Trade, Productivity and (Mis)allocation

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Motivation

- Rapid expansion in international trade in recent decades has intensified debates about trade policy and structural reforms
  - Advanced countries: competition from low-wage countries, inequality
  - Developing countries: mixed gains, weak macro fundamentals
- How does globalization affect aggregate productivity and welfare?
  - Firm heterogeneity: selection, reallocation
  - Efficient allocation: institutional, factor, product market frictions
  - Bilateral vs. unilateral trade reforms
- This paper: theoretically and empirically examine the impact of international trade on aggregate productivity and welfare

Overview: Theory & Methodology

- Study trade impact and adjustment mechanisms in heterogeneous-firm model with and without resource misallocation
  - No misallocation: definite gains from bilateral and export liberalization, ambiguous effects of import liberalization
  - Misallocation can amplify, dampen or reverse the gains from trade: all trade reforms have ambiguous effects
- Map theoretical concepts to empirical measures
  - Firm productivity vs. measured firm productivity
  - Welfare vs. aggregate productivity vs. measured aggregate productivity
  - OP decomposition: AggProd = AvgProd + Cov(Prod,Size)

Overview: Empirics

- Exploit unique macro data that captures micro firm heterogeneity & value-added trade flows by export & import sector (ECB, WIOD)
  - 14 European countries, 20 manufacturing industries, 1998-2011
  - Establish causality using tariffs and Bartik shocks as IVs
- International trade significantly increases aggregate productivity
  - Export demand: ↑ avg prod (~3/4), ↑ prod-size covariance (~1/4)
  - Import competition: ↑ avg prod (~5/4), ↓ prod-size covariance (~-1/4)
- Mechanism: reallocation across firms under resource misallocation
  1. Results consistent only with model simulations with misallocation
  2. Trade improves firm selection, but minProd not a sufficient statistic
  3. Efficient institutions, factor and product markets amplify gains from import competition, but dampen gains from export expansion

Literature

- Macro: productivity dispersion and resource misallocation across firms contribute to productivity differences across countries
  - Restuccia & Rogerson 2008, Hsieh & Klenow 2009, Foster et al 2008, Foster et al 2016, Bartelsman et al 2013, Gopinath et al 2015, Hopenhayn 2014 …
- Trade: firm heterogeneity & reallocation across firms shape trade gains
  - Arkolakis, Costinot & Rodriguez-Clare 2012, Melitz & Redding 2014, Burstein & Cravino 2015, Pavcnik 2002, Bernard et al 2006, Harrison et al 2013 …
  - Lileeva & Trefler 2010, Bustos 2011, Bloom et al 2015, Bernard et al 2011, Goldberg et al 2010, Khandelwal & Topalova 2013, …

Contribution: embed trade and macro insights on firm heterogeneity and misallocation into integrated model of trade, welfare and productivity

Contribution: provide causal evidence for the gains from trade in a cross-section of countries yet still incorporate firm dimension

Literature

- Financial and labor market frictions distort firm-level trade activity
  - Manova 2013, Chor & Manova 2012, Foley & Manova 2015 …
  - Helpman et al 2010, Tombe 2015, Ruggieri 2018 …
- Frictions in input and output markets affect resource allocation and gains from trade
  - Khandelwal et al 2013, Chung 2018, Bai et al 2018
- Variable mark-ups result in market share misallocation and moderate pro-competitive gains from trade
  - Epifani & Gancia 2011, Edmond et al 2015, Dhingra & Morrow 2016, Feenstra & Weinstein 2017, Arkolakis et al 2018 …

Contribution: quantify the productivity gains from trade under misallocation

Contribution: distinguish between export access and import competition

Outline

1. Theory
    a. Set up
    b. Theory → empirics
    c. Predictions
    d. Counterfactuals
2. Data
3. Empirics
4. Conclusions

Theoretical Set-Up

- 2-country GE model with CES demand and monopolistic competition in differentiated sector: $U_i = H_i^{1-\beta} Q_i^{\beta}$, $Q_i^{\beta} = \left[\int_z q_i(z)^{\alpha} dz\right]^{1/\alpha}$
  - Free entry of heterogeneous firms
  - Exogenous w_i=1 if CRS outside good ($\beta < 1$), endogenous otherwise
- Production and trade technology
  - Sunk entry cost $w_i f_i^E$, fixed production cost $w_i f_i$, const marginal cost
  - Fixed export cost $w_i f_{ij}$, asymmetric iceberg trade costs τ_{ij}
- No misallocation: firms draw productivity φ from $G_i(\varphi)$
  - Marginal cost w_i/φ (Melitz 2003)
- Misallocation: firms draw productivity φ & distortion η from $H_i(\varphi, \eta)$
  - Marginal cost $w_i/\varphi\eta$ (Hsieh-Klenow 2009, Bartelsman et al 2013)

Resource Misallocation

- We interpret η as any distortion that creates a wedge b/w social marginal cost of input bundle and private marginal cost to the firm
  - Ex: imperfect institutions, capital or labor market frictions
  - Qualitatively similar to revenue distortion in product market
- Misallocation governed by σ_η and $\rho(\varphi,\eta)$
  - Trade can change misallocation outcome, but not primitives
- Firm selection, production and export activity depend on $\varphi\eta$, while optimal resource allocation would depend on φ alone
  - Distortionary taxes and subsidies covered via lump-sum taxation
  - No additional misallocation due to variable mark-ups

Firm Problem: First Best

$$\max \pi_{ij}(\varphi) = p_{ij}(\varphi)q_{ij}(\varphi) - \frac{w_i \tau_{ij} q_{ij}(\varphi)}{\varphi} - w_i f_{ij}$$

$$\text{s.t. } q_{ij}(\varphi) = \beta E_j P_{jQ}^{\sigma-1} p_{ij}(\varphi)^{-\sigma}$$

➔ $p_{ij}(\varphi) = \frac{w_i \tau_{ij}}{\alpha\varphi}$ $\qquad q_{ij}(\varphi) = \beta E_j P_{jQ}^{\sigma-1} \left(\frac{\alpha\varphi}{w_i \tau_{ij}}\right)^{\sigma}$

$l_{ij}(\varphi) = f_{ij} + \frac{\tau_{ij} q_{ij}(\varphi)}{\varphi}$ $\qquad c_{ij}(\varphi) = \left(f_{ij} + \frac{\tau_{ij} q_{ij}(\varphi)}{\varphi}\right) w_i$

$r_{ij}(\varphi) = \beta E_j \left(\frac{\alpha P_{jQ} \varphi}{w_i \tau_{ij}}\right)^{\sigma-1}$ $\qquad \pi_{ij}(\varphi) = \frac{r_{ij}(\varphi)}{\sigma} - w_i f_{ij}$

Firm Problem: Constrained Optimum

$$\max \pi_{ij}(\varphi,\eta) = p_{ij}(\varphi,\eta)q_{ij}(\varphi,\eta) - \frac{w_i\tau_{ij}q_{ij}(\varphi,\eta)}{\varphi\eta} - w_i f_{ij}$$

$$\text{s.t. } q_{ij}(\varphi,\eta) = \beta E_j P_{jQ}^{\sigma-1} p_{ij}(\varphi,\eta)^{-\sigma}$$

➔

$$p_{ij}(\varphi,\eta) = \frac{w_i\tau_{ij}}{\alpha\varphi\eta} \qquad q_{ij}(\varphi,\eta) = \beta E_j P_{jQ}^{\sigma-1}\left(\frac{\alpha\varphi\eta}{w_i\tau_{ij}}\right)^{\sigma}$$

$$l_{ij}(\varphi,\eta) = f_{ij} + \frac{\tau_{ij}q_{ij}(\varphi,\eta)}{\varphi} \qquad c_{ij}(\varphi,\eta) = \left(f_{ij} + \frac{\tau_{ij}q_{ij}(\varphi,\eta)}{\varphi\eta}\right)w_i$$

$$r_{ij}(\varphi,\eta) = \beta E_j\left(\frac{\alpha P_{jQ}\varphi\eta}{w_i\tau_{ij}}\right)^{\sigma-1} \qquad \pi_{ij}(\varphi,\eta) = \frac{r_{ij}(\varphi,\eta)}{\sigma} - w_i f_{ij}$$

Equilibrium

- Zero-profit productivity or profitability $\underline{\varphi} = \varphi\eta$ cut-offs

$$\pi_{ij}(\varphi_{ij}^*) = 0 \qquad \pi_{ij}\left(\underline{\varphi}_{ij}^*\right) = 0$$

- Free entry $\quad w_i f_i^E = \sum_j E\left[\pi_{ij}(\varphi)\mathbb{I}(\varphi \geq \varphi_{ij}^*)\right]$

