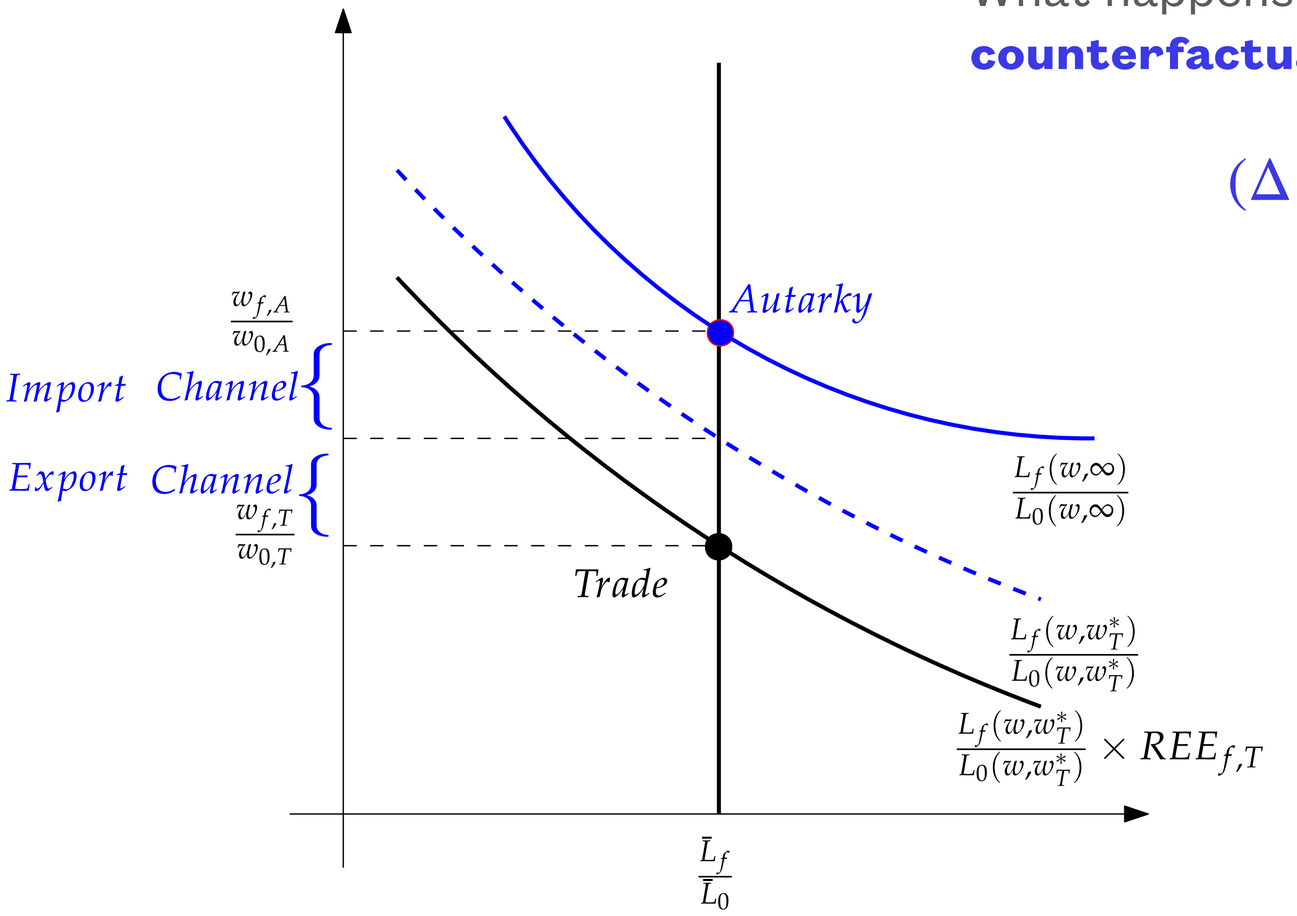

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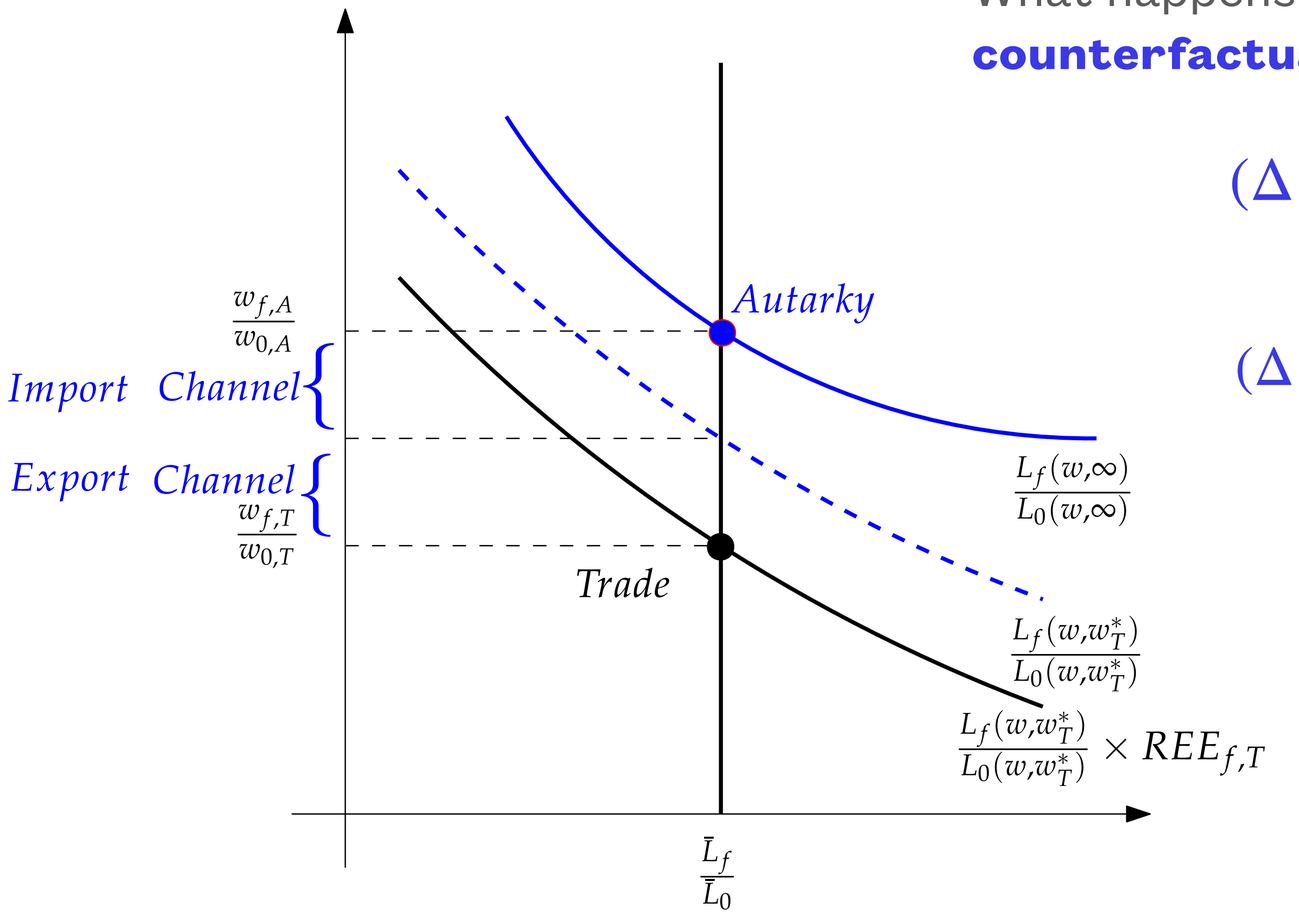

