Trade and Inequality in Developing Countries

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World Trade Organization, Dec. 20, 2016
Income inequality increased in OECD over past 3 decades

Figure 1.3. Income inequality increased in most OECD countries

Gini coefficients of income inequality, mid-1980s and 2013, or latest available year

Source: OECD report, In It Together, 2015, based on OECD Income Distribution Database.
Is trade responsible?

▶ For developed countries, there has been wide recognition that trade is likely playing some role.
▶ Idea is consistent with Heckscher-Ohlin or “factor proportions” theory.
  ▶ Simplest version: 2 countries, 2 goods, 2 factors.
  ▶ When skilled-labor-abundant country (North) integrates with unskilled-labor-abundant country (South), it shifts toward producing the skill-intensive good.
  ▶ In North, demand ↑ for skilled labor, ↓ for unskilled labor ⇒ inequality ↑.
▶ Debate has been over magnitude of effect.
Influential recent work by Autor, Dorn & Hanson (2013, 2014) has shown that China shock has had negative impacts on workers in competing sectors in U.S.

Recent follow-up shows that this led to polarized voting patterns (Autor, Dorn, Hanson and Majlesi, 2016).

Similar research found effect on right-wing vote share in Germany (Dippel, Gold and Heblich, 2016).
Is trade responsible? (cont.)

► For developing countries, there has (until recently) been less agreement.

► Back to Heckscher-Ohlin theory:
  
  ► When unskilled-labor-abundant country (South) integrates with skilled-labor-abundant country (North), it shifts toward producing the unskilled-labor-intensive good.
  
  ► In South, demand ↑ for unskilled labor, ↓ for skilled labor ⇒ inequality ↓.

► But evidence has accumulated that inequality ↑ when trade ↑ in developing countries.

  ► In influential review paper, Goldberg and Pavcnik (2007) present evidence for this coincidence from Argentina, Brazil, Chile, Colombia, Hong Kong, India, Mexico.
More complicated Heckscher-Ohlin-type models can account for rising inequality in LDCs, but only if production shifts to skill-intensive activities. There is little evidence of such between-sector shifts.

When I first started in this area, dominant view was that therefore inequality must be due to non-trade factors, e.g. technical change (Berman, Bound and Griliches, 1994; Berman, Bound and Machin, 1998).
This talk

- Non-technical summary of research program I have been working on, showing a particular causal link — “quality upgrading mechanism” — between trade and wage inequality in developing countries.
- Focus on Mexico, outlier in the OECD figure.
  - Illustrative in part because it went from very closed to very integrated.
- Review of other mechanisms that have been proposed to explain same patterns.
- Additional evidence from new paper on Portugal.
- Brief discussion of normative and political implications.
Inequality ↑ in Mexico following mid-80s liberalization

**Figure I**
Wage Inequality, 1984-2001

- Log 90-10 ratio is for real hourly wages from ENEU household survey.
- White-collar/blue-collar ratio is for hours-weighted averages of hourly wages for non-production workers and production workers in EIA 1984-2001 panel of 1114 plants. Variable definitions in Appendix I. Further details on datasets in Section IV of text and Appendix II (online).

Inequality ↑ in Mexico following mid-80s liberalization

Figure II
Wage Variance, EIA 1984-2001 Panel

Notes: Total wage variance is hours-weighted variance of the log plant-average real hourly wage in balanced EIA 1984-2001 panel of 1114 plants. Within-industry-year variance is hours-weighted variance of residual from regression of the log plant-average real hourly wage on a full set of industry-year dummies (205 industries * 18 years) in EIA 1984-2001 panel. Variable definitions in Appendix I. Further details on dataset in Section IV of text and Appendix II (online).
Production shifted to *unskilled*-labor-intensive sectors

