MIT 14.76/760: Firms, Markets, Trade and Growth
Sp 2026, Lecture 17: Trade and Inequality

Dave Donaldson

What is the Impact of Trade on Inequality?

- Substantial interest in this question in recent decades, as heightened globalization and rising inequality (in many countries, rich and poor) have gone hand in hand
- As we saw over the last few lectures, openness to trade is likely to be good for most countries, in terms of raising real GDP per capita.
- But (just as with any economic change that amounts to an improved technology, or a reduction in a market failure), *absolutely* no presumption that:
  - Everyone will benefit
  - Notions of inequality (across people, regions, etc.) won't go up
- However, the gains to those who benefit should be larger than the gains to those harmed (in the sense that lump-sum tax and transfer schemes exist that would mean that trade is Pareto-improving)
  - But would real-world tax/social insurance schemes pull this off?

Kovak (AER 2013)

- Kovak (2013) provides a particular way of looking a the import competition (IC) side of inequality—everyone is at least weakly exposed to IC, but some are more exposed to it than others. (This is similar to the Autor, Dorn and Hanson (2013) study of the impact of the "China shock" on US labor markets.)
- NB: this paper will focus only on the IC side of how trade affects people differently. There are also three other effects:
  1. People are consumers too (i.e. they are not just competing in the product market with imports, they are consuming those cheaper imported goods too—and their "production bundle" is very undiversified, but their "consumption bundle" is much more diversified)
  2. Many imports are imported *intermediates* into production—those could be complements for many people's human capital and hence make them more productive and better paid (could also be substitutes though)
  3. People are exporters too. When a country can import more it typically (esp. in the long-run, when trade balance more likely to hold) exports more too.
- Focusing on IC is quite a "pessimistic" take on the distributional effects of trade

Kovak (AER 2013)

- In particular, Kovak (2013) develops a "specific factors" model of trade to guide our thinking about (and empirical measures of) who is exposed to IC
- Specific factors model:
  - Factors of production: labor, capital (like we've seen)
  - But now:
    - Labor and capital are stuck in their particular sub-region of the country we are looking at
    - Capital is also stuck within (i.e. "specific to") each sector, not able to move across sectors
  - These are extreme assumptions, but somewhat testable. Turn out to be reasonable approximations in places where research has looked—at least over the time horizon of a decade or two.

Kovak (2013): Model

- For now consider the model for one particular region (e.g. a "municipality" of Brazil, a "district" of India...) of a country we care about.
- Many industries i. Each industry has its own "specific factor" K_i. One other factor L is mobile across sectors.
- Factor market clearing then requires (where a_{fi} is the—potentially endogenous—amount of factor f required to produce in industry i):

$$a_{Ki} Y_i = K_i \quad (1)$$

$$\sum_i a_{Li} Y_i = L \quad (2)$$

Kovak (2013): Model

- Let $\hat{x} \equiv dx/x$ (i.e. the proportional change) for any variable x
- Differentiating (2) and using $\hat{L} = 0$ yields (with $\lambda_i \equiv \frac{L_i}{L}$)

$$\sum_i \lambda_i(\hat{a}_{Li} + \hat{Y}_i) = 0 \tag{3}$$

- Differentiating (1), using $\hat{K}_i = 0$, and substituting into (3) we have

$$\sum_i \lambda_i(\hat{a}_{Li} - \hat{a}_{Ki}) = 0$$

- But recall that the definition of the elasticity of substitution between K_i and L (in industry i's prod. function), denoted σ_i, means that:

$$\hat{a}_{Ki} - \hat{a}_{Li} = \sigma_i(\hat{w} - \hat{r}_i)$$

- So combining the previous expressions we have:

$$\sum_i \lambda_i \sigma_i(\hat{r}_i - \hat{w}) = 0 \tag{4}$$

Kovak (2013): Model

- Perfect competition (i.e. "$p = MC$") and CRTS (i.e. "$MC = AC$") requires

$$a_{Li}w + a_{Ki}r_i = p_i$$

- Differentiating (and using Shepherd's Lemma) that gives

$$(1 - \theta_i)\hat{w} + \theta_i\hat{r}_i = \hat{p}_i$$

where $\theta_i \equiv \frac{r_i K_i}{p_i Y_i}$.

