Globalization and Workforce Composition in Indian Formal manufacturing: New evidence on product market competition channel

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Table of contents

Introduction

Motivation I

Globalization, it is now widely accepted, has been the key factor underlying the observed pressure on labour markets in both developed and developing countries.

A variety of mechanisms linking globalization and margins of adjustment in the labour markets have been empirically tested in the trade and development literature.

The focus of empirical research has been essentially on measuring the direct effects of trade liberalization and globalization on employment, wages and wage inequality (relative wages of skilled and unskilled workers (Ramaswamy,2003; Goldberg and Pavcnik,2007; Dix-Carneiro and Kovak,2019).

Motivation II

Much less attention has been paid to the indirect ways in which trade openness could affect the quality of jobs within the formal sector or the so-called covered sector, consequently worker welfare in developing countries.

We have drawn attention to one possible indirect mechanism wherein the effect of globalization is mediated through changes in product market *structure*.

In our set up, globalization affects the product market *structure* (the intermediate factor) and in turn affects the profit markup (the product market outcome) and the workforce composition (the labour market outcome).

A Possible Mechanism Channel

Let us assume that manufacturing firms can hire either regular workers or it can hire workers through a temping firms.

Notice that both worker types are unskilled with similar productivity but, the hire and fire of regular workers is regulated by labour market regulations.

Greater product market competition could lead to greater uncertainty of expected profits or could raise the probability of external shock to the firms in the industry raising their costs of labour adjustment.

In other words the expected cost savings from changing the workforce composition will be more valuable as competition increases in an industry.

Concepts

Market Concentration

Among the variables that can measure market *structure*, our main emphasis will be on concentration.

Concentration can be said as the measure of distribution of sales shares of firms in an industry.

Concentration Ratio of top four firms (CR4 ratio) is measured as the sum of share of sales of top four firms in the industry

$$CR4 = \sum_{j=1}^{n} \frac{s_{j,i,t}}{\sum_{j=1}^{n} s_{j,i,t}}$$

Trade Adjusted Market Concentration

A major criticism of the concentration indices is the failure to account for the global competition.

Export from India has an impact on the competition in the importing country's market, whereas imports to India increases competition in the Indian market.

In this light, Bhattacharjea and Sindhwani (2014) adjusted the market share of firms:

$$MS_i = \frac{Sales_i - Exports_i}{Total\ Sales - (Total\ Exports - Total\ Imports)}$$

Profit Markup and Contract Intensity

Profit markup (PCM) is defined as:

$$PCM = \frac{Sales - Variable\ Cost}{Sales}$$

Contract workers‘ intensity (CI) is defined as:

$$CI = \frac{Number\ of\ Contract\ Workers}{Number\ of\ Contract\ Workers + Number\ of\ Regular\ Workers}$$

Literature Overview

A Brief Literature Review I

Currie and Harrison (1997) found that firms started hiring more temporary workers after the completion of a comprehensive trade liberalization program.

Using Argentinean manufacturing industry level data for 1992-2003, Acosta and Montes-Rojas (2014) confirms the hypothesis that trade increases informality in industries that experience sudden foreign competition.

The impact on informal employment could vary depending on the tightness of labour market regulations prevailing in a particular country as found in a study of Brazil and Columbia by Goldberg and Pavcnik (2003). In countries with weak enforcement of labour regulations firms have been observed to have greater flexibility in responding to trade liberalization.

A Brief Literature Review II

Recently, Dix-Carneiro and Kovak (2017) study the impact of trade reforms of the 1990s on employment in Brazil. They find that workers in the tradable sectors that faced larger tariff reductions had shorter spells of formal employment, while workers in non-tradable sectors were driven into informal employment .

Menezes-Filho and Muendler (2007) find that Brazil's trade liberalization in the 1990s led to the displacement of formally employed workers from protected industries and that 'comparative advantage' industries or exporters did not absorb trade-displaced workers in full.

Data

Data Source

Time period: 1998 – 2014

Industry Data: Annual Survey of Industries (ASI) factory panel dataset and CMIE Prowess firm level data.