**Appendix Figure I: Shift Toward Less-Skill-Intensive Sectors, 1988-1998**

Notes: Data on employment in 1988 and 1998 by 4-digit manufacturing industry (including *maquiladoras*) from the Mexican *Censos Industriales* (Industrial Censuses). Data on schooling by 4-digit industry from *Encuesta Nacional de Empleo Urbano (ENEU)*; further details in Appendix II. Regression weighted by employment in 1988.
Production shifted to *unskilled*-labor-intensive sectors

Appendix Figure I: Shift Toward Less-Skill-Intensive Sectors, 1988-1998

Appendix Figure II: Shift Toward Less-Capital-Intensive Sectors, 1988-1998

Notes: Data on employment in 1988 and 1998 by 4-digit manufacturing industry (including *maquiladoras*) from the Mexican *Censos Industriales* (Industrial Censuses). Data on schooling by 4-digit industry from *Encuesta Nacional de Empleo Urbano* (ENEU); further details in Appendix II. Regression weighted by employment in 1988.
Case Study: VW-Mexico

New Beetle in San Francisco, price ~$17,750

Original Beetles in Mexico City, price ~$7,500
Case Study: VW-Mexico (cont.)

Técnico (technician):

Average education: 9 years
Starting wage: $11.18/day

Especialista (Specialist) [not shown]:

Average education: 9 years + 3 years at VW school
Starting Wage: $17.74/day
Peso devaluation, Dec. 1994

Fig. III
Real Exchange Rate, 1984-2002

Notes: Real exchange rate calculated as $\text{RER} = \frac{e \times \text{CPI(US)}}{\text{CPI(Mex)}}$, where $e$ is the peso/US$ nominal exchange rate. Data from IMF International Financial Statistics.
Case Study: VW-Mexico (cont.)

Figure IV
Exports, High-quality Models as Percentage of VW Output

Notes: Output measured in physical units. Omitted model from upper curve is the Original Beetle. Data from Bulletins of the Asociacion Mexicana de la Industria Automotriz (Mexican Automobile Industry Association).
Shift toward exporting: all manufacturing

Figure V
Shift Toward Exporting, 1993-2001

Notes: Data from EIA 1993-2001 Panel. Export percentage of sales calculated as (total exports for all plants)/(total sales for all plants). Plants with exports greater than zero classified as exporting. Further details on dataset in Section IV of text and Appendix II (online).
Theoretical prediction
Theoretical prediction (cont.)
Theoretical prediction (cont.)
Larger firms ↑ exports more, 1994-1997

App. Fig. IVa: Export share of sales

App. Fig. IVb: Log white-collar wage

App. Fig. IVc: Log blue-collar wage

App. Fig. IVd: Log wage ratio
Larger firms $\uparrow$ white-collar wages more, 1993-1997

**App. Fig. IVb: Log white-collar wage**

- $1993$
- $1997$
Larger firms ↑ blue-collar wages more, 1993-1997
Greater differential change, exports

App. Fig. Va: Changes in export share of sales

Delta export share of sales vs. log domestic sales, initial year for changes 1994-1997 (black line) and 1998-2001 (gray line).

Notes: All variables deviated from industry means. Graphs are non-parametric regressions (bandwidth = .5), of changes of indicated variables over indicated periods on log domestic sales in initial year (1993 or 1997), using EIA 1993-2001 Panel. App. Fig. Va changes omit initial year to avoid bias from mean reversion. Variable definitions in Appendix I. Further details on dataset in Section IV of text and Appendix II.
Greater differential change, white-collar wages

App. Fig. Vb: Changes in log white-collar wage

![Graph showing changes in log white-collar wage](image)
Greater differential change, blue-collar wages

App. Fig. Vc: Changes in log blue-collar wage

![Graph showing changes in log blue-collar wage vs. log domestic sales, initial year. The graph compares changes from 1993-1997 and 1997-2001.](image)
Similar pattern for ISO 9000 certification