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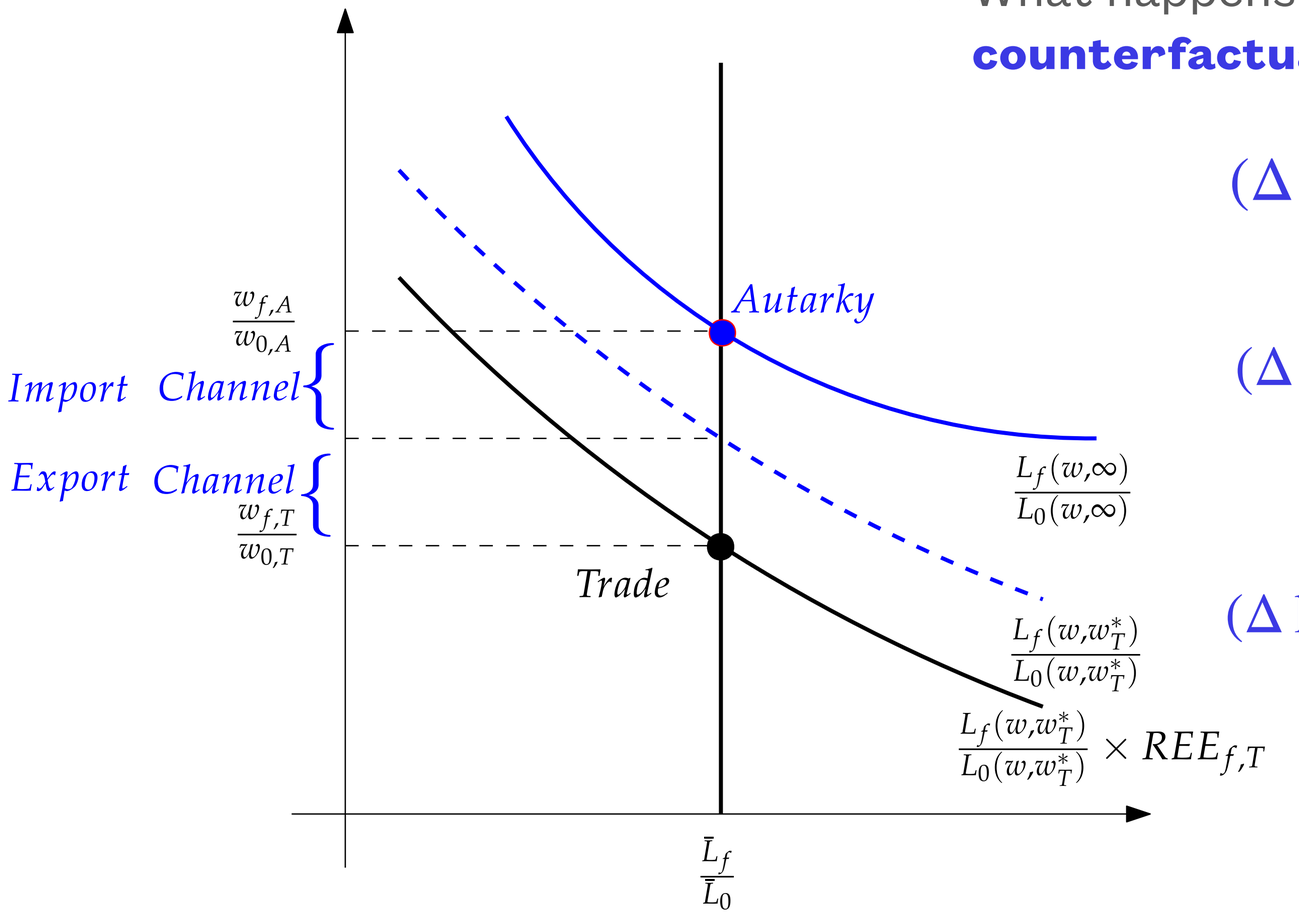