- Distortionary taxes and subsidies covered via lump-sum taxation
  - Firm cost $c_{ij} = \left(f_{ij} + \frac{\tau_{ij} q_{ij}(\varphi,\eta)}{\varphi\eta}\right) w_i$, workers get $c'_{ij} = \left(f_{ij} + \frac{\tau_{ij} q_{ij}(\varphi,\eta)}{\varphi}\right) w_i$
  - Lump-sum tax $T_i = \sum_j M_i E\left\{\left[c'_{ij}(\varphi,\eta) - c_{ij}(\varphi,\eta)\right]\mathbb{I}\left(\varphi\eta \geq \underline{\varphi}_{ij}^*\right)\right\}$

- Income-expenditure balance

$$\beta Y_j = \beta\left(w_j L_j - T_j\right) = \sum_i R_{ij} = \sum_i M_i E\left[r_{ij}(\varphi,\eta)\mathbb{I}\left(\varphi\eta \geq \underline{\varphi}_{ij}^*\right)\right]$$

Welfare & Aggregate Productivity

- Welfare depends on real wage and disposable income share

$$W_i \propto \frac{w_i}{P_i}\chi_i, \quad P_i = P_{iQ}^{\beta}, \quad \chi_i = \frac{w_i L_i - T_i}{w_i L_i}$$

$$W_i \propto \begin{cases} \left(\varphi_{ii}^*\right)^{\beta} & without\ misallocation \\ (\chi_i)^{\frac{\beta+\sigma-1}{\sigma-1}} \left(\underline{\varphi}_{ii}^*\right)^{\beta} & with\ misallocation \end{cases}$$

- Agg Prod depends on real wage & weighted avg distortion

$$AggProd_i = \begin{cases} \dfrac{\sigma\theta}{\sigma\theta - (\sigma-1)} \dfrac{w_i}{P_i^{1/\beta}} & without\ misallocation \\ \dfrac{\sigma\theta}{(\sigma-1)\theta\tilde{\eta}_i + \theta - (\sigma-1)} \dfrac{w_i}{P_i^{1/\beta}} & with\ misallocation \end{cases}$$

- Misallocation affects P_i, χ_i, $\underline{\varphi}_{ii}^*$ and $\tilde{\eta}_i$

From Theory to Empirics

1. Log real value added per worker $\propto \varphi\eta$ conditional on export status

2. Aggregate productivity decomposition (Olley-Pakes 1996)

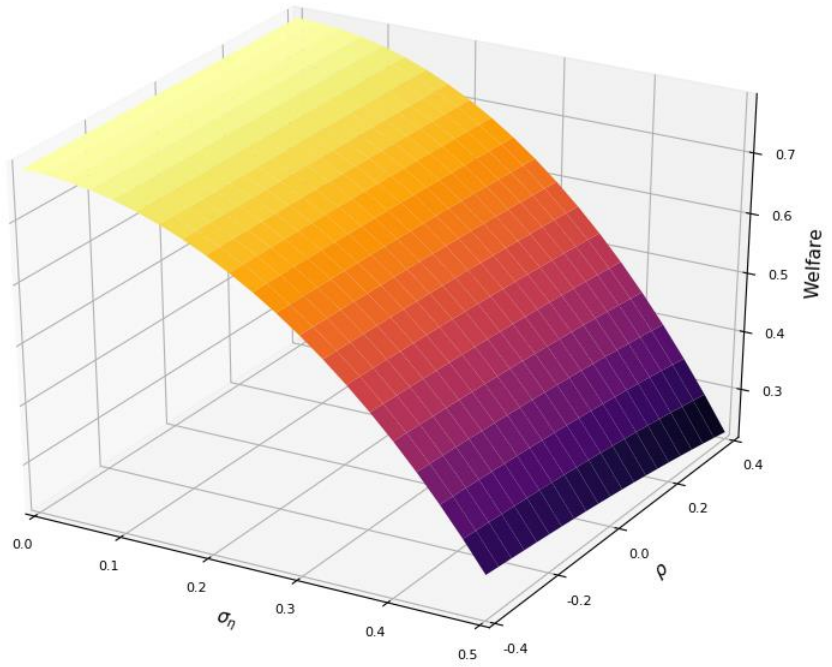
$$AggProd_{ikt} = \underbrace{\frac{1}{N_{ikt}}\sum_f Prod_{fikt}}_{AvgProd_{ikt}} + \underbrace{\sum_f \left(\theta_{fikt} - \overline{\theta_{ikt}}\right)\left(Prod_{fikt} - \overline{Prod_{ikt}}\right)}_{CovProd_{ikt}}$$

3. No observable summary statistic for misallocation or σ_η & $\rho(\varphi,\eta)$
   - $\{AggProd_i, AvgProd_i, CovProd_i\}$ response can reveal misallocation

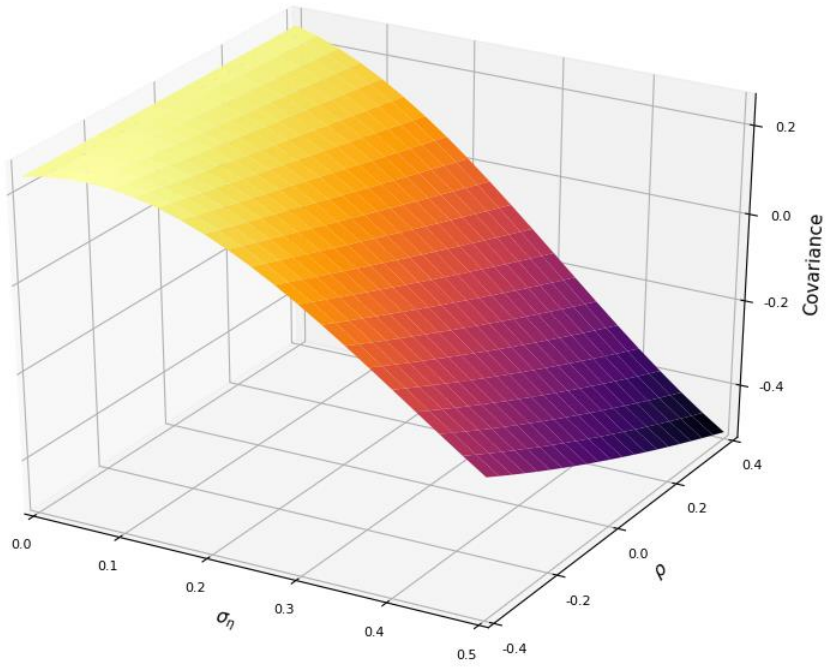
4. Welfare $\propto$ agg prod of firms selling in *i* $\neq$ agg prod of *i* firms
   - $W \propto AggProd$ only with symmetry, Pareto & efficient allocation

Welfare vs. OP Covariance

Welfare



OP Covariance



Trade Liberalization with Flexible Wages and No Misallocation

Proposition 1 With flexible wages and no misallocation,

$\downarrow(\tau_{ij},\tau_{ji})$, $\downarrow\tau_{ij}$, $\downarrow\tau_{ji}$ → $\uparrow W_i$, $\uparrow AggProd_i$, $\uparrow\downarrow AvgProd_i$, $\uparrow\downarrow CovProd_i$

- Reallocation of activity towards more productive firms → ex-post productivity distribution shifts right
- Lower export cost τ_{ij} increases export demand
  - Lower export cut-off φ_{ij}^* → higher production cut-off φ_{ii}^*
- Lower import cost τ_{ji} increases import competition
  - Lower domestic demand → higher production cut-off φ_{ii}^*

Trade Liberalization with Fixed Wages and No Misallocation

Proposition 2 With fixed wages and no misallocation,

$\downarrow(\tau_{ij},\tau_{ji})$, $\downarrow\tau_{ij}$ → $\uparrow W_i$, $\uparrow AggProd_i$, $\uparrow\downarrow AvgProd_i$, $\uparrow\downarrow CovProd_i$

$\downarrow\tau_{ji}$ → $\downarrow W_i$, $\downarrow AggProd_i$, $\uparrow\downarrow AvgProd_i$, $\uparrow\downarrow CovProd_i$

- Lower import cost τ_{ji} → lower foreign export cut-off φ_{ji}^* → higher foreign production cut-off φ_{jj}^*
  - Direct effect: tougher home market → higher home production cut-off φ_{ii}^*
  - Indirect effect: tougher foreign market → higher home export cut-off φ_{ij}^* → lower home production cut-off φ_{ii}^*
  - Metzler paradox: when w_i cannot fall, indirect effect dominates (Demidova-RodriguezClare 2013, Bagwell-Lee 2016)

Trade Liberalization with Misallocation

Proposition 3 With misallocation,

$\downarrow(\tau_{ij},\tau_{ji})$, $\downarrow\tau_{ij}$, $\downarrow\tau_{ji}$ → $\uparrow\downarrow W_i$, $\uparrow\downarrow AggProd_i$, $\uparrow\downarrow AvgProd_i$, $\uparrow\downarrow CovProd_i$

- Theory of second best: economy transitions between distorted states
- Misallocation can amplify, dampen or reverse the gains from trade
  - Reallocation depends on distorted productivity
  - Ex-post marginal productivity distribution differs from no-misallocation case, even if same ex-ante
  - Impact not monotonic in initial misallocation or parameters σ_η & $\rho(\varphi,\eta)$