<table>
<thead>
<tr>
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<th>Δ ISO 9000 certification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Δ white-collar avg. schooling</td>
</tr>
<tr>
<td>1993–1997 Log domestic sales, 1993</td>
<td>0.079***</td>
</tr>
<tr>
<td></td>
<td>[0.018]</td>
</tr>
<tr>
<td>R²</td>
<td>0.171</td>
</tr>
<tr>
<td>1997–2001 Log domestic sales, 1997</td>
<td>0.036***</td>
</tr>
<tr>
<td></td>
<td>[0.015]</td>
</tr>
<tr>
<td>R²</td>
<td>0.127</td>
</tr>
<tr>
<td>Difference (1993–1997 vs. 1997–2001)</td>
<td>0.042*</td>
</tr>
<tr>
<td></td>
<td>[0.024]</td>
</tr>
<tr>
<td>N</td>
<td>844</td>
</tr>
</tbody>
</table>
Looking at wage outcomes inside firm

Two follow-up projects use “employer-employee” data from Mexican social security agency to explore wage outcomes in more detail:

Exports and Within-Plant Wage Distributions

- Changes in log 10th percentile
- Changes in log 25th percentile
- Changes in log median
- Changes in log 75th percentile
- Changes in log 90th percentile

Changes in wage distributions for different percentiles over the years.
### Exports and Within-Plant Wage Distributions (cont.)

<table>
<thead>
<tr>
<th></th>
<th>△ log mean hourly wage</th>
<th>△ mean log daily wage</th>
<th>10th</th>
<th>25th</th>
<th>50th</th>
<th>75th</th>
<th>90th</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>(EIA)</td>
<td>(IMSS)</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
<tr>
<td>△ export share</td>
<td>2.647**</td>
<td>3.928***</td>
<td>-0.058</td>
<td>2.455**</td>
<td>3.965***</td>
<td>5.296***</td>
<td>5.333***</td>
</tr>
<tr>
<td></td>
<td>(1.227)</td>
<td>(1.443)</td>
<td>(0.639)</td>
<td>(1.113)</td>
<td>(1.532)</td>
<td>(1.945)</td>
<td>(2.026)</td>
</tr>
<tr>
<td>initial log emp.</td>
<td>0.006</td>
<td>0.007</td>
<td>0.037***</td>
<td>0.021*</td>
<td>0.007</td>
<td>-0.004</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.014)</td>
<td>(0.007)</td>
<td>(0.011)</td>
<td>(0.015)</td>
<td>(0.019)</td>
<td>(0.020)</td>
</tr>
</tbody>
</table>

| Industry-year effects | Y | Y | Y | Y | Y | Y | Y | Y |
| State-year effects   | Y | Y | Y | Y | Y | Y | Y | Y |
| N                    | 5062 | 5062 | 5062 | 5062 | 5062 | 5062 | 5062 | 5062 |

- Differential export shock associated with larger effects on the upper quantiles of wage distribution than lower quantiles.
- But effect 90th percentile not larger than at 75th.
Exports and Wage Premia

Standard model (Abowd, Kramarz and Margolis, 1999):

\[ w_{it} = \eta_t + \alpha_i + x_{it}' \gamma_t + \psi_{j(i,t)t} + \varepsilon_{it} \quad (1) \]

- \( i, j, t \) index individuals, plants, years
- \( w_{it} = \log \text{wage} \)
- \( x_{it} = \text{vector of observable individual characteristics} \)
- \( \psi_{j(i,t)t} = \text{plant-year effect for plant } j \text{ in which individual } i \text{ is located in year } t \)
- Need assumption that where individual workers is not correlated with shocks to his/her productivity in the same period.
- Interpret plant effect coefficients (“plant components”) \( \psi \) as wage premia.
Exports and Wage Premia (cont.)

Figure 9a. Avg. log daily wage

Figure 9b. Plant component

Figure 9c. Person component

Figure 9d. Changes in avg. log daily wage

Figure 9e. Changes in plant component

Figure 9f. Changes in person component
### Exports and Wage Premia (cont.)