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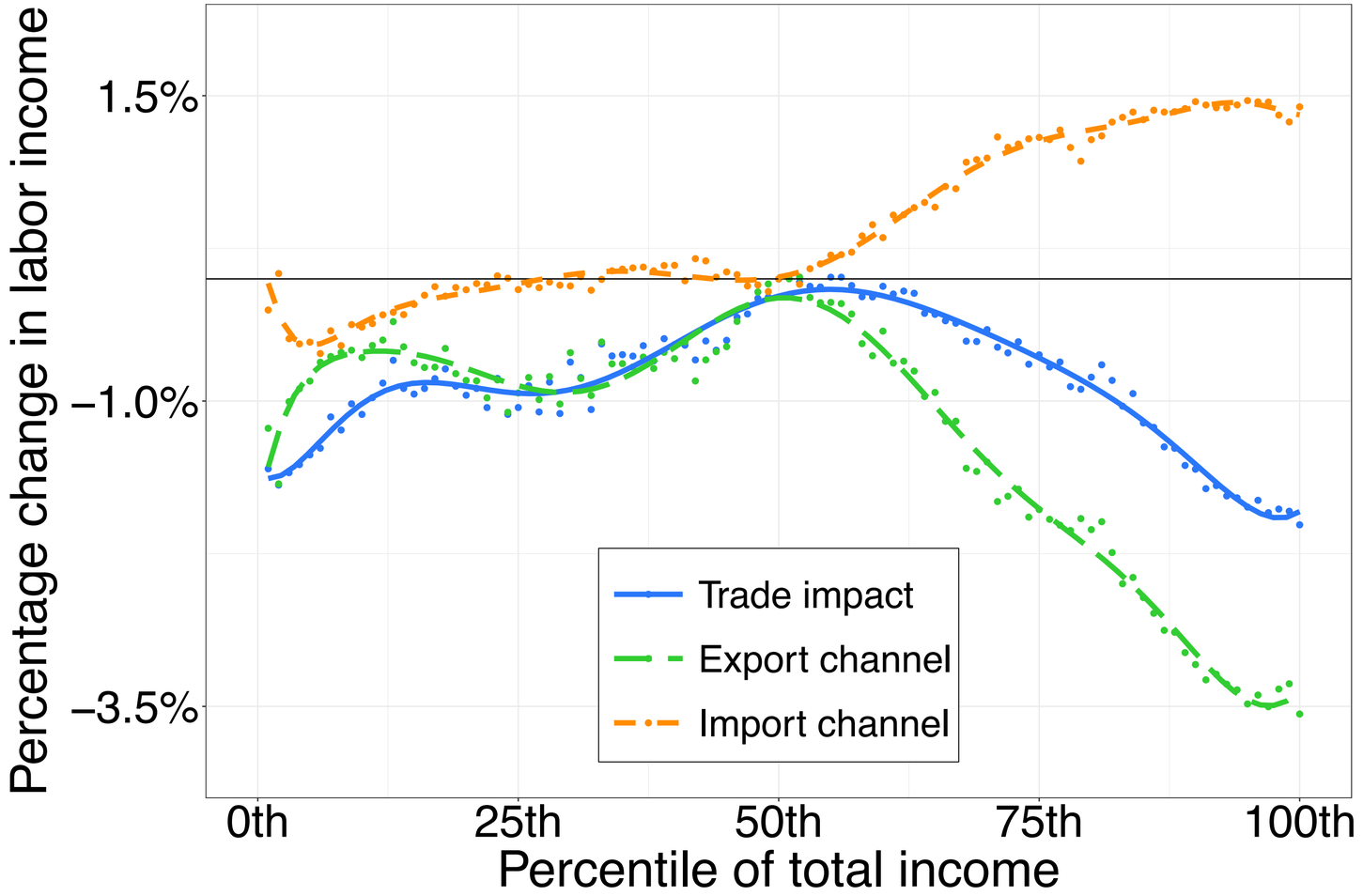
Distribution of the gains from trade (Labor only)