- Combining with (4) and solving for $\hat{w}$ yields:

$$\hat{w} = \sum_i \beta_i \hat{p}_i, \qquad \text{where:} \qquad \beta_i \equiv \frac{\lambda_i \frac{\sigma_i}{\theta_i}}{\sum_j \lambda_j \frac{\sigma_j}{\theta_j}}$$

Kovak (2013): Model

- Everything so far was written for an arbitrary (but small) change in prices $\hat{p}_i$. What does this have to do with *trade*?
- Will model IC as simply reducing prices:
  - The country's tariffs change, i.e. we know $\widehat{1+\tau_i}$ for every i (where τ_i is the ad-valorem, i.e. % tax, import tariff on good i)
  - Assume perfect pass-through of tariffs into prices (i.e. $\hat{p}_i = \widehat{1+\tau_i}$). This is a strong assumption. It means that the price of everything tradable in this country is pinned down by world markets. (Real world probably has more frictions and product differentiation.)
- Also assume that changes in the data approximate the small changes (derivatives) in the model (i.e. $\hat{x} \approx \Delta \ln x$)
- So, repeating this for any region r, Kovak defines a region's exposure to the nation's set of tariff changes (i.e. "regional tariff change") as:

$$RTC_r \equiv \sum_i \beta_{ir} \Delta \ln(1+\tau_i)$$

Kovak (2013): Measuring β_{ir}

- Remaining challenge is to measure $\beta_{ir} \equiv \frac{\lambda_{ir} \frac{\sigma_{ir}}{\theta_{ir}}}{\sum_j \lambda_{jr} \frac{\sigma_{jr}}{\theta_{jr}}}$
- The components λ_{ir} and θ_{ir} are typically (relatively) easy to measure:
  - $\lambda_{ir} \equiv \frac{L_{ir}}{L_r}$ is the share of this region's labor employed in this industry-region
  - $\theta_{ir} \equiv \frac{r_{ir} K_{ir}}{p_{ir} Y_{ir}}$ is the share of capital in sales for this industry-region
- The elasticities of substitution (in production) σ_{ir} are much harder to know.
  - Kovak (2013) assumes these are all $= 1$ (i.e. all production functions are Cobb-Douglas)
  - Might not be that bad an approximation

Kovak (2013): Model

- Kovak (2013) then estimates the regression (across regions r, and over some period of time when tariffs changed, and hence RTC_r could vary across regions):

$$\Delta \ln w_r = \alpha + \rho RTC_r + \varepsilon_r.$$

- What sign and magnitude do we expect the coefficient ρ to take?

Back to Kovak (2013): Tariff variation

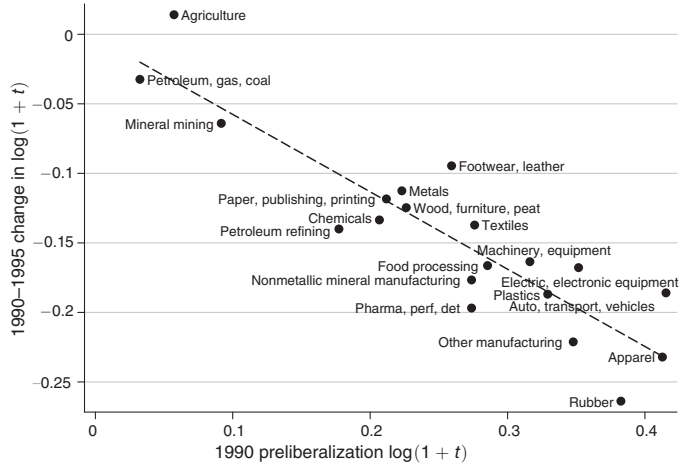


Figure 1. Relationship between Tariff Changes and Preliberalization Tariff Levels

Note: Correlation: −0.899; regression coefficient: −0.556; standard error: 0.064; t: −8.73.
Source: Author's calculations based on data from Kume, Piani, and de Souza (2003).