<table>
<thead>
<tr>
<th></th>
<th>△ avg. log daily wage (IMSS) (1)</th>
<th>△ plant comp. (2)</th>
<th>△ person comp. (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Changes over 1993-1997 period</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>log domestic sales, 1993</td>
<td>0.033***</td>
<td>0.027***</td>
<td>0.006***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.003)</td>
<td>(0.002)</td>
</tr>
<tr>
<td><strong>Changes over 1997-2001 period</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>log domestic sales, 1997</td>
<td>0.000</td>
<td>0.002</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>(\beta_{1997-2001} - \beta_{1993-1997})</td>
<td>-0.032***</td>
<td>-0.024***</td>
<td>-0.008***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.004)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>6-digit industry effects</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>region (state) effects</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>N</td>
<td>2211</td>
<td>2211</td>
<td>2211</td>
</tr>
</tbody>
</table>

**Notes:** Log plant size is log employment in Column (1), log domestic sales otherwise. (Domestic sales enters the denominator of export share, and we avoid regressing changes in export share on initial level of domestic sales to avoid a spurious negative correlation.) Export share is fraction of total sales derived from exports. Robust standard errors in brackets. *10% level, **5% level, ***1% level.
Feenstra and Hanson (1996) outsourcing hypothesis

- Each sector consists of many activities of different skill intensities.
- Most skill-intensive located in North; least skill-intensive in South.
- When trade costs fall, the least skill-intensive activities from North shift to South.
  - Average skill intensity ↑ in both North, South.
  - Return to skill ↑ in both North, South.
  - Inequality ↑ in both North, South.
- Very plausible, but in Mexican can outsourced activities (maquiladoras) tend to be unskilled-labor-intensive even relative to rest of Mexican manufacturing.
Bustos (2011b) technology upgrading

- Firms have choice between:
  - Traditional technology: low fixed costs, high variable costs.
  - New technology: high fixed costs, low variable costs.
  as in Yeaple (2005).
- Choice depends on scale of production: more-productive, larger firms have greater incentive to adopt, since fixed costs per unit are smaller.
- Trade liberalization increases scale of larger firms, induces them to upgrade technology.
Recall Fig. VIII from Verhoogen (2008). Bustos (2011b) generates similar prediction for technology spending: larger effect for new exporters (3rd quintile in Argentinean case).
Bustos (2011b) technology upgrading (cont.)

Table 7—Technology Adoption by Quartile of the Firm Size Distribution

<table>
<thead>
<tr>
<th>Dependent variable indicated in columns</th>
<th>Change in spending on technology</th>
<th>Product and process innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) (2) (3)</td>
<td>(4) (5) (6)</td>
</tr>
<tr>
<td>∆ Brazil’s tariffs</td>
<td></td>
<td></td>
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<tr>
<td>× First size quartile</td>
<td>−0.872</td>
<td>−0.041</td>
</tr>
<tr>
<td></td>
<td>[0.604]</td>
<td>[0.116]</td>
</tr>
<tr>
<td>× Second size quartile</td>
<td>−0.846</td>
<td>−0.199</td>
</tr>
<tr>
<td></td>
<td>[0.569]</td>
<td>[0.149]</td>
</tr>
<tr>
<td>× Third size quartile</td>
<td>−2.106</td>
<td>−0.359</td>
</tr>
<tr>
<td></td>
<td>[0.609]**</td>
<td>[0.133]**</td>
</tr>
<tr>
<td>× Fourth size quartile</td>
<td>−0.372</td>
<td>−0.190</td>
</tr>
<tr>
<td></td>
<td>[0.534]</td>
<td>[0.130]</td>
</tr>
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</table>

Controls

Δ Arg.’s tariffs w.r.t. world         | yes                             | yes                           |
Δ Arg.’s tariffs w.r.t. Brazil       |                                 |                               |
Industry-level controls              | yes                             | yes                           |
Firm-level controls                  | yes                             | yes                           |
2-digit ISIC industry dummies        | yes                             | yes                           |
Observations                         | 894                             | 1,301                         |
$R^2$                                 | 0.05                            | 0.20                          |