Trade with vs. without Misallocation

Gains from trade depend on how different firms respond

- No misallocation: activity shifts towards more productive firms ➔ ex-post productivity distribution shifts right
- Misallocation: reallocation depends on distorted productivity ➔ ambiguous impact on ex-post marginal productivity distribution
  - Gains dampened if more productive firms cannot fully respond to growth opportunity, while less productive firms are not forced to exit
  - Gains amplified if cleansing on the extensive margin and improved allocative efficiency on the intensive margin

Numerical Simulation

- No misallocation: log-normal productivity with $\mu_\varphi = 0$, $\sigma_\varphi = 1$
- Misallocation: joint log-normal productivity and distortion with $\mu_\varphi = 0$, $\sigma_\varphi = 1$, $\mu_\eta = 0$, $\sigma_\eta = 0.15$, $\rho(\varphi, \eta) \in \{-0.4, 0, 0.4\}$
- Other model parameters (Burstein-Cravino 2015)
  - Elasticity of substitution $\sigma = 3$
  - Initial trade costs $\tau = \tau_i = \tau_e = 1.81$
  - Fixed cost of production 1.2
  - Fixed cost of exports 1.75
  - Sunk cost of entry 0.1

Numerical Simulation: Flexible Wages

- Counterfactual effects of 20% fall in variable trade costs

	Bilateral Liberalization				Export Liberalization				Import Liberalization			
	Welfare	Agg Prod	Avg Prod	Cov Term	Welfare	Agg Prod	Avg Prod	Cov Term	Welfare	Agg Prod	Avg Prod	Cov Term
No Misallocation: $\sigma_\eta=0$												
	3.92%	3.50%	2.75%	0.75%	1.39%	1.22%	0.96%	0.26%	1.95%	1.72%	1.35%	0.37%
Misallocation: $\sigma_\eta=0.15$												
$\rho-0.4$	3.92%	3.49%	2.65%	0.84%	1.40%	1.22%	0.92%	0.30%	1.96%	1.72%	1.30%	0.42%
$\rho=0$	3.87%	3.47%	2.80%	0.67%	1.37%	1.21%	0.98%	0.22%	1.93%	1.70%	1.38%	0.32%
$\rho=0.4$	3.85%	3.47%	2.94%	0.53%	1.35%	1.20%	1.04%	0.16%	1.91%	1.70%	1.46%	0.24%

Numerical Simulation: Fixed Wages

- Counterfactual effects of 20% fall in variable trade costs

	Bilateral Liberalization				Export Liberalization				Import Liberalization			
	Welfare	Agg Prod	Avg Prod	Cov Term	Welfare	Agg Prod	Avg Prod	Cov Term	Welfare	Agg Prod	Avg Prod	Cov Term
No Misallocation: $\sigma_\eta=0$												
	2.73%	3.50%	2.75%	0.75%	3.77%	4.89%	3.84%	1.05%	-0.49%	-0.60%	-0.48%	-0.12%
Misallocation: $\sigma_\eta=0.15$												
$\rho=-0.4$	-1.68%	-0.05%	-0.16%	0.11%	2.32%	2.26%	1.77%	0.49%	-3.27%	-1.55%	-1.37%	-0.18%
$\rho=0$	2.70%	3.48%	2.81%	0.67%	2.62%	4.46%	3.54%	0.91%	0.58%	-0.21%	-0.13%	-0.08%
$\rho=0.4$	0.92%	7.71%	6.42%	1.29%	0.15%	8.47%	7.11%	1.36%	1.38%	0.03%	0.11%	-0.09%

Robustness & Extensions

- Key results survive various sensitivity checks
  - Fixed mass of firms (but no Metzler without misallocation)
  - No misallocation or asymmetric misallocation in foreign
- Model extensions motivate identification strategy
  - Multiple differentiated sectors
  - Export cost shocks ~ foreign demand shocks,
    import cost shocks ~ foreign supply shocks

Outline

1. Theory
2. Data
3. Empirics
4. Conclusions

ECB CompNet Productivity Data

- Cross-country, cross-sector panel data on macro aggregates and micro heterogeneity 1998-2011 (Lopez-Garcia et al 2015)
  - Standardized aggregation of firm-level data
  - 14 countries: Austria, Belgium, Estonia, Finland, France, Germany, Hungary, Italy, Lithuania, Poland, Portugal, Slovakia, Slovenia, Spain
- Indicators for firm labor productivity, capital productivity, TFP, size
  - Multiple moments of each distribution and joint distributions
  - Olley-Pakes (1996) decomposition of aggregate productivity
  - Annual growth: mean 3.21, st dev 1.13

WIOD Trade Data

- Annual bilateral trade data in value added by export sector and import sector of final use
  - X_{ijkst}: gross sales from input sector k in origin i to sector s in destination j in year t

- Trade exposure in country i, sector k, year t
  - Export demand: mean 7.65, st dev 1.74

$$ExpDemand_{ikt} = \ln\left[\sum_{j \neq i,s} X_{ijkst}\right]$$

  - Import competition: mean 6.41, st dev 1.97

$$ImpComp_{ikt} = \ln\left[\sum_{j \neq i,s \neq k} X_{jikst}\right]$$

Outline

1. Theory
2. Data
3. Empirics
    a. OLS correlation
    b. IV causality
    c. Robustness
    d. Mechanisms
4. Conclusions

OLS Correlations

- Long-run correlation between aggregate productivity and trade exposure

$$Y_{ikt} = \alpha + \beta_1 \cdot ExpDemand_{ikt} + \beta_2 \cdot ImpComp_{ikt} + \Gamma \cdot Z_{ikt} + \varphi_{it} + \varepsilon_{ikt}$$

  - Y_{ikt} : productivity measure in country i, sector k, year t
  - Z_{ikt} : # firms ($\ln N_{ikt}$), sector trends ($\ln N_{kt}$, $\ln L_{kt}$)
  - φ_{it} : 14 country * 14 year FE
    (subsume GDP per capita, GDP, institutions, macro shocks)
  - ε_{ikt} : clustered by sector-year

Measurement Error & Sample Selection

- Size threshold varies across countries
  - Include country fixed effects
  - Control for $\ln N_{ikt}$
- Outliers
  - Drop observations with $N_{ikt} < 20$
  - Drop observations in top and bottom percentile by annual change in Y_{ikt}, $ExpDemand_{ikt}$, $ImpComp_{ikt}$, $\ln N_{ikt}$