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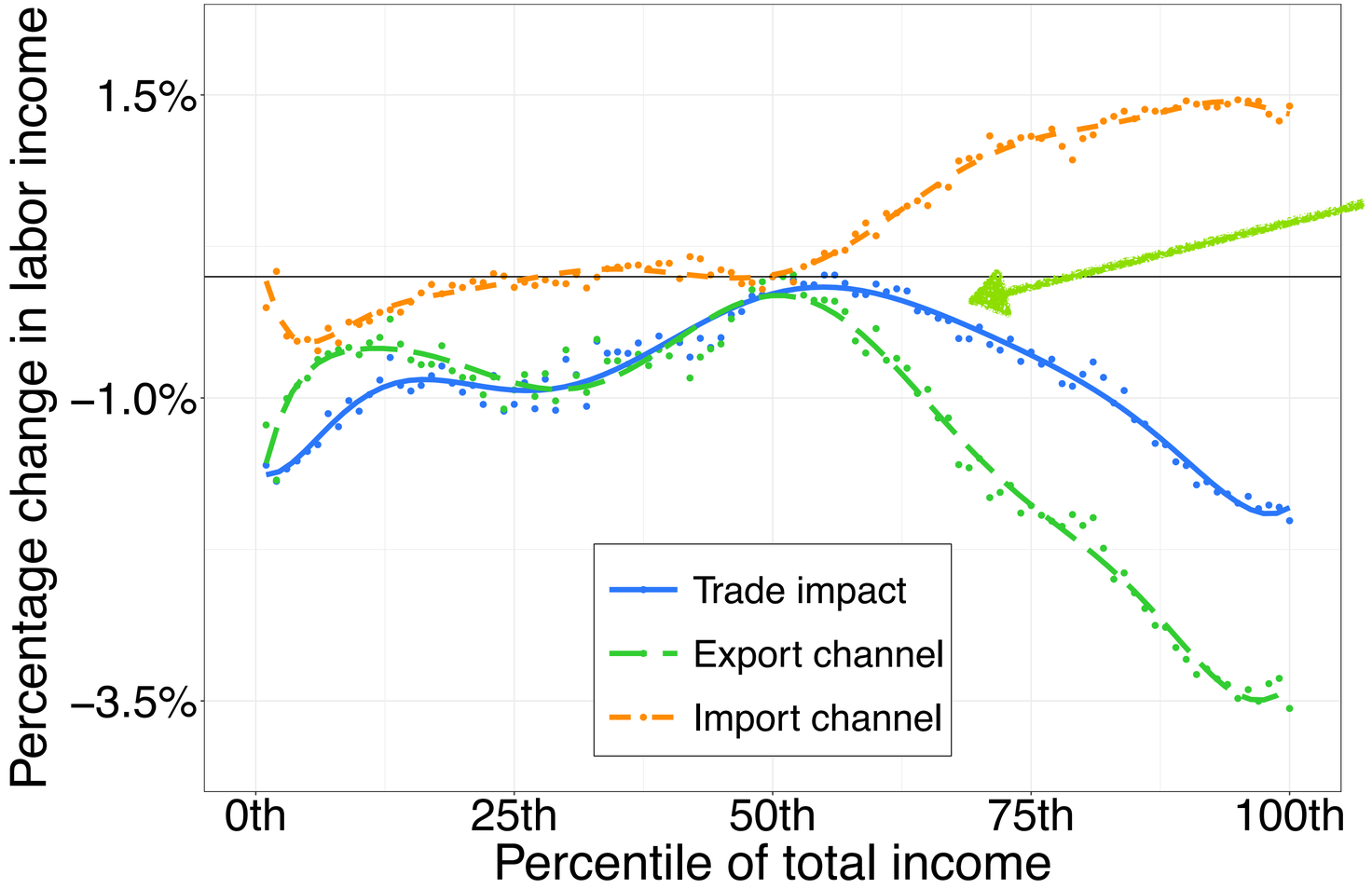

