

RELATIVE EFFICIENCY IN ADAPTATION TO PRO-COMPETITIVE ENVIRONMENT: UNORGANIZED INDIAN TEXTILE AND GARMENTS ENTERPRISES

Sarmishtha Sen*, Subrata Majumder**

*Teacher Fellow, Department of Economics, University of Calcutta, West Bengal, India.

E-mail: sarmishtha.sen@gmail.com

**Assistant Professor, Sundarban Mahavidyalaya, West Bengal, India. E-mail: subrata.eco@gmail.com

Abstract *The unorganized Textile and Garments (T&G) units in India have been facing increasingly intense competition following the withdrawal of major protective measures favouring the decentralized production units in 2000 Textile Policy along with encouragement of large-small linkages through subcontracting agreements at both pre- and post-production stages. A cluster analysis conducted for the average labour and capital productivities of different groups indicated the relative dominance of structural factors such as size - rather than the product-group-based classification of firms - in explaining the inter-group variation in productivity. A modified Heckman selection model was applied to analyze the determinants of marketing agreement and the differential impact of different firm characteristics on enterprises with and without marketing agreement. The results demonstrated that instead of relying solely on market-driven forces of productivity-enhancement, it is better to pay heed to the structural location of the enterprises indicated by the availability of institutional support, presence of female-headed enterprise and so on.*

Keywords: *Unorganized Textile & Garments Production in India, Average Productivity, Organizational Characteristics, Marketing Agreement, Cluster Analysis, Modified Heckman Selection Model*

JEL Classifications: *C24, D22, F68, L25, L67*

1. INTRODUCTION

The unorganized¹ Textile and Garments (T&G) sector has experienced a few important changes in recent years. On the one hand the Textile Policy 2000 de-reserved the growing garments segment. Production of garments for the domestic market was earlier earmarked only for small-scale decentralized units. On the other hand, the period of economic reforms has also seen increased emphasis on market-driven forces like subcontracting agreement with large firms for improvement in performance of the small unorganized enterprises (Teewari, 1999, 2000). This created a pro-competitive environment offering new risks as well as

opportunities² for the small units. In this context the present paper seeks to examine how these changes have affected the performance on productivity of different segments of unorganized Textile and Garments enterprises during the first decade of this century.

Adaptation by different groups of firms to pro-competitive environment by coping up with increased risks or through utilizing fresh opportunities varies according to the enterprise characteristics and the nature of markets they cater to. So,

¹ Manufacturing firms not registered under the section 2m(i) and 2m(ii) of the 1948 Factories Act are officially considered the Unorganized Manufacturing units.

² For example, the reforms withdrew many protective measures that exposed the smaller units to new risks related with marketing. The same period also saw greater opportunities for expansion in newer areas as producing for certain market-segments such as ready-made garments, embroidery and knitted products has become profitable than before (Roy 1998 (b); Liebl & Roy 2001).

we make an attempt to classify different segments of firms in similar as well as distinct groups in terms of productivity-performance. In doing this we expect to identify dimensions along which the performances seem to be similar and find out in what respect the productivity-behaviour varies.

Once this is done, the question remains: how groups with similarity or difference in identified dimensions cope up with the challenge of enhancing their productivity in the new context. Given the evidence of limited role played by government policy in the post-reforms years (Roy, 1996, 1998(a), 1998(b); Government of India, 2006, 2007; NCEUS, 2007 Galab et al, 2009; Kathuria & Mamta, 2012) we can expect greater reliance of small unorganized T&G firms on market-driven arrangements such as subcontracting for improvement of productivity. In the next stage we examine the impact of subcontracting on unorganized T&G firms' productivity.

Thus, in the third part of our analysis our objective is to examine the impact of prior marketing agreement³ (MA) on different segments of T&G firms. These agreements refer to linkages between large and small units in the industry at both pre- and post-production stages. Thus, such contracts cover input, technical and credit-related assistance from large firms in production as well as marketing of the small units' produce.