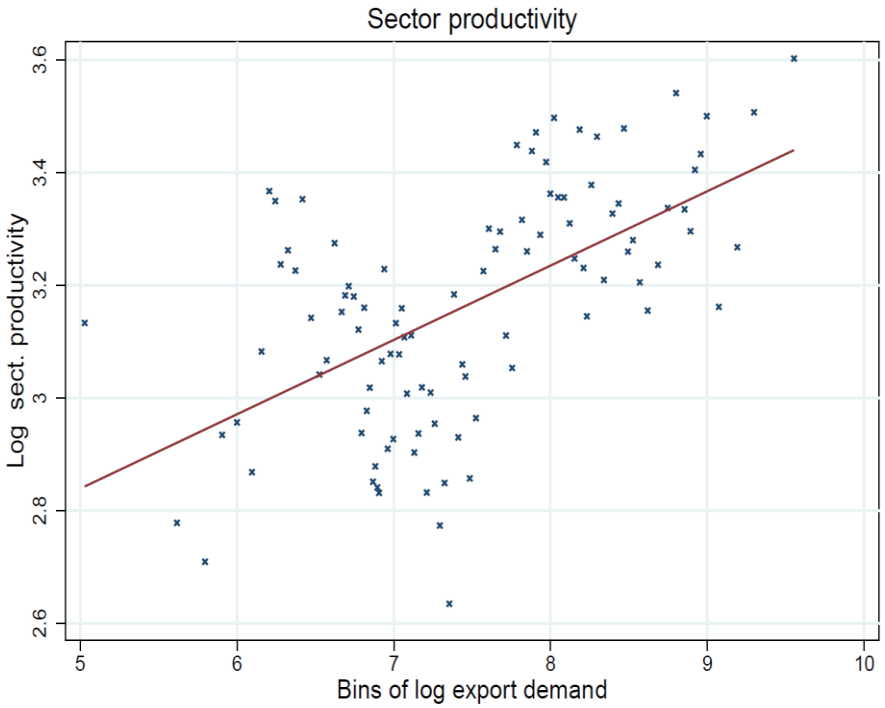
OLS Correlations

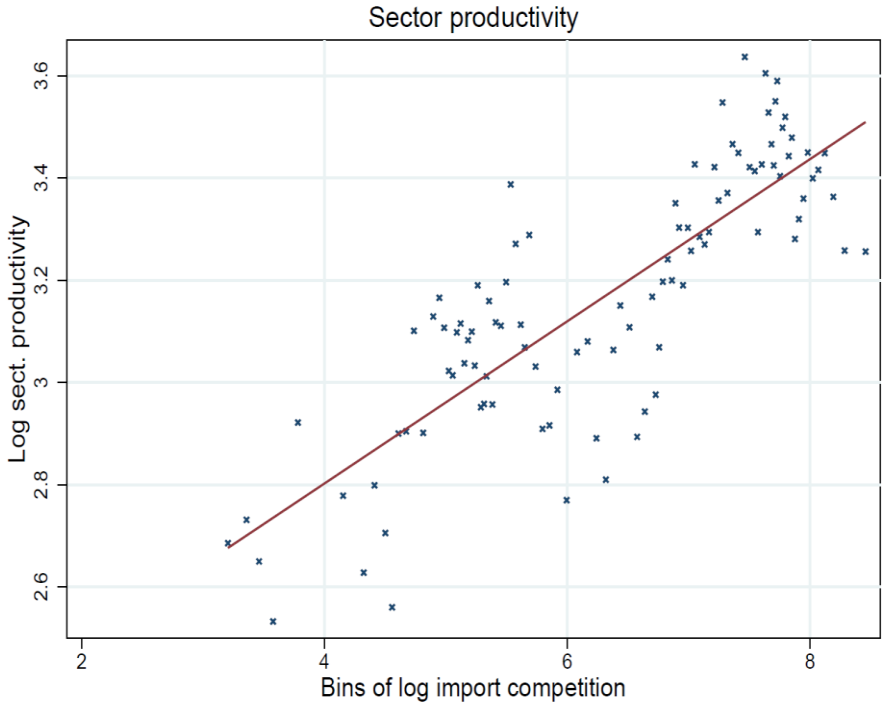
- 20% ↑ exports, ↑ imports ↔ 2.1%-2.5% ↑ aggregate productivity
  - ↑ exports ↔ ↑ avg firm productivity, ↑ allocative efficiency
  - ↑ imports ↔ ↑ avg firm productivity, ↓ allocative efficiency

	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
Exp Dem (ikt)	**0.125*** **	**0.080*** **	**0.045*** **
	(0.016)	**(0.016)**	**(0.007)**
Imp Comp (ikt)	**0.106*** **	**0.124*** **	**-0.019*** **
	(0.013)	**(0.013)**	**(0.005)**
N	2,811	2,811	2,811
R2	0.849	0.868	0.519
Country*Year FE	Y	Y	Y

Bin Scatter Correlations

- Aggregate productivity and trade activity across country-sector-year triplets in 100 bins, after demeaning by country-year FE





OLS Endogeneity

$$Y_{ikt} = \alpha + \beta_1 \cdot ExpDemand_{ikt} + \beta_2 \cdot ImpComp_{ikt} + \Gamma \cdot Z_{ikt} + \varphi_{it} + \varepsilon_{ikt}$$

- Reverse causality
  - More productive countries may export more because they are more competitive on world markets → β_1 biased +
  - Lower local productivity may induce more entry by foreign exporters → β_2 biased –
- Omitted variable bias
  - Country-year FE control for aggregate supply and demand shocks
  - OVB must vary systematically across sectors within country-years

IV Causality

$$Y_{ikt} = \alpha + \beta_1 \cdot \widehat{ExpDemand}_{ikt} + \beta_2 \cdot \widehat{ImpComp}_{ikt} + \Gamma \cdot Z_{ikt} + \varphi_{it} + \varepsilon_{ikt}$$

$$\{ExpDemand_{ikt}, ImpComp_{ikt}\} = \alpha_{IV} + \Gamma_{IV} \cdot Z_{ikt} + \Theta \cdot IV_{ikt} + \phi_{it} + \epsilon_{ikt}$$

- Ideal instruments: relevance and validity
  - $ExpDemand_{ikt}$: exogenous foreign demand for ik goods, not i's endogenous export supply of k goods
  - $ImpComp_{ikt}$: exogenous foreign supply of k goods to i, not i's endogenous import demand for k goods

Instruments

- Initial trade structure of each country-sector + contemporaneous trade flows of each trade partner (Hummels et al AER 2014, Berman et al JIE 2015)

- IV for $ExpDemand_{ikt}$
  - Foreign demand: weighted average absorption by i's export destinations, using i's initial export shares as weights (WIOD)

$$FDemand_{ikt} = \ln\left[\sum_{j \neq i} \frac{X_{ijk,t=0}}{X_{ik,t=0}} \left(Y_{jkt} + M_{-i,jkt} - X_{-i,jkt}\right)\right]$$

- IV for $ImpComp_{ikt}$
  - Foreign supply: weighted average export value added for final consumption by i's import origins, using i's initial import shares as weights (WIOD)

$$FSupply_{ikt} = \ln\left[\sum_{j \neq i} \frac{M_{ijk,t=0}}{M_{ik,t=0}} XVA^{final}_{-i,jkt}\right]$$

  - Import tariffs $MTariff_{ikt}$: average applied tariff (WITS)

IV Relevance (First Stage)

	Exp Dem (ikt)		Imp Comp (ikt)	
Foreign Demand (ikt)	**0.638*** **	**0.443*** **	**-0.002**	**-0.036**
	(0.034)	**(0.062)**	**(0.022)**	**(0.030)**
Foreign Supply (ikt)	**0.087*** **	**0.140***	**0.868*** **	**0.345*** **
	(0.015)	**(0.081)**	**(0.007)**	**(0.031)**
Import Tariff (ikt)	**-4.693*** **	**0.662**	**-2.802*** **	**-1.332*** **
	(0.847)	**(0.816)**	**(0.507)**	**(0.437)**
ln N Firms (ikt)	0.555***	0.569***	0.036**	0.007
	(0.034)	(0.032)	(0.018)	(0.016)
Avg ln N Firms (kt)	-0.741***		-0.112***	
	(0.033)		(0.025)	
Avg ln Employment (kt)	0.344***		0.113***	
	(0.065)		(0.042)	
N	2,777	2,777	2,777	2,777
R2	0.889	0.924	0.974	0.986
Country*Year FE	Y	Y	Y	Y
Sector*Year FE	N	Y	N	Y

IV Causal Effects (Second Stage)

- 20% ↑ exp demand (imp compet) → 7.3-8% (1.4-10%) ↑ agg prod
  - Exp demand: ↑ avg prod (~ 3/4), ↑ prod-size covariance (~ 1/4)
  - Imp compet: ↑ avg prod (~ 5/4), ↓ prod-size covariance (~ -1/4)

	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
^Exp Dem (ikt)	**0.398*** **	**0.295*** **	**0.103*** **	**0.367*** **	**0.226** **	**0.141*** **
	(0.039)	**(0.039)**	**(0.014)**	**(0.109)**	**(0.098)**	**(0.050)**
^Imp Comp (ikt)	**0.068*** **	**0.090*** **	**-0.021*** **	**0.502*** **	**0.585*** **	**-0.083**
	(0.014)	**(0.014)**	**(0.005)**	**(0.185)**	**(0.166)**	**(0.059)**
N	2,777	2,777	2,777	2,777	2,777	2,777
R2	0.820	0.852	0.485	0.856	0.887	0.649
Ctry*Year FE, Controls	Y	Y	Y	Y	Y	Y
Sector*Year FE	N	N	N	Y	Y	Y

Sensitivity & Extensions

- Sensitivity
  - Single trade dimension
  - 1-year lagged effects
  - Import penetration ratio
  - Winsorize at 1st and 99th perc
- Extensions
  - Sector weights
  - China vs. ROW
  - Skill dispersion
  - Markup dispersion

Sector Weights

Dep Variable:	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
Panel A. Country-Sector Weights: Initial Share of Manuf Employment, L (ikt=0) / L^M (it=0)						
^Exp Dem (ikt)	0.427***	0.360***	0.067***	0.467***	0.359***	0.108***
	(0.039)	(0.036)	(0.011)	(0.102)	(0.090)	(0.039)
^Imp Comp (ikt)	0.075***	0.092***	-0.017***	0.498***	0.494***	0.004
	(0.015)	(0.014)	(0.005)	(0.151)	(0.141)	(0.043)
Panel B. Country-Year Weights: Manufacturing Share of Total Employment, L^M (it) / L (it)						
^Exp Dem (ikt)	0.385***	0.288***	0.097***	0.436***	0.267***	0.168***
	(0.037)	(0.036)	(0.013)	(0.112)	(0.101)	(0.052)
^Imp Comp (ikt)	0.069***	0.091***	-0.022***	0.703***	0.811***	-0.108*
	(0.014)	(0.014)	(0.005)	(0.193)	(0.175)	(0.063)

China vs. ROW Import Competition

- How do firms respond to competition from foreign firms with relatively low vs. high levels of productivity, factor costs, and quality?

