Markups, Market Imperfections, and Trade Openness: Evidence from Ghana

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Motivation

- Productivity has dominated the literature on the impact of openness on firms in developing countries (Pavcnik, 2002; Amiti and Konings, 2007; Topalova and Khandelwal, 2011)

- Trade openness has the potential to affect domestic market competition
  - Reduction in market power, by forcing firms to reduce their marginal cost (Helpman and Krugman, 1985)
  - Inter and intra-industry resources reallocation (Melitz, 2003)

- The paper aims to analyse firm behaviour in product and labour markets as a result of increased competition through trade openness

Research Questions

- Does trade liberalisation have the same effect on firm-level market power across product and labour markets?

- What is the effect of trade openness on firm's price-cost margin?

- What is the effect of trade openness on firm's monopsony power?
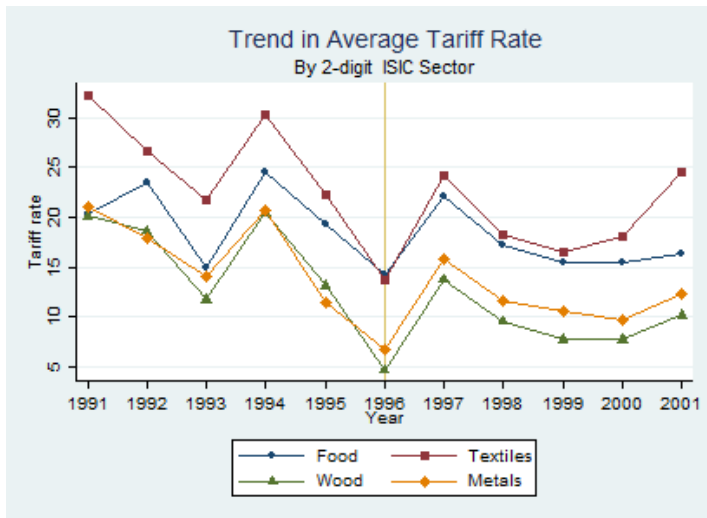
Trade Liberalisation Policy in Ghana

Figure: Trend in Output Tariff, 1991-2001

Data

- Under the World Bank's Regional Program on Enterprise Development (RPED), firm-level data were collected in eight African countries from 1990 to 1994
- Initial 200 firms drawn from 1987 Ghana Industrial Census for four main ISIC Rev. 2 sectors: food, textiles, wood, and metals
- The University of Oxford, CSAE, University of Ghana, and Ghana Statistical Service collectively launched Ghana Manufacturing Enterprise Survey (GMES) from 1995 to 2003 as a continuation for RPED Ghana
    - Resulting in 12 years panel data: 1990-2002
- Exiting firms are replaced by resampling from the census data to keep number of firms constant
- Tariffs data are from CEPII

Markups (De Loecker & Warzynski, (2012))

- A firm i produces output at time t according to the following production function

$$Q_{it} = F_{it}(L_{it}, M_{it}, K_{it}, \omega_{it}), \tag{1}$$

- Firms tend to variable inputs $V_{it} = L_{it}, M_{it}$ to minimize cost

$$\mathcal{L}(V_{it}, K_{it}, \lambda_{it}) = \sum_{v=1}^{V} P_{it}^v V_{it}^v + r_{it} K_{it} + \lambda_{it}(Q_{it} - F(\cdot)), \tag{2}$$

- Solving for F.O.C and rearranging terms yields:

$$\frac{\partial Q_{it(\cdot)}}{\partial V_{it}^v} \frac{V_{it}^v}{Q_{it}} = \frac{1}{\lambda_{it}} \frac{P_{it}^v V_{it}^v}{Q_{it}}. \tag{3}$$

- Define $\mu_{it} = \frac{P_{it}}{\lambda_{it}}$, then

$$\mu_{it} = \theta_{it}^v \left(\frac{P_{it} Q_{it}}{P_{it}^v V_{it}^v} \right) = \frac{\theta_{it}^v}{\alpha_{it}^v} \tag{4}$$