Kovak (2013): RTC_r changes by region r

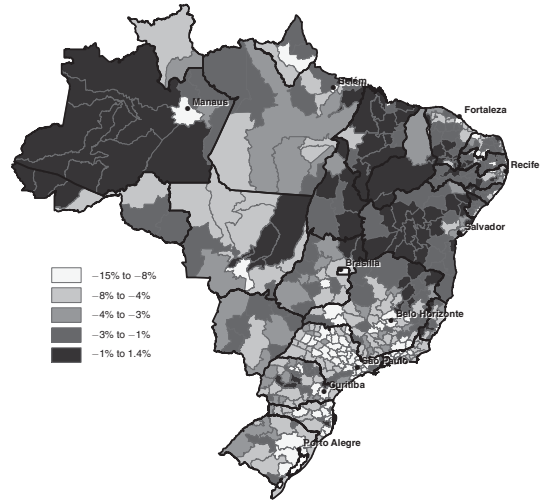


FIGURE 3. REGION-LEVEL TARIFF CHANGES

Notes: Weighted average of tariff changes. See text for details.

Kovak (2013): Main Results (Wages, 1991-2000)

TABLE 1—THE EFFECT OF LIBERALIZATION ON LOCAL WAGES

	Main		No labor share adjustment		Nontraded price change set to zero		Nontraded sector workers' wages	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regional tariff change	0.404	0.439	0.409	0.439	2.715	1.965	0.417	0.482
Standard error	(0.502)	(0.146)***	(0.475)	(0.136)***	(1.669)	(0.777)**	(0.497)	(0.140)***
State indicators (27)	—	X	—	X	—	X	—	X
Nontraded sector								
Omitted	X	X	X	X	—	—	X	X
Zero price change	—	—	—	—	X	X	—	—
Labor share adjustment	X	X	—	—	X	X	X	X
R^2	0.034	0.707	0.040	0.711	0.112	0.710	0.037	0.763

Notes: 493 microregion observations (Manaus omitted). Standard errors adjusted for 27 state clusters (in parentheses). Weighted by the inverse of the squared standard error of the estimated change in log microregion wage, calculated using the procedure in Haisken-DeNew, and Schmidt (1997).

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

NB: See (optional) Appendix slides for discussion of Topalova (2010): a similar (and earlier) study finding similar results (including on poverty measures) in the context of India's 1991 trade liberalization.

Dix Caneiro and Kovak (AER, 2017): Timepaths of Effects

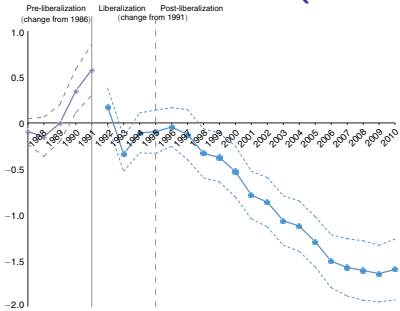


FIGURE 3. REGIONAL LOG FORMAL EARNINGS PREMIA, 1987–2010

Notes: Each point reflects an individual regression coefficient, $\hat{\theta}_t$, following (3), where the dependent variable is the change in regional log formal earnings premium and the independent variable is the regional tariff reduction (RTR_r), defined in (2). Note that RTR_r always reflects tariff reductions from 1990 to 1995. For circles, the earnings changes are from 1991 to the year listed on the x-axis. For diamonds, the changes are from 1986 to the year listed. All regressions include state fixed effects, and post-liberalization regressions control for the 1986–1990 outcome pretrend. Negative estimates imply larger earnings declines in regions facing larger tariff reductions. Vertical bars indicate that liberalization began in 1991 and was complete by 1995. Dashed lines show 95 percent confidence intervals. Standard errors adjusted for 112 mesoregion clusters.