- Dramatic rise in Chinese exports since WTO accession in 2001 and removal of MFA quotas in 2005
  - Large shock ~ quasi-natural experiment (Autor et al 2015, Bloom et al 2015)

$$ChinaImpComp_{ikt} = \ln\left[\sum_{s \neq k} X_{China \rightarrow i,kst}\right]$$

- IV for $ChinaImpComp_{ikt}$
  - Import tariffs $Tariff_{ikt}$
  - Chinese export supply: Chinese export value added for final consumption, weighted by China's share in i's initial imports

$$ChinaSupply_{ikt} = \ln\left[\frac{M_{China \rightarrow i,k,t=0}}{M_{ik,t=0}} XVA^{final}_{-i,China,kt}\right]$$

China vs. ROW Import Competition

Dep Variable:	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
Panel C. Import Competition from China vs. ROW						
^Exp Dem (ikt)	0.371***	0.290***	0.082***	0.337***	0.200**	0.137***
	(0.038)	(0.038)	(0.013)	(0.104)	(0.093)	(0.047)
^Imp Comp ROW (ikt)	0.082***	0.086***	-0.004	0.398**	0.484***	-0.086
	(0.015)	(0.015)	(0.006)	(0.182)	(0.163)	(0.067)
^Imp Comp China (ikt)	-0.015	0.005	-0.019***	0.136**	0.141***	-0.005
	(0.014)	(0.014)	(0.004)	(0.058)	(0.051)	(0.023)

Skill and Mark-Up Dispersion

Dep Variable:	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
Panel D. OVB: Skill Dispersion						
^Exp Dem (ikt)	0.394***	0.291***	0.103***	0.364***	0.224**	0.140***
	(0.039)	(0.038)	(0.014)	(0.109)	(0.099)	(0.050)
^Imp Comp (ikt)	0.066***	0.088***	-0.022***	0.501***	0.584***	-0.083
	(0.014)	(0.014)	(0.005)	(0.184)	(0.165)	(0.059)
90-10 Wage Ratio (ikt)	-0.001**	-0.001**	-0.000	-0.001**	-0.001*	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Panel E. OVB: Mark-Up Dispersion						
^Exp Dem (ikt)	0.397***	0.294***	0.103***	0.367***	0.226**	0.141***
	(0.039)	(0.039)	(0.014)	(0.109)	(0.098)	(0.050)
^Imp Comp (ikt)	0.068***	0.090***	-0.022***	0.509***	0.591***	-0.082
	(0.014)	(0.014)	(0.005)	(0.184)	(0.165)	(0.059)
90-10 PCM Ratio (ikt)	-0.000	-0.000	-0.000	-0.000*	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Mechanisms

Interpretation:

Trade shapes aggregate productivity via the reallocation of activity across heterogeneous firms in the presence of resource misallocation

Justification: three testable and falsifiable predictions

1. Empirical results for {AggProd, AvgProd, CovProd} are consistent only with numerical simulations of the model with misallocation
2. Measured min firm productivity is not a summary statistic for the effect of trade, but it should be without misallocation
3. Institutions modify trade impact, and they could only if misallocation

Firm Selection

- Trade increases min firm productivity
- Firm selection = 1/3 (2/3) ExpDem (ImpComp) effect on AggProd
  = 1/2 effect on AvgProd

	ln min Prod (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
^Exp Dem (ikt)	**0.198*** **	**0.275*** **	**0.152*** **	**0.124*** **
	(0.040)	**(0.027)**	**(0.020)**	**(0.013)**
^Imp Comp (ikt)	**0.073*** **	**0.026*** **	**0.039*** **	**-0.013** **
	(0.015)	**(0.010)**	**(0.007)**	**(0.005)**
ln min Prod (ikt)		0.642***	0.733***	-0.091***
		(0.025)	(0.018)	(0.011)
N	2,750	2,750	2,750	2,750
R2	0.911	0.913	0.948	0.473
Ctry*Year FE, Controls	Y	Y	Y	Y

Institutional and Market Frictions

- Rule of Law : index of overall institutional capacity
  - Mean 1.11, st dev 0.49 ***World Bank Governance Indicators***
- (Inverse) Corruption: perceived use of public power for private gain
  - Mean 1.07, st dev 0.69 ***World Bank Governance Indicators***
- Labor Market Flexibility : avg of 21 indicators for firing & hiring costs
  - Mean 3.28, st dev 0.37 ***OECD Employment Database***
- Creditor Rights' Protection : index of financial contractibility
  - Mean 5.86, st dev 1.79 ***World Bank Doing Business***
- (Inverse) Product Market Regulation : avg of 18 indicators for state control, barriers to entrepreneurship, barriers to trade and investment
  - Mean 1.17, st dev 0.25 ***OECD Market Regulation***

Institutional and Market Frictions

- Efficient institutions, factor and product markets amplify gains from import competition, but dampen gains from export expansion

	ln Agg Prod (ikt)				
Institution Measure:	Rule of Law	(Inverse) Corruption	Labor Market Flexibility	Creditor Rights Protection	(Inverse) Product Market Regulation
	(1)	(2)	(3)	(4)	(5)
^Exp Dem (ikt)	1.066***	0.850***	1.121***	0.718***	1.314***
	(0.126)	(0.096)	(0.261)	(0.158)	(0.172)
^Imp Comp (ikt)	-0.113**	-0.063*	-0.202**	-0.108*	-0.045
	(0.050)	(0.038)	(0.096)	(0.061)	(0.061)
^Exp Dem (ikt) x Institution (it)	**-0.476*** (0.067)**	**-0.302*** (0.042)**	**-0.218*** (0.069)**	**-0.048** (0.019)**	**-0.769*** (0.130)**
^Imp Comp (ikt) x Institution (it)	**0.136*** (0.031)**	**0.095*** (0.020)**	**0.083*** (0.027)**	**0.028*** (0.009)**	**0.085* (0.046)**
N	2,777	2,777	2,777	2,777	2,777
R2	0.792	0.797	0.747	0.811	0.825
Ctry*Year FE, Controls	Y	Y	Y	Y	Y

Conclusions

- Theoretically, trade liberalization can have ambiguous welfare and productivity effects
- Empirically, export demand and import competition both increase aggregate productivity, but through different channels
  - Reallocation across firms matters
  - Misallocation matters, and it matters asymmetrically
- Policy implications
  - Impact of trade shocks (Brexit, US-China trade war, TPP, TIPP)
  - Optimal design of trade policy and structural reforms

Equilibrium with No Misallocation

- Zero-profit productivity cut-offs $\pi_{ij}\left(\varphi_{ij}^{*}\right) = 0$
- Free entry $w_i f_i^E = \sum_j E\left[\pi_{ij}(\varphi)\mathbb{I}(\varphi \geq \varphi_{ij}^{*})\right]$
- Labor market clearing (if no outside sector)

$$L_i = \sum_j M_i E[l_{ij}(\varphi)\mathbb{I}\left(\varphi \geq \varphi_{ij}^{*}\right)] + M_i f_i^E$$

- Income-expenditure balance

$$\beta Y_j = \beta w_j L_j = \sum_i R_{ij} = \sum_i M_i E[r_{ij}(\varphi)\mathbb{I}\left(\varphi \geq \varphi_{ij}^{*}\right)]$$

Equilibrium with Misallocation

- Zero-profit profitability $\underline{\varphi} = \varphi\eta$ cut-offs $\quad \pi_{ij}\left(\underline{\varphi}_{ij}^{*}\right) = 0$
  - Free entry and labor market clearing conditions adjusted accordingly
- Distortionary taxes and subsidies covered via lump-sum taxation
  - Firm incurs cost $c_{ij} = \left(f_{ij} + \frac{\tau_{ij} q_{ij}(\varphi,\eta)}{\varphi\eta}\right) w_i$
  - But workers receive $c'_{ij} = \left(f_{ij} + \frac{\tau_{ij} q_{ij}(\varphi,\eta)}{\varphi}\right) w_i$
  - Lump-sum tax $T_i = \sum_j M_i E\left\{\left[c'_{ij}(\varphi,\eta) - c_{ij}(\varphi,\eta)\right] \mathbb{I}\left(\varphi\eta \geq \underline{\varphi}_{ij}^{*}\right)\right\}$
- Income-expenditure balance

$$\beta Y_j = \beta\left(w_j L_j - T_j\right) = \sum_i R_{ij} = \sum_i M_i E\left[r_{ij}(\varphi,\eta) \mathbb{I}\left(\varphi\eta \geq \underline{\varphi}_{ij}^{*}\right)\right]$$