Trade Data: WITS database.

Firm level variables are aggregated to industry level by using weighted average where the weights are the sales share of the firms. An Example

All series are concorded to three digit NIC 2008 industry classification.

Data Summary I

Correlation between CR4 and TCR4 is 0.66.

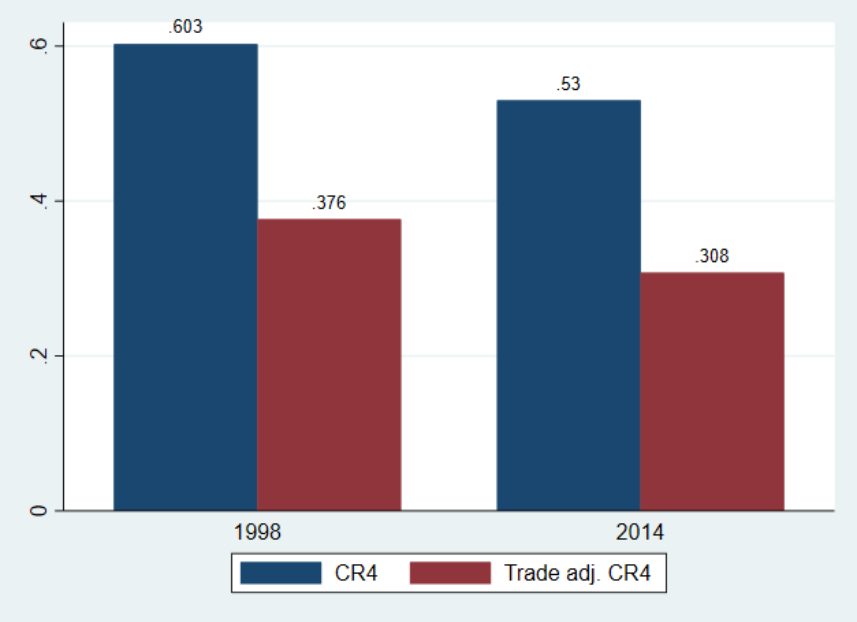

Figure 1: Mean CR4 and TCR4 for the origin and terminal years

Decline in TCR4 is around 18% whereas decline in CR4 is around 12%.

Data Summary II

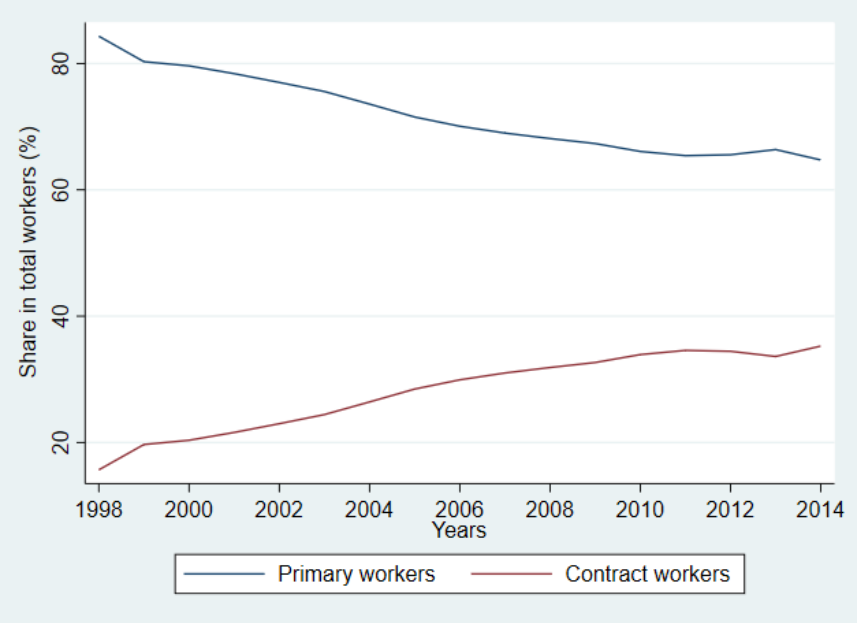

Figure 2: Change in the workforce composition over time

Data Summary III

The contract workers intensity has increased by 95% for the high capital-intensive industries but only by 63% for low capital-intensive industries.