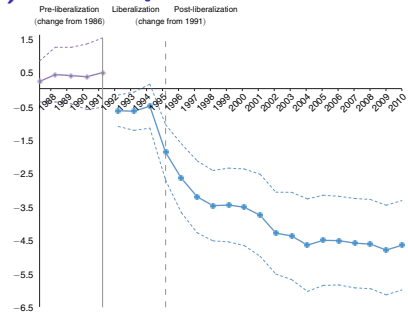


FIGURE 4. REGIONAL LOG FORMAL EMPLOYMENT, 1987–2010

Notes: Each point reflects an individual regression coefficient, $\hat{\theta}_t$, following (3), where the dependent variable is the change in regional log formal earnings premium and the independent variable is the regional tariff reduction (RTR_r), defined in (2). Note that RTR_r always reflects tariff reductions from 1990 to 1995. For circles, the earnings changes are from 1991 to the year listed on the x-axis. For diamonds, the changes are from 1986 to the year listed. All regressions include state fixed effects, and post-liberalization regressions control for the 1986–1990 outcome pretrend. Negative estimates imply larger earnings declines in regions facing larger tariff reductions. Vertical bars indicate that liberalization began in 1991 and was complete by 1995. Dashed lines show 95 percent confidence intervals. Standard errors adjusted for 112 mesoregion clusters.

- Estimated using within-person variation over time (for formal sector only)
- Impact of tariff changes on regional earnings 20 years after liberalization was three times the size of the effect 10 years after.

Effects of import competition

- We have seen how, in Brazil (and, in the appendix, India) in the 1990s, import competition appears to have harmed the wages in locations that are more exposed, at least *relative* to locations that are less exposed
  - Suggests that formal/informal social safety nets are sufficiently weak that people are still substantially affected
  - And migration doesn't appear to be fluid enough to be a means of avoiding these effects either
- Numerous findings (from many locations, including the US that faced a dramatic rise in IC from China) have documented that import competition seems to have had other consequences, for relative:
  - crime, health, domestic violence, divorce, ...
- Should give us pause about the merits of policies that generate concentrated groups of people who get suddenly (relatively) harmed, even if many more are helped.
  - Trade shocks that give rise to more IC are a visible example of such events, but are by no means the only ones...

Other effects of trade on inequality

- Recall, Kovak/Topalova focused on IC but put to the side three other forces:
  1. *Consumption effects:* these would affect inequality (of real wages) to the extent that people consume different things
  2. *Imported intermediate inputs*
  3. *Export opportunities*

- Some references (if you're interested) for #1:
  - Deaton (1997) on Thailand
  - Porto (2016) on Argentina
  - Faber (2014) on Mexico
  - Borusyak and Jaravel (2018) on US
  - At a high level though, people are highly specialized in their production and highly diversified in their consumption. So we broadly expect these consumption effects to be spread out thinly, and unlikely to overturn the inequality generated by the IC mechanism.

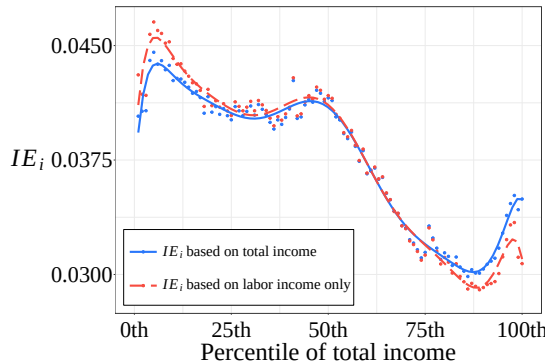
- Adao, Carrillo, Costinot, Donaldson and Pomeranz (2022 QJE) look at #2 and #3 (plus IC) in context of Ecuador...

Adao et al (2022)

- To study #2 need to know where firms get their inputs from
  - Get them from domestic and foreign suppliers (of course)
  - But even domestic suppliers (and/or *their* domestic suppliers...) perhaps get inputs from abroad
  - Call this "direct plus indirect" use of foreign intermediate inputs
- To study #3 need to know who is "participating" in exporting
  - That is, who works in exporting firms
  - And who makes intermediate inputs that get sold to exporting firms (or sold to firms that sell to firms that export...)
  - And who *could* work at such firms (i.e. perfect substitutes for such workers)
  - Call this "direct plus indirect" export participation
- With data on firm-to-firm domestic transactions (available from administrative data from the VAT tax system) can see these effects
- Also have data on "business registers"—which people own (and hence earn the profits from) which firm. Can hence look at "capital" and not just labor.