From Theory to Empirics

1. Theoretical vs. measured firm productivity
   - Theoretical notion φ is quantity-based (TFPQ), while empirical measures are revenue-based (TFPR, LPR)
   - Measured real value added per worker Φ is monotonic in φη conditional on export status

$$\Phi_i(\varphi) = \frac{r_i(\varphi)}{P_i^{1/\beta} l_i(\varphi)} = \frac{w_i}{\alpha P_i^{1/\beta}} \left[1 - \frac{\sum_j f_{ij} \mathbb{I}\left(\varphi \geq \varphi_{ij}^*\right)}{\sum_j l_{ij}(\varphi) \mathbb{I}\left(\varphi \geq \varphi_{ij}^*\right)} \right]$$

$$\Phi_i(\varphi, \eta) = \frac{r_i(\varphi, \eta)}{P_i^{1/\beta} l_i(\varphi, \eta)} = \frac{w_i}{\alpha P_i^{1/\beta} \eta} \left[1 - \frac{\sum_j f_{ij} \mathbb{I}\left(\varphi\eta \geq \underline{\varphi}_{ij}^*\right)}{\sum_j l_{ij}(\varphi) \mathbb{I}\left(\varphi\eta \geq \underline{\varphi}_{ij}^*\right)} \right]$$

From Theory to Empirics

2. Measured aggregate productivity decomposition
   - Agg productivity = avg firm productivity + covariance of firm productivity and employment share (Olley-Pakes 1996, Melitz-Polanec 2015)

$$\tilde{\Phi}_i = \overline{\Phi}_i + \ddot{\Phi}_i = \int_{\varphi_{ii}^*}^{\infty} \Phi_i(\varphi) \frac{dG_i(\varphi)}{1 - G_i(\varphi_{ii}^*)} + \int_{\varphi_{ii}^*}^{\infty} \left[\Phi_i(\varphi) - \overline{\Phi}_i\right]\left[\theta_i(\varphi) - \overline{\theta}_i\right] \frac{dG_i(\varphi)}{1 - G_i(\varphi_{ii}^*)}$$

$$\Leftrightarrow AggProd_{ikt} = \underbrace{\frac{1}{N_{ikt}} \sum_f Prod_{fikt}}_{AvgProd_{ikt}} + \underbrace{\sum_f \left(\theta_{fikt} - \overline{\theta_{ikt}}\right)\left(Prod_{fikt} - \overline{Prod_{ikt}}\right)}_{CovProd_{ikt}}$$

   - $\ddot{\Phi}_i > 0$ without misallocation, $\ddot{\Phi}_i \gtrless 0$ with misallocation
   - f, i, k, t : firm, country, sector, year

From Theory to Empirics

3. No observable summary statistic for misallocation or σ_η & $\rho(\varphi,\eta)$
   - Optimal resource allocation depends on demand / cost / market structure and productivity distribution
   - $CovProd_i$ is not monotonic in misallocation and $\Delta CovProd_i > 0$ does not imply improvement in allocative efficiency (Bartelsman et al 2013)
   - But numerical exercises indicate that trade effect on $\{AggProd_i, AvgProd_i, CovProd_i\}$ can reveal misallocation

From Theory to Empirics

4. Welfare vs. measured aggregate productivity

- Welfare ∝ agg prod across firms selling in *i* ≠ agg prod across *i* firms

$$AggProd_i = \begin{cases} \dfrac{\sigma\theta}{\sigma\theta-(\sigma-1)}\dfrac{w_i}{P_i^{1/\beta}} & without\ misallocation \\ \dfrac{\sigma\theta}{(\sigma-1)\theta\tilde{\eta}_i+\theta-(\sigma-1)}\dfrac{w_i}{P_i^{1/\beta}} & with\ misallocation \end{cases}$$

- Size-weighted avg distortion across firms $\tilde{\eta}_i = \dfrac{\sum_j \int \int_{\varphi\eta \geq \underline{\varphi}_{ij}^*}^{\infty} \eta r_{ij}(\varphi,\eta) dH_i(\varphi,\eta)}{\sum_j \int \int_{\varphi\eta \geq \underline{\varphi}_{ij}^*}^{\infty} r_{ij}(\varphi,\eta) dH_i(\varphi,\eta)}$
- $W_i \propto AggProd_i$ only with symmetry, Pareto and no misallocation
- W_i and $AggProd_i$ tend to comove in simulations with efficient allocation

CompNet Data Coverage

	Years	# Sector-Years	Avg # Firms per Sector-Year
AUSTRIA	2000-2011	178	68
BELGIUM	1998-2010	254	709
ESTONIA	1998-2011	157	218
FINLAND	1999-2011	233	573
FRANCE	1998-2009	231	3,559
GERMANY	1998-2011	274	721
HUNGARY	2003-2011	164	1,484
ITALY	2001-2011	218	4,356
LITHUANIA	2000-2011	179	263
POLAND	2005-2011	128	709
PORTUGAL	2006-2011	110	1,637
SLOVAKIA	2001-2011	182	109
SLOVENIA	1998-2011	232	216
SPAIN	1998-2011	271	3,192