Market Imperfections

- In a fully competitive market; $\mu_{it} = \frac{P_{it}}{\lambda_{it}} = 1 \Rightarrow \theta_{it}^v = (\alpha_{it}^v)$
- If product and labour markets are equally competitive; $\Rightarrow \mu_{it}^m = \mu_{it}^l$
- Dobbelaere and Mairesse (2013) defined a joint parameter of market imperfection as $\psi_{it} = \dfrac{\theta_{it}^m}{\alpha_{it}^m} - \dfrac{\theta_{it}^l}{\alpha_{it}^l}$
- Inequality in ψ is attributed to Labour Market Setting (LMS) (Dobbelaere and Mairesse (2013) - industry level; Nesta and Schiavo (2017) - firm level)
- LMS $\mapsto$ Perfect Competition (PR), Efficient Bargaining (EB), Monopsony (MO)
- Short-run profit maximization of monopsonist firm $L_{it}(w_{it})$

$$\max_{L_{it}, M_{it}} \pi(w_{it}, L_{it}, M_{it}) = R_{it}(L_{it}, M_{it}) - w_{it}(L_{it})L_{it} - p_{it}^m M_{it}$$

$$w_{it} = \gamma_{it}(R_{it}^L)$$

- To obtain $\theta_{it}^v = \{\theta_{it}^m, \theta_{it}^l\}$, I estimate a translog production function using De Loecker et al. (2016) methodology, where I control for input price bias, endogeneity, and selection biases

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Table: Average Markups and Market Imperfections Based on Regimes, By Sector

		PANEL A: Perfect Competition		PANEL B: Efficient Bargaining			PANEL C: Monopsony			
		$\hat{\mu}_{it}^m$	$\hat{\mu}_{it}^l$	$\tilde{\mu}_{it}^m$	$\hat{\mu}_{it}^l$	$\hat{\psi}_{it}$	$\hat{\mu}_{it}^m$	$\tilde{\mu}_{it}^l$	$\hat{\psi}_{it}$	$\hat{\gamma}_{it}$
31	Food	1.60	1.69	2.64	0.70	1.95	1.18	4.66	-3.54	0.29
32	Textiles	1.54	1.53	1.83	1.28	1.06	1.40	4.33	-3.10	0.35
33	Wood	2.02	1.79	3.86	2.48	2.81	1.54	4.46	-3.14	0.35
38	Metals	1.69	1.40	2.47	0.79	1.73	1.53	4.27	-2.95	0.36
	All Sectors	1.71	1.60	2.70	1.31	1.88	1.41	4.43	-3.18	0.34

Table reports market imperfection parameters divided into panels. Observations are distributed between regimes as follows: Perfect Competition (PR) 36.50%, Efficient Bargaining (EB) 3.81%, and Monopsony (MO) 59.69%.

Table: Average Markups and Market Imperfections, By Sector

ISIC Rev. 2	Sector	Pre-WTO			Post-WTO		
		$\hat{\mu}_{it}^m$	$\hat{\mu}_{it}^l$	$\hat{\psi}_{it}$	$\hat{\mu}_{it}^m$	$\hat{\mu}_{it}^l$	$\hat{\psi}_{it}$
31	Food	1.36	3.43	-2.13	1.26	3.79	-2.36
32	Textiles	1.55	2.36	-0.78	1.40	2.47	-1.04
33	Wood	1.88	1.89	0.24	1.91	1.89	0.13
38	Metals	1.72	2.59	-0.99	1.54	2.65	-1.18
	All sectors	1.63	2.57	-0.91	1.55	2.60	-0.95