Similar result for 2-digit NIC classification, has been found by Kapoor and Krishnapriya (2019).

The PCM has reduced by 26% for low capital-intensive industries and only 8% for high capital-intensive industries.

Methodology

Estimation Equation

In order to empirically investigate the effect of trade adjusted market concentration on the price cost markup and the contract workers‘ intensity, we employ the following empirical model:

$$PCM_{i,t} = \beta_0 + \beta_1 \ TCR4_{i,t} + \sum_{j=1}^{J} \alpha_j \ X_{i,j,t} \ + \beta_2 \gamma_i + \beta_3 \theta_t + \epsilon_{i,t}$$

$$CI_{i,t} = \beta_0 + \beta_1 TCR4_{i,t} + \sum_{k=1}^{K} \alpha_k Z_{i,k,t} + \beta_2 \gamma_i + \beta_3 \theta_t + u_{i,t}$$

Identification

One of the foremost challenges that an empirical study can potentially face is that of presenting a convincing identification strategy.

Identification issues can arise due to omitted variable bias, or reverse causality, or both.

We have tried to establish the identification strategy through multiple estimation methods.

In our benchmark regression, we estimate both the models using fixed-effects estimator with robust standard errors.

Benchmark Model (Omitted variable bias)

Fixed-effect estimators can deal with unobserved heterogeneity associated with panel data, by considering the time invariant factors like elasticity of consumption of the final goods, inherent skill intensivity etc., and thus, ensure that our estimates are only capturing the variation within industries over time.

The standard errors are clustered at the industry level, to control for possible heteroskedasticity and autocorrelation within the same industry in different years.

We have specified and taken help of penalized-likelihood criteria – AIC and BIC wherever necessary (possible) to choose between models of the trade-adjusted CR4 ratio and the traditional CR4 ratio.

Robustness Analysis (Reverse Causality)

There might still be a problem of potential endogeneity of PCM and CI.

Highly concentrated industries may be the ones that are more likely to engage more contract workers or enjoy a higher price markup which could lead to reverse causality.

Alternatively, it could be the low concentrated industries engage in more contract workers usage in the expectation that this would increase the competitiveness of the firms in that industry.

Hence it is unclear which way the bias would go.

Robustness Analysis (Reverse Causality)

If the same set of industries is most likely to engage in more CI or more PCM over the sample period, then the industry fixed effects would suffice.

However, if there are time-varying factors that affect CI (PCM) and TCR4 then it is necessary to instrument for TCR4.

Unfortunately, valid instruments for TCR4 are unavailable, thus we use the Arellano–Bond GMM estimator – which uses lagged variable as instruments.

We perform AR (2) test for second order serial correlation and Sargan/Hansen test of over-identification restrictions (exogeneity test) to validate our GMM estimations.

Further Robustness Analysis

Additionally, we have done a battery of robustness checks treating each of the explanatory variables as exogeneous and then checking our benchmark results.

We have used subsamples based on KOR and checked our models in those subsamples.