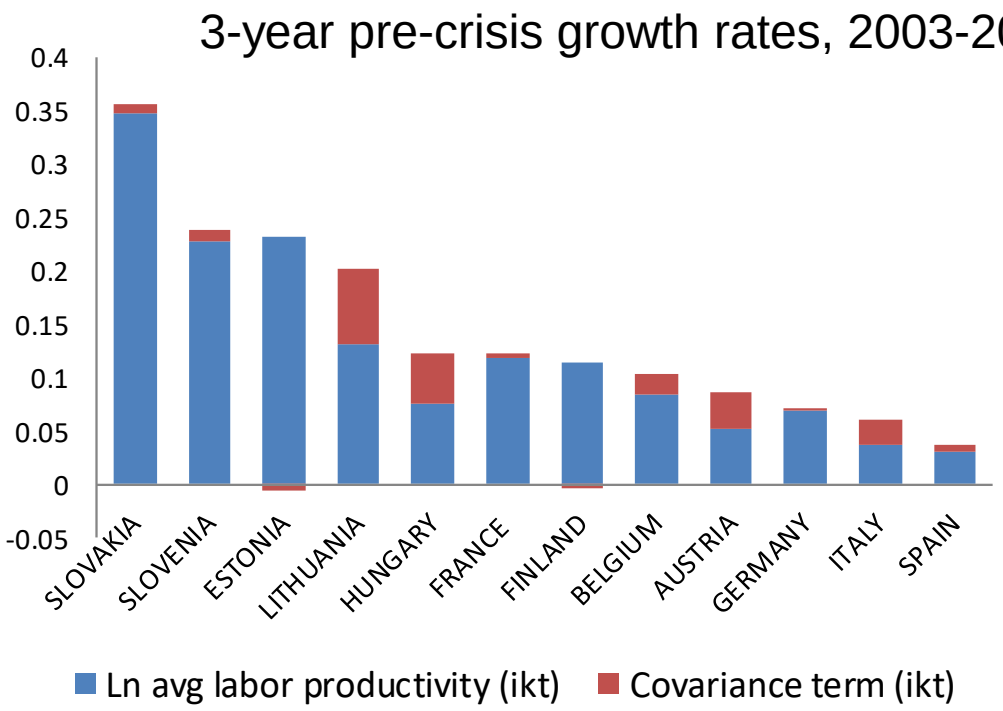
Summary Statistics

- Cov term ≈ 7.2% of agg productivity level and 19% of its variance

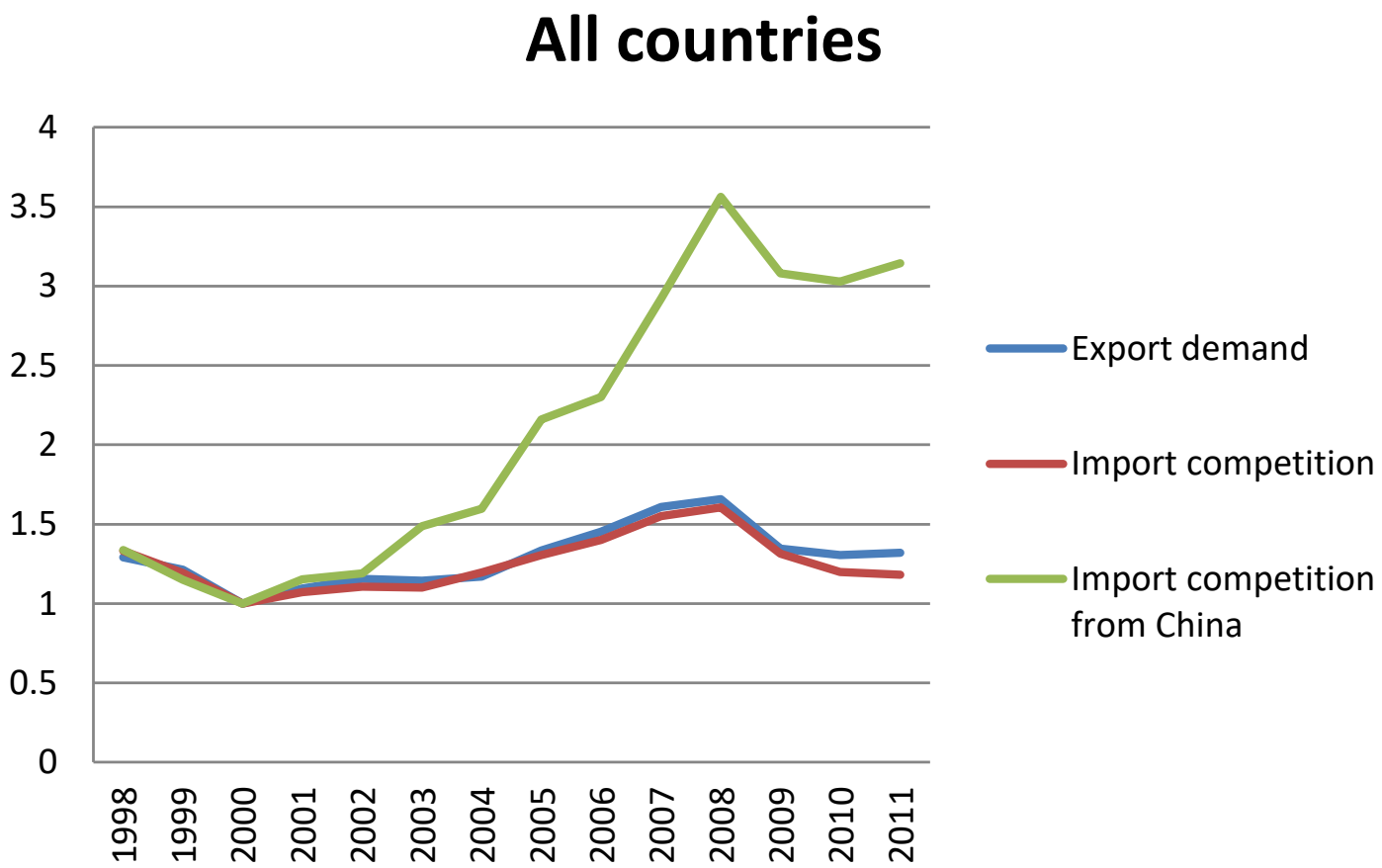
	Aggregate Productivity	Average Productivity	Covariance Term
Avg across countries, sectors, years	3.21	2.98	0.23
St dev across countries, sectors, years	1.13	1.19	0.22
Avg change: 1 year	0.04	0.03	0.01
Avg change: 3 years	0.11	0.09	0.02
Avg change: 5 years	0.18	0.16	0.02

ECB CompNet Productivity Data

- 14 countries: Austria, Belgium, Estonia, Finland, France, Germany, Hungary, Italy, Lithuania, Poland, Portugal, Slovakia, Slovenia, Spain
  - Annual growth by country-sector 1998-2011: mean 3.21, st dev 1.13

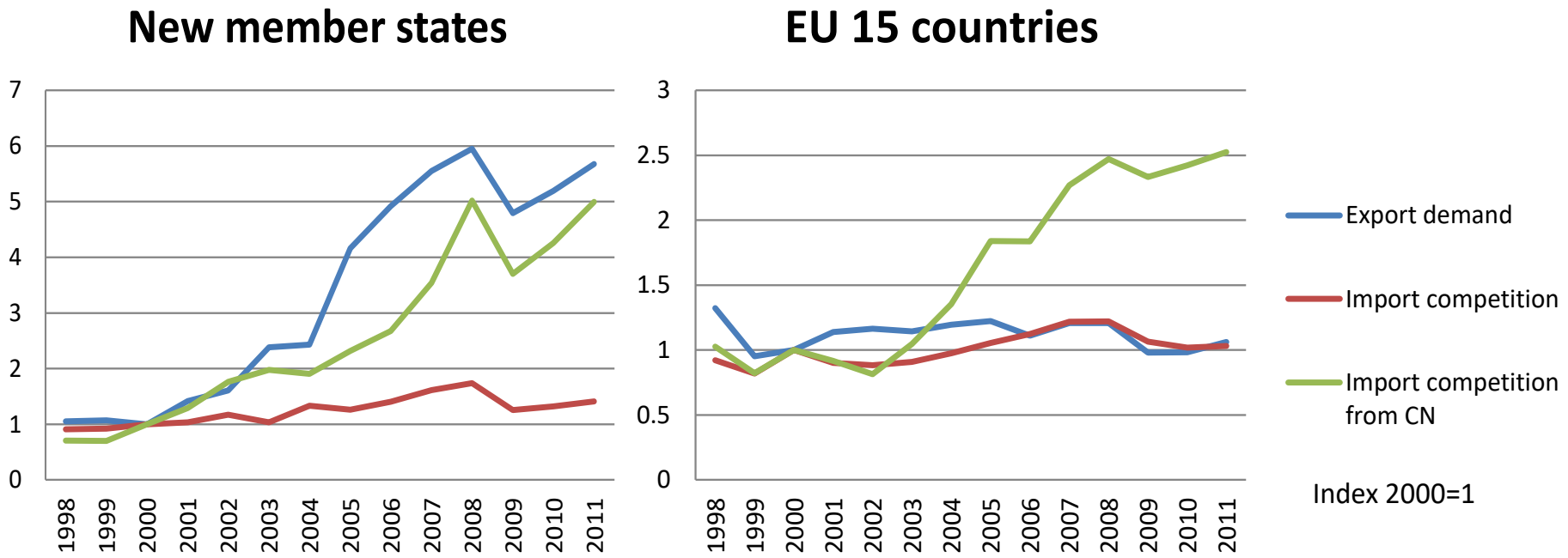


Trade Exposure over Time (Index 2000 = 1)



WIOD Trade Data

- Large variation in trade exposure across countries, sectors, years
  - Exports: mean 7.65, st dev 1.74
  - Imports: mean 6.41, st dev 1.97



Aggregate Performance

- ↑ exports ↔ ↑ output, value added, employment
- ↑ imports ↔ ↓ output & employment, ↑ value added

	ln Output (ikt)	ln Value Added (ikt)	ln Employ-ment (ikt)
Exp Dem (ikt)	**0.403*** **	**0.380*** **	**0.243*** **
	(0.029)	**(0.022)**	**(0.014)**
Imp Comp (ikt)	**-0.139*** **	**0.041*** **	**-0.066*** **
	(0.015)	**(0.015)**	**(0.006)**
ln N Firms (ikt)	0.552***	0.573***	0.736***
	(0.023)	(0.023)	(0.019)
Avg ln N Firms (kt)	-0.969***	-0.710***	-0.727***
	(0.032)	(0.033)	(0.023)
Avg ln Employment (kt)	1.285***	0.653***	0.858***
	(0.065)	(0.045)	(0.028)
N	2,811	2,811	2,811
R2	0.927	0.928	0.949
Country*Year FE	Y	Y	Y

OLS First Differences

- OLS estimate of the short- to medium-run relationship between aggregate productivity and trade exposure

$$\Delta Y_{ikt} = \alpha + \beta_1 \cdot \Delta ExpDemand_{ikt} + \beta_2 \cdot \Delta ImpComp_{ikt} + \Gamma \cdot \Delta Z_{ikt} + \varphi_t + \varepsilon_{ikt}$$

  - ΔY_{ikt} : 1-, 3- or 5-year change in productivity, overlapping periods
  - $\Delta ExpDemand_{ikt}$, $\Delta ImpComp_{ikt}$, ΔZ_{ikt} : concurrent or lagged change
  - country x sector FE differenced out
  - φ_t : trends in productivity growth
  - ε_{ikt} : robust standard errors

Trade-Productivity Nexus in the Short to Medium Term

	Δ = 1 year			Δ = 3 years			Δ = 5 years		
	Δ ln Agg Prod (ikt)	Δ ln Avg Prod (ikt)	Δ Cov Term (ikt)	Δ ln Agg Prod (ikt)	Δ ln Avg Prod (ikt)	Δ Cov Term (ikt)	Δ ln Agg Prod (ikt)	Δ ln Avg Prod (ikt)	Δ Cov Term (ikt)
Δ Exp Dem (ikt)	**0.116*** **	**0.034**	**0.082*** **	**0.142*** **	**0.053***	**0.089*** **	**0.162*** **	**0.088*** **	**0.074*** **
	(0.028)	**(0.025)**	**(0.027)**	**(0.027)**	**(0.027)**	**(0.018)**	**(0.032)**	**(0.031)**	**(0.019)**
Δ Imp Comp (ikt)	**0.083*** **	**0.102*** **	**-0.019**	**0.062** **	**0.102*** **	**-0.040** **	**0.078*** **	**0.108*** **	**-0.030***
	(0.021)	**(0.022)**	**(0.019)**	**(0.025)**	**(0.024)**	**(0.017)**	**(0.030)**	**(0.027)**	**(0.016)**
N	2,546	2,546	2,546	2,073	2,073	2,073	1,587	1,587	1,587
R2	0.114	0.115	0.022	0.101	0.117	0.044	0.096	0.094	0.035
Year FE, Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y

Robustness: Sector FE

	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
^Exp Dem (ikt)	**0.300*** **	**0.197** **	**0.103** **
	(0.097)	**(0.085)**	**(0.045)**
^Imp Comp (ikt)	**0.294** **	**0.296** **	**-0.002**
	(0.131)	**(0.118)**	**(0.042)**
N	2,777	2,777	2,777
R2	0.869	0.897	0.635
Ctry*Year FE, Controls	Y	Y	Y
Sector FE	Y	Y	Y