Inverted U-shape…

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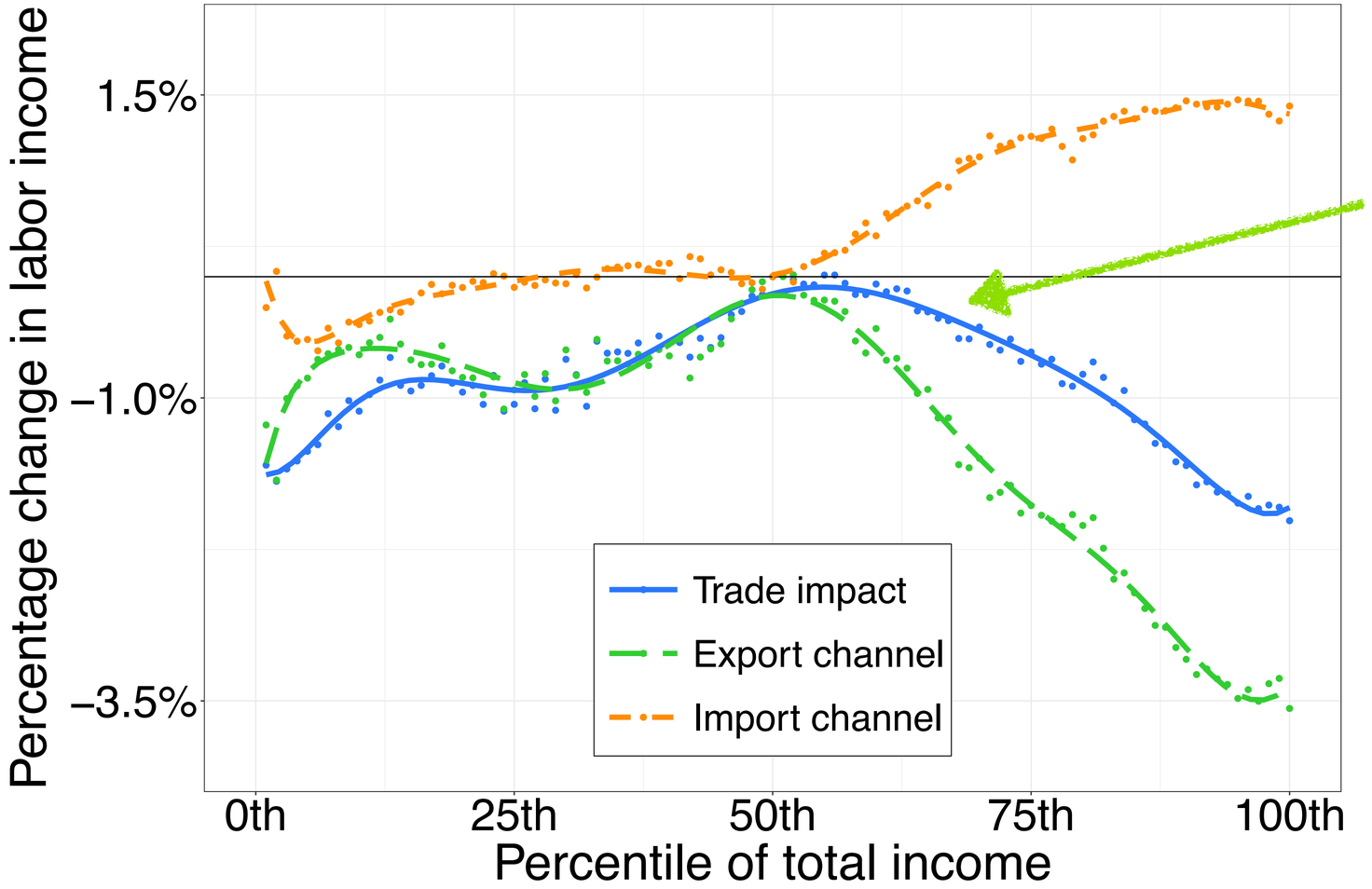