Notes: Standard errors are clustered at the 4-digit ISIC industry level. ∆ denotes a change in a variable during the period 1992–1996. Controls for changes in Argentina’s tariffs with respect to the world and Brazil include both output and input tariffs. Industry-level controls include demand elasticity, skill intensity, and capital intensity of the 4-digit ISIC industry in the United States. Firm-level controls include dummies for the second, third, and fourth quartile of the firm-size distribution in the initial year (1992).

Follow-up paper (Bustos, 2011a) looks at skill choices, finds skill share moves with technology spending/adoption.
Helpman, Itskhoki and Redding (2010) labor screening

- Workers have an unobserved firm-specific productivity.
- Firms can pay fixed cost to screen workers, hire only those above some minimum level.
- As scale $\uparrow$:
  - incentive to pay fixed costs of screening $\uparrow$
  - average productivity, wage in firm $\uparrow$.
- Can have effect on inequality, for reasons similar to Bustos (2011b).
- Note that in both Bustos (2011b) and Helpman, Itskhoki and Redding (2010), mechanism is a *scale effect*.
Exports $\uparrow \Rightarrow$ quality $\uparrow$

- Atkin et al. (forthcoming) randomized initial export contacts among Egyptian rug producers.
### Exports $\uparrow \Rightarrow$ quality $\uparrow$

<table>
<thead>
<tr>
<th>Quality Metric</th>
<th>Control Mean</th>
<th>ITT (1)</th>
<th>TOT (2)</th>
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<tr>
<td>Corners</td>
<td>2.98</td>
<td>1.11 ***</td>
<td>1.70 ***</td>
</tr>
<tr>
<td></td>
<td>(0.12)</td>
<td>(0.11)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>Waviness</td>
<td>2.99</td>
<td>1.10 ***</td>
<td>1.68 ***</td>
</tr>
<tr>
<td></td>
<td>(0.12)</td>
<td>(0.10)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>Weight</td>
<td>3.08</td>
<td>1.07 ***</td>
<td>1.63 ***</td>
</tr>
<tr>
<td></td>
<td>(0.11)</td>
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<td>(0.10)</td>
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<tr>
<td>Touch</td>
<td>3.12</td>
<td>0.40 ***</td>
<td>0.66 ***</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.07)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Packedness</td>
<td>3.11</td>
<td>0.89 ***</td>
<td>1.59 ***</td>
</tr>
<tr>
<td></td>
<td>(0.11)</td>
<td>(0.12)</td>
<td>(0.10)</td>
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<tr>
<td>Warp Thread Tightness</td>
<td>3.05</td>
<td>0.83 ***</td>
<td>1.49 ***</td>
</tr>
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<td></td>
<td>(0.10)</td>
<td>(0.12)</td>
<td>(0.10)</td>
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<tr>
<td>Firmness</td>
<td>2.98</td>
<td>0.87 ***</td>
<td>1.60 ***</td>
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<td>(0.11)</td>
<td>(0.12)</td>
<td>(0.11)</td>
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<tr>
<td>Design Accuracy</td>
<td>3.17</td>
<td>0.79 ***</td>
<td>1.41 ***</td>
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<td></td>
<td>(0.10)</td>
<td>(0.12)</td>
<td>(0.10)</td>
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<tr>
<td>Warp Thread Packedness</td>
<td>3.05</td>
<td>1.07 ***</td>
<td>1.65 ***</td>
</tr>
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<td>(0.11)</td>
<td>(0.11)</td>
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<tr>
<td>Inputs</td>
<td>3.07</td>
<td>0.89 ***</td>
<td>1.62 ***</td>
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<tr>
<td></td>
<td>(0.10)</td>
<td>(0.12)</td>
<td>(0.10)</td>
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</table>
Scale vs. income-based quality channel

- Brambilla, Lederman and Porto (AER, 2012):
  - Brazilian devaluation affects destination of exports for Argentinian firms.
  - Find positive effect on wages of exporting to richer markets, but not of exporting *per se*.