Robustness: Single Trade Dimension

	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
Panel A. Only Export Demand						
^Exp Dem (ikt)	0.461***	0.350***	0.111***	0.417***	0.304***	0.114**
	(0.039)	(0.041)	(0.018)	(0.112)	(0.097)	(0.047)
Panel B. Only Import Competition						
^Imp Comp (ikt)	0.148***	0.149***	-0.001	0.730***	0.728***	0.001
	(0.013)	(0.015)	(0.005)	(0.150)	(0.142)	(0.050)
Ctry*Year FE, Controls	Y	Y	Y	Y	Y	Y
Sector*Year FE	N	N	N	Y	Y	Y

Robustness: Lagged Trade Effects

	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
^Exp Dem (ikt-1)	**0.395*** **	**0.292*** **	**0.103*** **	**0.297*** **	**0.179***	**0.118** **
	(0.041)	**(0.041)**	**(0.014)**	**(0.102)**	**(0.092)**	**(0.049)**
^Imp Comp (ikt-1)	**0.069*** **	**0.091*** **	**-0.022*** **	**0.500*** **	**0.569*** **	**-0.069**
	(0.015)	**(0.014)**	**(0.006)**	**(0.180)**	**(0.163)**	**(0.062)**
Ctry*Year FE, Controls	Y	Y	Y	Y	Y	Y
Sector*Year FE	N	N	N	Y	Y	Y

Robustness: Import Penetration Ratio

$$ImpCompRatio_{ikt} = \ln \frac{\sum_{j,s \neq k} X_{jikst}}{Turnover_{ik}}$$

	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
^Exp Dem (ikt)	**0.433*** **	**0.329*** **	**0.104*** **	**0.465*** **	**0.345*** **	**0.121** **
	(0.038)	**(0.038)**	**(0.013)**	**(0.140)**	**(0.124)**	**(0.058)**
^Imp Comp Ratio (ikt)	**0.101*** **	**0.144*** **	**-0.043*** **	**0.153*** **	**0.181*** **	**-0.028**
	(0.020)	**(0.020)**	**(0.010)**	**(0.053)**	**(0.047)**	**(0.024)**
N	2,777	2,777	2,777	2,777	2,777	2,777
R2	0.811	0.845	0.495	0.860	0.891	0.652
Ctry*Year FE, Controls	Y	Y	Y	Y	Y	Y
Sector*Year FE	N	N	N	Y	Y	Y

Robustness: Winsorizing Outliers

	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
Winsorizing Outliers						
^Exp Dem (ikt)	0.393***	0.301***	0.092***	0.206*	0.078	0.127*
	(0.039)	(0.039)	(0.014)	(0.120)	(0.122)	(0.067)
^Imp Comp (ikt)	0.073***	0.094***	-0.021***	0.637***	0.792***	-0.154*
	(0.014)	(0.014)	(0.006)	(0.245)	(0.236)	(0.087)
Ctry*Year FE, Controls	Y	Y	Y	Y	Y	Y
Sector*Year FE	N	N	N	Y	Y	Y

Selection + Innovation

- Firm selection and productivity upgrading are not the whole story

	ln R&D (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
^Exp Dem (ikt)	**0.103**	**0.282*** **	**0.154*** **	**0.129*** **
	(0.115)	**(0.027)**	**(0.019)**	**(0.012)**
^Imp Comp (ikt)	**0.164*** **	**0.016***	**0.038*** **	**-0.022*** **
	(0.046)	**(0.009)**	**(0.007)**	**(0.004)**
ln min Prod (ikt)		0.657***	0.736***	-0.079***
		(0.022)	(0.016)	(0.009)
ln R&D (ikt)		-0.000	-0.018***	0.017***
		(0.008)	(0.006)	(0.003)
N	2,777	2,750	2,750	2,750
R2	0.999	0.915	0.949	0.501
Ctry*Year FE, Controls	Y	Y	Y	Y

Institutional and Market Frictions

- Efficient institutions, factor and product markets amplify gains from import competition, but dampen gains from export expansion

	Rule of Law			(Inverse) Corruption		
	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
^Exp Dem (ikt)	1.066***	0.862***	0.204***	0.850***	0.670***	0.180***
	(0.126)	(0.111)	(0.037)	(0.096)	(0.085)	(0.031)
^Imp Comp (ikt)	-0.113**	-0.053	-0.060***	-0.063*	-0.013	-0.050***
	(0.050)	(0.044)	(0.012)	(0.038)	(0.034)	(0.010)
^Exp Dem (ikt) x Institution (it)	**-0.476*** (0.067)**	**-0.405*** (0.059)**	**-0.070*** (0.017)**	**-0.302*** (0.042)**	**-0.252*** (0.036)**	**-0.050*** (0.012)**
^Imp Comp (ikt) x Institution (it)	**0.136*** (0.031)**	**0.106*** (0.028)**	**0.030*** (0.006)**	**0.095*** (0.020)**	**0.074*** (0.018)**	**0.021*** (0.004)**
N	2,777	2,777	2,777	2,777	2,777	2,777
R2	0.792	0.835	0.459	0.797	0.839	0.460
Ctry*Year FE, Controls	Y	Y	Y	Y	Y	Y

Institutional and Market Frictions

- Efficient institutions, factor and product markets amplify gains from import competition, but dampen gains from export expansion

	Labor Market Flexibility			Creditor Rights Protection			(Inverse) Product Market Regulation		
	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)	ln Agg Prod (ikt)	ln Avg Prod (ikt)	Cov Term (ikt)
^Exp Dem (ikt)	1.121***	0.763***	0.358***	0.718***	0.511***	0.207***	1.314***	1.047***	0.267***
	(0.261)	(0.238)	(0.063)	(0.158)	(0.147)	(0.040)	(0.172)	(0.155)	(0.045)
^Imp Comp (ikt)	-0.202**	-0.102	-0.100***	-0.108*	-0.063	-0.045***	-0.045	0.033	-0.078***
	(0.096)	(0.089)	(0.027)	(0.061)	(0.055)	(0.015)	(0.061)	(0.055)	(0.016)
^Exp Dem (ikt) x Institution (it)	**-0.218*** (0.069)**	**-0.143** (0.063)**	**-0.075*** (0.016)**	**-0.048** (0.019)**	**-0.033* (0.017)**	**-0.015*** (0.005)**	**-0.769*** (0.130)**	**-0.636*** (0.118)**	**-0.133*** (0.032)**
^Imp Comp (ikt) x Institution (it)	**0.083*** (0.027)**	**0.060** (0.026)**	**0.024*** (0.008)**	**0.028*** (0.009)**	**0.025*** (0.008)**	**0.003 (0.002)**	**0.085* (0.046)**	**0.039 (0.043)**	**0.046*** (0.013)**
N	2,777	2,777	2,777	2,777	2,777	2,777	2,777	2,777	2,777
R2	0.747	0.802	0.447	0.811	0.848	0.463	0.825	0.858	0.398
Ctry*Year FE, Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y

Alternative Misallocation Measures

- Indicators of resource (mis)allocation across firms in the literature
  - MRPK and MRPL dispersion (Hsieh-Klenow 2009, Gopinath et al 2015)
  - TFPR dispersion (Hsieh-Klenow 2009, Bartelsman et al 2013)
  - PCM dispersion (Edmond et al 2015)

- These indicators face conceptual challenges
  - Measurement error can inflate dispersion
  - Dispersion = misallocation only with constant mark-ups, CRS, no shocks or adjustment costs (Dhingra-Morrow 2014, Bartelsman et al 2013, Foster et al 2015, 2016)

Alternative Misallocation Measures

Dep Variable:	MRPK St Dev	MRPL St Dev	TFPR St Dev	PCM p90 / p10	MRPK St Dev	MRPL St Dev	TFPR St Dev	PCM p90 / p10
^Exp Dem (ikt)	**-0.203*** **	**0.272*** **	**0.297*** **	**0.407*** **	**0.425*** **	**0.059**	**0.125**	**-0.738**
	(0.069)	**(0.038)**	**(0.035)**	**(0.138)**	**(0.145)**	**(0.082)**	**(0.155)**	**(0.527)**
^Imp Comp (ikt)	**0.193*** **	**0.095*** **	**0.059*** **	**-0.031**	**0.408***	**0.483*** **	**0.981*** **	**2.077*** **
	(0.026)	**(0.012)**	**(0.013)**	**(0.050)**	**(0.229)**	**(0.131)**	**(0.248)**	**(0.707)**
N	2,777	2,777	2,382	2,775	2,777	2,777	2,382	2,775
R2	0.552	0.810	0.784	0.661	0.703	0.872	0.792	0.731
Ctry*Year FE, Controls	Y	Y	Y	Y	Y	Y	Y	Y
Sector*Year FE	N	N	N	N	Y	Y	Y	Y