Inverted U-shape…

… mostly driven by export channel

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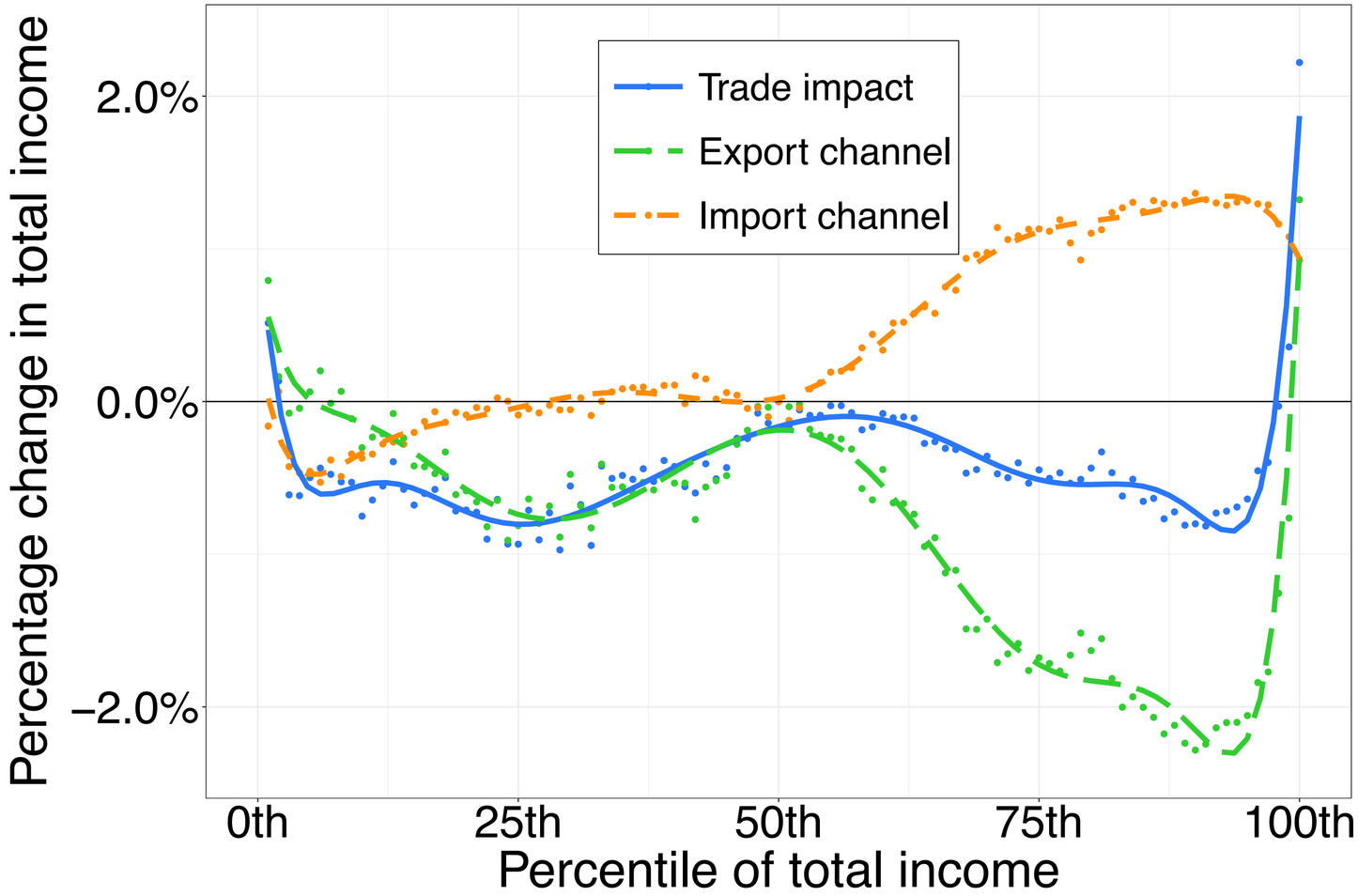

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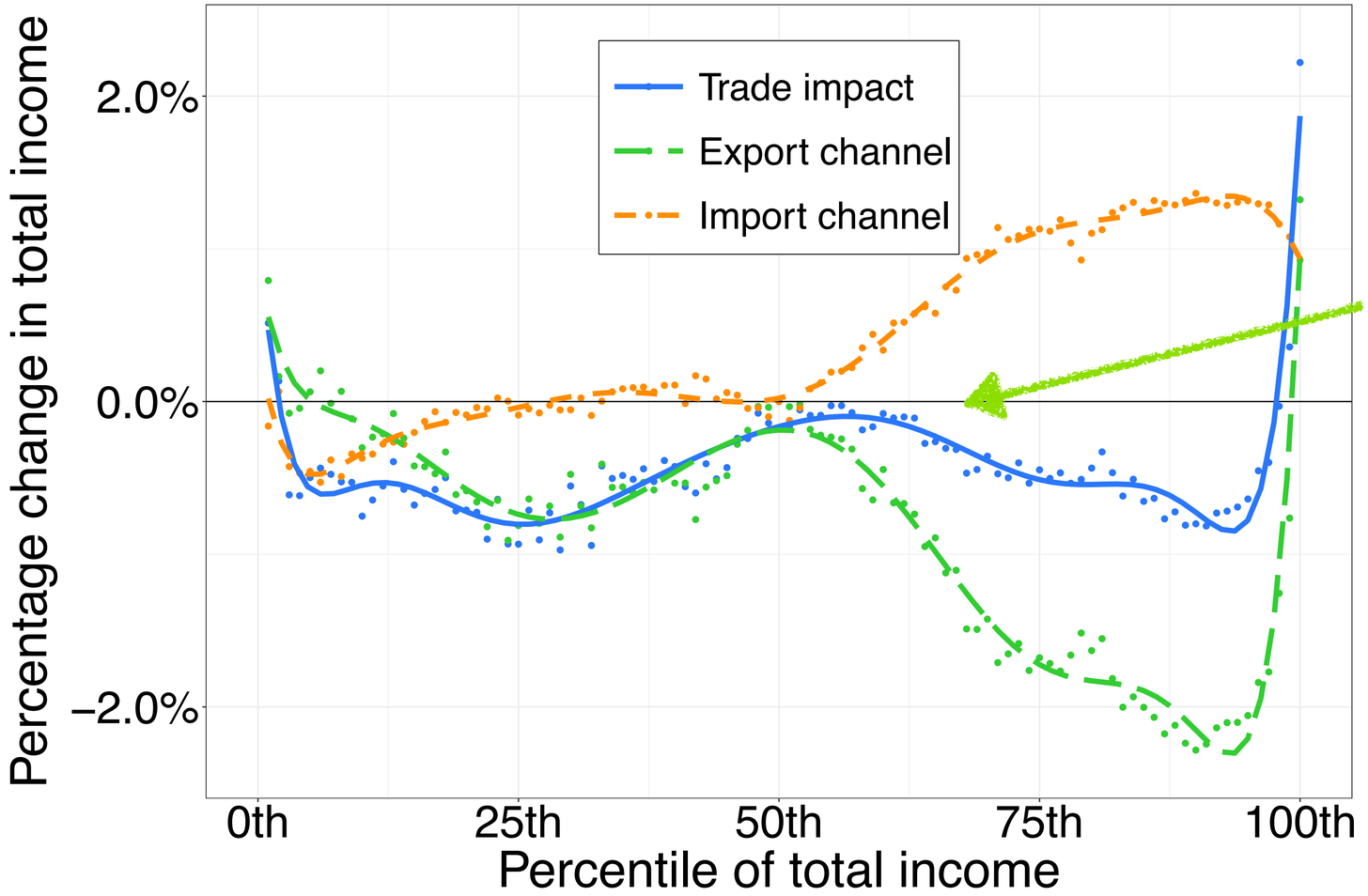