Adao et al (2022): *Import* exposure throughout the income distribution (importing is pro-rich)

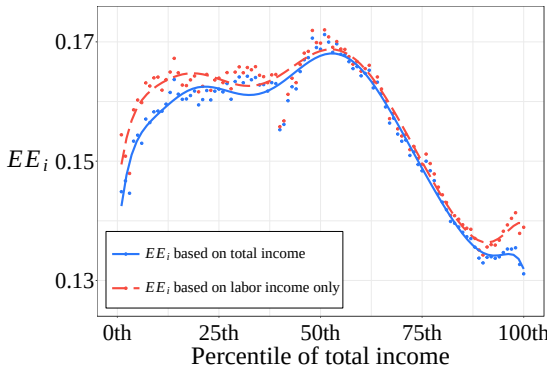
Figure 4: Distribution of Import Exposure Across Individuals, 2012



IE here combines both IC and #2. Defined here such that import exposure is *bad* for factor demand (and hence relative earnings). Difference between red and blue lines is due to capital ownership.

Adao et al (2022): *Export* exposure throughout the income distribution (exporting is pro-middle class)

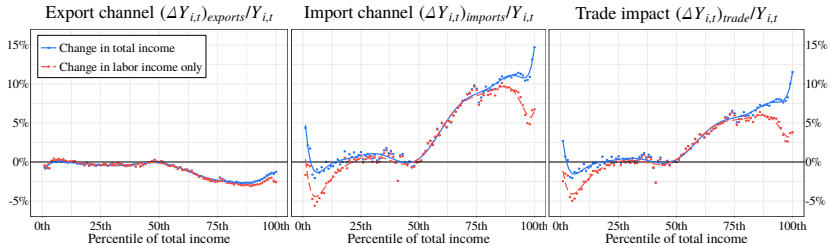
Figure 3: Distribution of Export Exposure Across Individuals, 2012



Exporting is an opportunity: exposure is good for factor demand (and hence relative earnings)

Adao et al (2022): Combining import and export effects (net effect of trade is pro-rich

Figure 5: Trade and Earnings Inequality, Baseline Sample



Notes: Blue dots correspond to the total (including both labor and capital) income change for each individual, averaged within each percentile and normalized to zero at the median percentile, between 2012 and the counterfactual autarkic equilibrium. Positive numbers therefore reflect larger gains from trade than at the median. Red dots do the same but for labor income only. In both cases the line indicates a fitted 10^{th}-order polynomial. Trade impact is the sum of the export and import channels.

Shown here: the effect (relative to the median income earner) of starting from autarky and opening up to the amount of trade that Ecuador was actually doing in 2012

Summary of Trade module—typical findings

- Aggregate GDP tends to be helped by trade openness—combination of aggregate productivity gains and aggregate consumption gains
- Aggregate productivity gains: plausible mechanisms involving both technological change and reallocation/selection
- But these aggregate effects have inequality consequences
  - some will benefit relatively more from export opportunities
  - and others will be harmed relatively more by IC
  - but whether either of these things raises inequality or not, however, is not clear (e.g. the relatively harmed might be those who start out relatively better-off)
- Typical warnings apply (as with just about any policy):
  - Even if good for aggregate efficiency...
  - ... might not be a good idea if its pre-tax/transfer distributional consequences are deleterious (and for whatever reason we lack a strong social safety net, so that taxes/transfers don't compensate)

(Optional) Appendix Slides

Topalova (AEJ Applied, 2010)

- Topalova looked at India's massive early-1990s trade "liberalization" (tariff drop) event—was a "poster child" case of this sort of policy change (many other examples of which happened in other developing countries in the 1990s).
  - Balance of payments "crisis" led to IMF loans, conditional on tariff reductions
  - But tariffs fell more in some industries than others, mostly because they all fell to a similar end-line level but started at different points—Topalova uses this feature to develop an IV for the $\Delta \ln(1 + \tau_i)$ inside RTC
  - (Khandelwal and Topalova, 2010, document that industries with initially high tariffs were not on different trends in the pre-1991 period, in terms of observable characteristics.)