Results

PCM Regression

	(1)	(2)	(3)	(4)
	Static Fixed Effects Regression	**Dynamic AB Regression**	**Static Fixed Effects Regression**	**Dynamic AB Regression**
	Price cost margin	Price cost margin	Price cost margin	Price cost margin
One-year lagged price cost margin (L.PCM)		0.350**		0.362**
		(3.03)		(3.10)
Trade adjusted CR4 (TCR4)	0.194*	0.362**		
	(1.86)	(2.06)		
CR4			0.236*	0.356*
			(1.88)	(1.91)
Capital – Output Ratio	-0.0672**	-0.100**	-0.0600*	-0.102**
	(-2.13)	(-2.67)	(-1.71)	(-2.21)
Growth rate of sales	0.00831**	0.00693*	0.00713**	0.0119**
	(3.51)	(1.97)	(2.62)	(2.06)
Marketing Intensity	0.335	-2.354	0.528	-2.562
	(0.99)	(-0.78)	(1.53)	(-0.83)
R&D Intensity	-0.612	-1.681	-0.394	-1.414
	(-0.50)	(-1.19)	(-0.33)	(-0.87)
Intermediate Imported Input Intensity	-0.217**	-0.250**	-0.244*	-0.273**
	(-2.29)	(-2.86)	(-1.86)	(-2.36)
Export Intensity			-0.0339	-0.0549
			(-0.89)	(-0.93)
Constant	0.347***		0.281***	
	(7.15)		(3.79)	
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	No	Yes	No
No. of observations	736	689	736	689
No. of groups	46	46	46	46
No. of instruments		35		36
R^2	0.210		0.210	
AR1 *(p-value)*		0.001		0.000
AR2 *(p-value)*		0.253		0.268
Sargan Statistic *(p-value)*		0.000		0.000
Hansen Statistic *(p-value)*		0.245		0.274
AIC	-1982		-1980	
BIC	-1886		-1884	

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$
Standard errors are clustered at the industry level. Standard errors are heteroskedastic, and autocorrelation corrected.

From the above regression table, we observe that there is significant effect of concentration ratio on price cost margin, be it the traditional measure or the trade-adjusted measure. But the AIC and the BIC statistic infers that the model with the trade-adjusted concentration ratio is doing a better job of explaining the variation in the price cost margin than the traditional concentration ratio, even after accounting for the export intensity.

CI Regression

	(1)	(2)	(3)	(4)	(5)	(6)
	Static Fixed Effects Regression		**Dynamic AB Regression**	**Static Fixed Effects Regression**		**Dynamic AB Regression**
	Contract Intensity	Contract Intensity	Contract Intensity	Contract Intensity	Contract Intensity	Contract Intensity
One-year lagged Contract Intensity (L.CI)			0.272*			0.274*
			(1.84)			(1.94)
Trade adjusted CR4 (TCR4)	-0.263**	-0.261**	-0.183**			
	(-3.10)	(-4.17)	(-3.01)			
CR4				-0.0525	-0.0603	-0.0418
				(-0.80)	(-0.87)	(-0.75)
Fuel consumed / GVA		0.0197**	0.001		0.0198**	-0.001
		(2.41)	(-0.06)		(2.50)	(0.05)
Growth rate of sales		-0.001	-0.001		-0.001	-0.001
		(-0.70)	(-1.00)		(-0.69)	(-0.81)
Intermediate Imported Input Intensity		0.227**	0.158**		0.174	0.125
		(2.22)	(1.83)		(1.28)	(1.17)
Capital – Output Ratio		0.027	0.014		0.017	0.007
		(0.98)	(0.60)		(0.50)	(0.27)
Export Intensity					0.215**	0.138**
					(3.44)	(2.55)
Constant	0.470***	0.421***		0.417***	0.346***	
	(16.52)	(18.73)		(12.50)	(8.49)	
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	No	Yes	Yes	No
No. of observations	782	736	690	782	736	690
No. of groups	46	46	46	46	46	46
No. of instruments			35			36
R^2	0.567	0.561		0.526	0.540	
AR1 *(p-value)*			0.004			0.004
AR2 *(p-value)*			0.300			0.247
Sargan Statistic *(p-value)*			0.000			0.000
Hansen Statistic *(p-value)*			0.165			0.208
AIC		-1989			-1947	
BIC		-1893			-1851	

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$
Standard errors are clustered at the industry level. Standard errors are heteroskedastic, and autocorrelation corrected.

From the above regression table, we observe that trade adjusted concentration ratio is significantly affecting the composition of workforce, contract workers' intensity. We also observe that the traditional concentration ratio does not capture the effect. The result is robust even if we account for the lagged dependent variable and employ Arellano Bond regression.
We have also mentioned the AIC and BIC statistic (lower the value, better the model). Looking at the AIC and BIC statistic, we see that our specification including the trade-adjusted concentration ratio is doing better job of explaining the variation in the workforce composition, than the traditional concentration ratio even after accounting for the export intensity.