Inverted U-shape…

… but also large impact of capital at the top, also through export channel

From Trade Exposure to Trade Impact

	Change in total income		Change in labor income	
	Estimates	Shapley % R^2	Estimates	Shapley % R^2
	(1)	(2)	(3)	(4)
EE	1.454	76.0 %	1.468	77.3 %
	(0.000)		(0.000)	
IE^C	-4.097	11.2 %	-4.111	12.7 %
	(0.001)		(0.001)	
IE^L	-1.267	12.8 %	-1.217	10.0 %
	(0.002)		(0.002)	
R^2	93.2 %	100 %	92.5 %	100 %
Obs.	2,702,120		2,612,925	

From Trade Exposure to Trade Impact

All three measures of exposure have expected sign

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Sensitivity to Factor Mobility, Demand Estimates

	Parameters as in baseline ($\eta = 0.86$, $\varepsilon = 1.10$, $\sigma = 1.37$), Factors set to....			Factors as in baseline (K: national; L: education+province), Parameters set to...		
	K: national	K: national	K: 6-digit industry			
	L: education + province	L: education	L: education +province +6-digit industry	High η	High ε	High σ
Relative trade impact at income percentile	(74 factors)	(5 factors)	(26,354 factors)	($\eta = 1.4$, $\varepsilon = 1.10$, $\sigma = 1.37$)	($\eta = 0.86$, $\varepsilon = 2.3$, $\sigma = 1.37$)	($\eta = 0.86$, $\varepsilon = 1.10$, $\sigma = 4$)
50^{th}	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10^{th}	-0.75%	0.31%	-5.37%	-0.63%	0.02%	-0.52%
90^{th}	-0.80%	-0.68%	-4.78%	-0.54%	-2.12%	-0.27%

Concluding Remarks

Summary

- **How does trade affect earnings inequality?**
  - *Export channel* — $\neq$ in export exposure — $REE \neq 1$ — simply measure REE
  - *Import channel* — $\neq$ in import exposure — $\frac{d \ln RD}{d \ln w^*} \neq 0$ — estimate $RD(w^*)$ flexibly ($IE, \eta, \varepsilon, \sigma$)

- **Estimates from admin. micro-data (formal sector firms, workers, owners) in Ecuador**
  - **Largest earnings gains from trade to middle class**
  - Mostly driven by the export channel
  - Export exposure (factor content of gross exports) a strong predictor

Thank you!