- Bastos, Silva and Verhoogen (2016)
  - Exchange rates shift where Portuguese firms export goods.
  - Avg. destination income ↑ ⇒ firms pay more for inputs.
  - Exports *per se* ↑ ⇒ no effect on input prices.

- Both suggest that income-based quality channel — not scale effects — is driving wage effects.
## Firms charge higher prices in richer destinations (1997)

The table below shows the results of a regression analysis investigating factors affecting firm-product log export price. The dependent variable is the log export price of a firm-product, and the analysis examines the effect of factors such as the log GDP/cap., log GDP, membership in the European Union, being landlocked, and distance from the richer destination.

<table>
<thead>
<tr>
<th></th>
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<th>(2)</th>
<th>(3)</th>
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<tbody>
<tr>
<td>richer than Portugal</td>
<td>0.09***</td>
<td>0.09***</td>
<td>0.03***</td>
<td>0.03***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>log GDP/cap.</td>
<td></td>
<td></td>
<td>0.03***</td>
<td>0.03***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>log GDP</td>
<td>0.01*</td>
<td>0.00</td>
<td>0.01</td>
<td>0.00</td>
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<td></td>
<td>(0.00)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>European Union</td>
<td>0.05*</td>
<td>0.02</td>
<td>0.06**</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.03)</td>
<td>(0.02)</td>
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<tr>
<td>landlocked</td>
<td>0.02</td>
<td>0.03</td>
<td>0.01</td>
<td>0.02</td>
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<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.03)</td>
<td>(0.02)</td>
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<tr>
<td>log distance</td>
<td>0.07***</td>
<td>0.06***</td>
<td>0.07***</td>
<td>0.06***</td>
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<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
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</tbody>
</table>

Product effects: Y, firm-product effects: N, R2: 0.75, 0.93, 0.75, 0.93, N: 71519, 71519, 71519, 71519.
## Exchange rates affect existing exporters more

### A. Data at firm-destination-product-year level

<table>
<thead>
<tr>
<th></th>
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<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(RER)</td>
<td>0.092***</td>
<td>0.100***</td>
<td>0.022**</td>
<td>0.031***</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.010)</td>
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<td>(0.012)</td>
</tr>
<tr>
<td>log(RER)*1(any exports in 1997)</td>
<td></td>
<td></td>
<td>0.430***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.041)</td>
<td></td>
</tr>
<tr>
<td>log(RER)*(sales share in 1997)</td>
<td></td>
<td></td>
<td></td>
<td>0.353***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.057)</td>
</tr>
</tbody>
</table>

- firm effects: Y
- destination effects: Y
- firm-product-destination effects: N, Y, Y, Y
- year effects: Y, Y, Y, Y
- R2: 0.15, 0.70, 0.70, 0.70
- N: 954025, 954025, 954025, 954025

<table>
<thead>
<tr>
<th>dep. var.: % firm's sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
</tr>
</tbody>
</table>

---

**Note:**
- The table shows the coefficients and standard errors for the relationship between exchange rate changes (log(RER)) and the percentage of a firm's sales. The coefficients are significant at the 1% level for log(RER) and log(RER)*1(any exports in 1997). The results suggest that exchange rate changes have a significant impact on firm sales, with a stronger effect on firms with exports in 1997.
### Exports to richer destinations $\uparrow \implies \text{input prices} \uparrow$