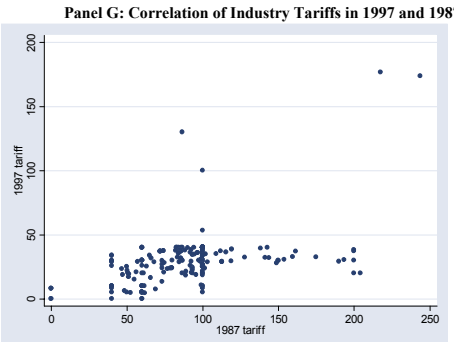
Topalova (2010): Estimating equation

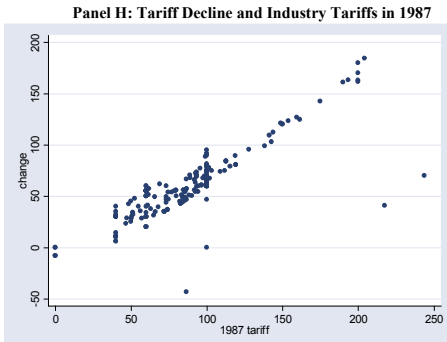
- Topalova (2010) estimates following regression on Indian districts (d):

$$y_{dt} = \alpha_d + \beta_t + \gamma \text{Tariff}_{dt} + \varepsilon_{dt}$$

- Where:
  - y_{dt} is the district's poverty rate (think of it as a measure inversely related to w_{dt})
  - The "district-specific tariff", Tariff_{dt} is (up to a minor difference) effectively a "levels" version of RTC_d, namely: $\text{Tariff}_{dt} \equiv \sum_i \beta_{id} \ln(1 + \tau_{it})$

Topalova (2010): Identification Strategy for Tariff Changes





Topalova (2010): Main findings

TABLE 3A—TRADE LIBERALIZATION, POVERTY, AND AVERAGE CONSUMPTION IN RURAL INDIA

Data	Pre & post (1)	Pre & post (2)	Pre & post (3)	Pre & post (4)	Pre only (5)	Pre & post (6)	Pre & post (7)	Pre & post (8)
Panel A. Dependent variable: poverty rate								
Tariff	−0.242*		−0.710***	−0.467*	0.038	−0.479**	−0.424*	−0.381***
	[0.122]		[0.250]	[0.247]	[1.000]	[0.236]	[0.229]	[0.139]
Traded tariff		−0.223**						
		[0.084]						
NTB (share of free HS codes)						0.073		
						[0.202]		
Panel B. Dependent variable: log average per capita consumption								
Tariff	−0.055		0.512	0.677*	−0.085	0.683*	0.657*	0.583**
	[0.353]		[0.639]	[0.400]	[0.463]	[0.373]	[0.333]	[0.216]
Traded tariff		0.161						
		[0.207]						
NTB (share of free HS codes)						−0.036		
						[0.248]		
IV with traded tariff	No	No	Yes	Yes	Yes	Yes	Yes	Yes
IV with traded tariff and initial traded tariff	No	No	No	No	No	No	No	Yes
District indicators	Yes	Yes	Yes	Yes	NA	Yes	Yes	Yes
Initial district conditions × post	No	No	No	Yes	NA	Yes	Yes	Yes
Region indicators	NA	NA	NA	NA	Yes	NA	NA	NA
Initial region indicators × post	NA	NA	NA	NA	Yes	NA	NA	NA
Other reforms controls	No	No	No	No	No	No	Yes	Yes
N	728	728	728	728	128	728	728	728

Notes: Standard errors (in brackets) are clustered at the state-year level. Regressions are weighted by the number of households in a district. All specifications include a post-reform indicator. Initial district conditions that are interacted with the post-reform indicator include percentage of workers in a district employed in agriculture, employed in mining, employed in manufacturing, employed in trade, employed in transport, and employed in services (construction is the omitted category), as well as the share of district's population that is schedule caste/tribe, the percentage of literate population, and state labor laws indicators. Other reform controls include controls for industry licensing, foreign direct investment, and number of banks per 1,000 people. Regressions in column 5 replace all district-level variables with their equivalents at the regional level and use only pre-reform data for the outcomes of interest.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

(3.9pp increase in a district's relative poverty from avg. 5.5pp tariff drop)