Robustness

We find similar result for Model 1 (PCM) after dividing our sample into high KOR industries and low KOR industries.

For Model 2, we observe that the variation in CI is explained by TCR4 in industries where KOR is low but fails to explain in industries with high KOR.

We have changed our control variables from endogeneous to exogeneous (in turn) using the Arellano-Bond regression and we find that our result holds true.

Thank you!

Example of Aggregation

An example:

$$PCM_{i,t} = \sum_{j=1}^{m} \frac{s_{j,i,t}}{\sum_{j=1}^{m} s_{j,i,t}} \cdot PCM_{j,i,t}$$

where,

$$PCM_{j,i,t} = \frac{Sales_{j,i,t} - (Variable\ \ Cost)_{j,i,t}}{Sales_{j,i,t}}$$

$PCM_{j,i,t}$ represents Price-cost markup (PCM) for j^{th} firm of i^{th} industry at time t and $s_{j,i,t}$ represents the usual for sales

Back

Control Variables (Model 1)

Variables	Definition and measurement	Expected sign
Capital – Output Ratio (KOR)	Capital – Output ratio is measured as the ratio of total gross fixed assets to total sales in an industry.	Large sunk cost and credit discrimination working towards profitability and inflexibility to market shocks working against profitability. (?)
Growth rate of sales (GRS)	Growth rate of sales (GRS) is taken as a proxy for market demand.	Economies of large-scale operations working towards profitability and incentive of new entry coupled with pressure on inputs working against profitability. (?)
Marketing Intensity (MKI)	Marketing expenses includes marketing expenditure, advertisement expenditure, promos and rebates. Marketing Intensity (MKI) is calculated as the total marketing expenses in an industry per unit of total sales.	High MKI will lead to brand loyalty, brand penetration and product differentiation → entry barriers → increase markup. (+)
R&D Intensity (RND)	R&D Intensity measures the total R&D expenditure to that of the total sales in the industry. R&D expenditure includes in-house R&D expenditure and expenditure on technology fees and royalties.	High RND leads to reduction in cost and increase markup. (+)
Intermediate Imported Input Intensity (IIR)	IIR represents how the industry is dependent on the global market for inputs. It is calculated using total inputs imported in the industry (raw materials and capital goods) to total sales in that industry.	Imported inputs may increase cost efficiency and productivity which may lead to higher markup. (+)
Export Intensity (EIR)	EIR is calculated as the share of export of goods and services to the total sales in the industry. It denotes how much of that industry's sales is dependent on global market.	High EIR may create entry barriers due to global connectivity of the incumbent firms which may lead to higher markup. (+)

Control Variables (Model 2)

Variables	Definition and measurement	Expected signs
Fuel consumption intensity (FCI)	FCI is a proxy for the infrastructure input intensity of the firms and is computed by dividing costs of energy input by gross value of output	High FCI means more expenditure on infrastructure which means more workers to be employed but nothing can be concluded about the workforce composition. (?)
Growth rate of sales (GRS)	Growth rate of sales (GRS) is taken as a proxy for market demand.	High GRS means high demand of that product and with ease of entry, there are more entrants who are entering the industry, causing competition to soar up and CI increases. (+)
Capital – Output Ratio (KOR)	Capital – Output ratio is measured as the ratio of total gross fixed assets to total sales in an industry.	Large sunk costs which implies barriers to exit and thus firms might survive mostly on the "cheap" contract workers, CI rises. (+)
Intermediate Imported Input Intensity (IIR)	IIR represents how the industry is dependent on the global market for inputs. It is calculated using total inputs imported in the industry (raw materials and capital goods) to total sales in that industry.	Increase in IIR → integration to the global economy → precariousness rises, and firms want to hire workers on a contract basis. (+)
Export Intensity (EIR)	EIR is calculated as the share of export of goods and services to the total sales in the industry. It denotes how much of that industry's sales is dependent on global market.	Increase in EIR → integration to the global economy → precariousness rises, and firms want to hire workers on a contract basis. (+)