Table reports average markups computed on materials and labour; as well as the joint parameter of product/labour market imperfection. The sample is divided into two periods: Pre-WTO (1991 - 1994) and Post-WTO (1995 - 2002).
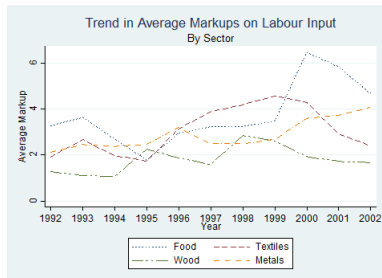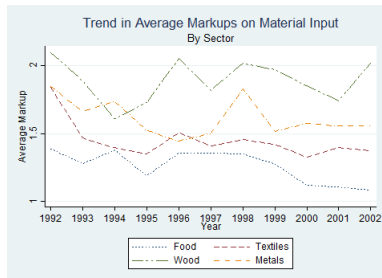
- Impact of Trade on Market Power: Estimation Setup

$$y_{ijt} = \alpha_i + \lambda_1(Post_{1995}) + \lambda_2(\tau_{ij1991}) + \lambda_3(\tau_{ij1991} \times Post_{1995}) + \mathbf{X}'_{it}\boldsymbol{\xi} + \delta_t + \epsilon_{ijt} \quad (5)$$

- For labour market, I apply Heckman Selection by first estimating the probability to be a monopsonist

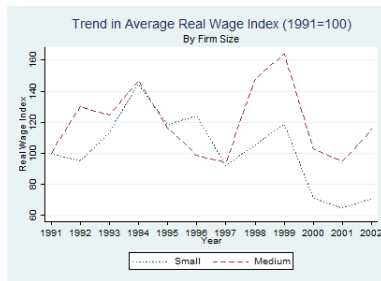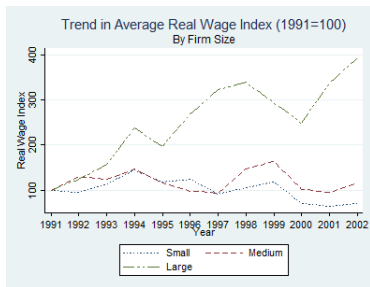- ...small and medium firms are more likely to be monopsonist compared to large firms

Table: Main Results

VARIABLES	Product Market			Labour Market		
	μ_{ijt}^m (1)	μ_{ijt}^m (2)	μ_{ijt}^m (3)	γ_{ijt} (4)	γ_{ijt} (5)	γ_{ijt} (6)
$\tau_{1991} \times Post_{1995}$	-0.00805** (0.00361)	-0.0181** (0.00690)	-0.0182** (0.00693)	0.00972*** (0.00189)	0.0108*** (0.00277)	0.0107*** (0.00262)
ω_{it}		1.570*** (0.171)	1.554*** (0.173)		0.0720** (0.0275)	0.0717** (0.0266)
Skill Ratio		0.0665 (0.155)	0.0817 (0.154)		0.112 (0.156)	0.117 (0.161)
Small size firms		0.101 (0.0840)	-0.0901* (0.0432)		0.350*** (0.0758)	0.318*** (0.0747)
Medium size firms		0.0559 (0.0664)	-0.0906** (0.0340)		0.0928** (0.0405)	0.0709*** (0.0175)
$\omega_{it} \times$ small size firms			0.0232*** (0.00353)			0.00349 (0.00656)
$\omega_{it} \times$ medium size firms			0.0177* (0.00830)			0.00256 (0.00377)
Inverse Mills Ratio				0.0903* (0.0465)	-0.170** (0.0654)	-0.169** (0.0664)
Constant	1.523*** (0.0701)	-12.44*** (1.522)	-12.30*** (1.537)	0.586*** (0.0472)	-1.141** (0.457)	-0.451 (0.360)
Observations	1,579	1,574	1,574	601	601	601
R^2	0.024	0.483	0.484	0.051	0.122	0.122
Number of firm	223	223	223	152	152	152
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors clustered at three digit industry level in parentheses
$***p < 0.01, **p < 0.05, *p < 0.1$.