<table>
<thead>
<tr>
<th>dep. var.: firm-average log real input price</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log avg. destination GDP/cap</td>
<td>0.66***</td>
<td>0.72***</td>
<td>0.73***</td>
<td>0.71***</td>
<td>0.69***</td>
<td>0.68***</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.25)</td>
<td>(0.25)</td>
<td>(0.25)</td>
<td>(0.26)</td>
<td>(0.26)</td>
</tr>
<tr>
<td>export share of sales</td>
<td>-0.34***</td>
<td>-0.34**</td>
<td>-0.33**</td>
<td>-0.22</td>
<td>-0.22</td>
<td>-0.22</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.13)</td>
<td>(0.13)</td>
<td>(0.31)</td>
<td>(0.32)</td>
<td>(0.32)</td>
</tr>
<tr>
<td>log avg. destination distance</td>
<td>-0.00</td>
<td>-0.00</td>
<td>-0.01</td>
<td>0.06**</td>
<td>-0.01</td>
<td>0.06**</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.01)</td>
<td>(0.03)</td>
<td>(0.01)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>log sales</td>
<td>0.02***</td>
<td>0.02***</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
</tbody>
</table>

- **initial source interactions**: Y Y Y Y Y Y
- **firm effects**: Y Y Y Y Y Y
- **year effects**: Y Y Y Y Y Y
- **N**: 45659 45659 45659 45659 45659 45659
- **Kleibergen-Paap LM statistic (under-identification)**: 264.22 250.03 249.61 248.92 192.30 232.20
- **Kleibergen-Paap LM p-value**: 0.00 0.00 0.00 0.00 0.00 0.00
- **Kleibergen-Paap Wald rk F-stat (weak insts.)**: 3.11 2.67 2.67 2.65 2.09 2.32
- **Anderson-Rubin Wald test F-stat**: 2.20 2.19 2.19 2.17 2.18 2.18
- **Anderson-Rubin Wald test p-value**: 0.00 0.00 0.00 0.00 0.00 0.00

Notes: Columns 1 to 4 treat only log avg. destination GDP/cap as endogenous; Column 5 adds export share of sales, and Column 6 adds log avg. destination distance to endogenous set. Petroleum exports and imports excluded. Robust standard errors in parentheses. *10% level, **5% level, ***1% level.
Conclusion

- Using data from Mexico, supplemented by other studies, I have argued that quality upgrading is a causal channel linking trade and wage inequality in developing countries.
  - Leads to increased wage dispersion across plants.
  - Pattern explained in large part by firms paying wage premia, not by changes in skill composition.
  - Quality upgrading also leads to increased dispersion within plants.

- Quality upgrading is not the only possible mechanism linking trade and wage inequality in LDCs, but it appears to be an important one.

- Question I haven’t answered: how much of rise in inequality in LDCs is due to trade?
  - Hard to answer convincingly.
  - Subject of future work.
Normative dimensions

- We tend to think of inequality as a “bad.”
  - The fact that trade is increasing it in LDCs would seem to be a black mark against trade.
- On the other hand, in the story I have tried to tell, it arises because a subset of firms are able to upgrade and export successfully.
  - Some increase in dispersion among firms seems inevitable. Not all firms are going to be able to export.
- But there is a role for policy to mitigate effects:
  - One direction is to promote upgrading of all firms (including small and medium-sized), in conjunction with policies to open export markets.
  - As do rich countries, LDCs need to find mechanisms to insures people against the risks that trade may pose for them.
- Otherwise political support for liberalized trade is likely to erode, as we are seeing in the North.
References


References


Cross-sectional Evidence for Quality Differences (cont.)

A. Output prices, hollow brick (ladrillo hueco)
slope=-0.028, s.e.=0.032

B. Input prices, common clay, paid by producers of hollow brick
slope=0.026, s.e.=0.073
Cross-sectional Evidence for Quality Differences (cont.)

A. Output prices, bar soap
slope=0.055, s.e.=0.025

B. Input prices, refined rendered suet, paid by producers of bar soap
slope=0.110, s.e.=0.038

C. Input prices, unrefined rendered suet, paid by producers of bar soap
slope=0.103, s.e.=0.039