Table: Robustness Check: Identification Assumptions

VARIABLES	Expectation Effect		Trade Volume	
	μ_{ijt}^m (1)	γ_{ijt} (2)	μ_{ijt}^m (3)	γ_{ijt} (4)
$\tau_{1991} \times Post_{1995}$	-0.0160*	0.0109***	-0.0228**	0.0109***
	(0.00797)	(0.00303)	(0.00881)	(0.00241)
$\tau_{1991} \times$ One year before WTO accession	-0.00992	-0.000712		
	(0.00826)	(0.00284)		
Total Industry Exports (log)			-0.0299	-0.0185
			(0.0482)	(0.0283)
Total Industry Imports (log)			0.203**	-0.0221
			(0.0757)	(0.0452)
ω_{it}	1.571***	0.0717**	1.574***	0.0717**
	(0.171)	(0.0275)	(0.168)	(0.0258)
Skill Ratio	0.0652	0.112	0.0530	0.0838
	(0.155)	(0.157)	(0.154)	(0.168)
Small size firms	0.103	0.349***	0.0832	0.355***
	(0.0836)	(0.0762)	(0.0879)	(0.0774)
Medium size firms	0.0554	0.0925**	0.0460	0.0955*
	(0.0669)	(0.0404)	(0.0680)	(0.0420)
Inverse Mills Ratio		-0.171**		-0.178**
		(0.0653)		(0.0679)
Constant	-11.41***	-1.107**	-14.60***	-0.773*
	(1.357)	(0.468)	(1.511)	(0.487)
Observations	1,574	601	1,555	593
R^2	0.484	0.122	0.483	0.124
Number of firm	223	152	220	149
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table: Robustness Check: Heterogeneous Effects

VARIABLES	Marginal Cost (1)	Sales (2)	Market Share (3)
$\tau_{1991} \times Post_{1995}$	-0.00707	0.0225**	0.00248
	(0.00417)	(0.00883)	(0.00327)
ω_{it}	-0.603***	0.284	0.0404**
	(0.0524)	(0.179)	(0.0178)
Skill Ratio	-0.0498	-0.269	-0.0430
	(0.102)	(0.258)	(0.0329)
Small size firms	-0.158	**-0.960***	**-0.0605***
	(0.0971)	(0.110)	(0.0153)
Medium size firms	-0.102*	**-0.473***	**-0.0381***
	(0.0461)	(0.0912)	(0.0107)
Constant	13.03***	22.00***	-3.776***
	(0.417)	(1.635)	(0.204)
Observations	1,574	1,602	1,602
R^2	0.914	0.588	0.795
Number of firm	223	226	226
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Robust standard errors clustered at three digit industry level in parentheses
$***p < 0.01, **p < 0.05, *p < 0.1$.

Table: Robustness Check: Misallocation Effects

	Surviving Firms		Entrants/Exits	
VARIABLES	μ_{ijt}^{m} (1)	γ_{ijt} (2)	μ_{ijt}^{m} (3)	γ_{ijt} (4)
$\tau_{1991} \times Post_{1995}$	-0.0150*	0.00918**	-0.0238**	0.0209**
	(0.00650)	(0.00345)	(0.00827)	(0.00748)
ω_{it}	1.415***	0.141***	1.784***	0.0279
	(0.208)	(0.0401)	(0.195)	(0.0322)
Skill ratio	0.128	-3.603*	0.0434	1.479
	(0.117)	(1.589)	(0.217)	(2.601)
Small size firm	-0.0370	2.830**	0.316	-0.454
	(0.147)	(1.127)	(0.192)	(1.789)
Medium size firm	-0.0227	0.181*	0.124	0.131
	(0.100)	(0.0900)	(0.0940)	(0.0894)
Inverse Mills Ratio		-7.106**		2.056
		(2.979)		(4.924)
Constant	-10.54***	-0.740	-16.70***	-2.740*
	(1.729)	(0.545)	(2.174)	(1.312)
Observations	873	377	701	236
R-squared	0.446	0.176	0.548	0.098
Number of firm	82	61	141	95
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Robust standard errors clustered at three digit industry level in parentheses
$* * *p < 0.01, * * p < 0.05, *p < 0.1$.

Conclusions

- Results are consistent when I used PRE-WTO average tariffs instead of tariffs rate at 1991
- Firm's price-cost margin declined in the aftermath of trade liberalisation
- However, firm's monopsony power tends to increase after trade openness
- Market imperfection gap increases eroding pro-competitive gains from trade
- Small and medium firms are likely to compress wages to remain active on the market
- The global objective of resource reallocation mechanism due to trade liberalisation is hindered.