The segments considered here are OAMEs, NDMEs and DMEs⁴ (i.e., firms grouped by enterprise-type-a proxy of size). The other classification is based on product groups (and the markets catered by them) and the segments are: garments, power-driven textile units (PDUs) and hand-made textile units (HMUs). The latter two-groups are distinguished by the criterion of power consumption (expenditure on power as a percentage of total output by each production unit). Following NCAER (2009) we treated units spending up to one percent as HMUs and those spending above this as PDUs.

The organization of the paper is as follows: Section 2 enlists the specific research questions. The following section on 'Data and Methodology' contains two broad subsections: One describes the database used for this analysis and the computation of variables evaluated. The other includes three parts – each discussing the methods used for three different research questions. In section 4 we discuss the findings which are arranged in three subsections – one on the descriptive

statistics related to average productivity of unorganized T&G firms from different segments followed by a cluster analysis while the regression results on the analysis of MA are reported at the end. Final section (Section 5) concludes the paper.

2. RESEARCH QUESTIONS

1. Exposed to an increasingly competitive environment, what have been the varying responses of different segments of the unorganized T&G industry in India – reflected in its performance relating to productivity?
2. The second exercise tries to identify homogenous and distinct groups of firms in terms of their respective levels of productivity and the aspect (viz. the structural characteristics of firms or the classification based on product groups) that dominates in explaining the variation in inter-group performances.
3. How the firm manages the risk of operating in a pro-competitive environment partly determines its adaptability. Risk-managing ability is likely to be derived from characteristics of individual firm and various market and non-market arrangements it enters in at the production as well as post-production stages. In the third part of the analysis we examine the determinants of marketing agreement – one such important market-driven arrangement – and its impact on firm productivity.

3. DATA AND METHODOLOGY

Database and Variables: We have used NSS annual cross-section data on unorganized manufacturing sector at the unit-level for two years 2000-01 and 2010-11 (2001 and 2011 respectively from now). All firms with codes 17 (textile) and 18 (garments) according to the NIC 2-digit classification were chosen for the year 2001 and the corresponding codes in 2011 are 13 (textile) & 14 (garments) respectively.

To enable over time comparison of average productivities (i) the datasets in the two years were made compatible by considering only proprietorship and partnership firms and by making other suitable adjustments⁵; and (ii) the relevant series on output and asset were converted at 2004-05 prices by using relevant WPI series for manufacturing products.

In the first exercise, $L : \text{Worker-days} = (\text{average number of FTE}^6 \text{ workers employed daily}) * 30 * (\text{number of months})$

3 The term 'marketing agreement' used in the NSS 67th round survey on Unincorporated Non-agricultural Enterprises is equivalent to contract-work/subcontracting - a concept used by the previous two rounds on Unorganized Manufacturing Enterprises.

4 Own Account Manufacturing Enterprises, Non-Directory Manufacturing Establishments and Directory Manufacturing Establishments respectively;

5 For example, 'Establishments' surveyed in the NSS 67th round were classified in NDMEs and DMEs following the employment criterion used in the NSS 2001 data;

6 Two part-time workers were treated as one full-time equivalent (FTE) worker (following NCEUS 2007).

operated); accordingly firm-specific AP_L is measured as the log value of annual GVA⁷ per worker-days; in the last two exercises, $L = \text{Worker-hour} = (\text{worker-days} \times \text{average hours worked daily})/8$ and $AP_L = \log \text{GVA per worker hour}$ ⁸; AP_K is measured by log value of annual GVA per unit of capital⁹ (K);

The T & G firms in our sample were divided into two groups – those with no prior marketing with other firms (called NMA firms here) and the other group having some prior marketing agreement with other firms (termed MA firms here). The firms in MA supply either the entire amount of their produce or a part of it to the other party in the agreement. To get clear results on impact of marketing agreement on firm productivity we considered firms operating only within marketing agreement mode and selling entire amount of the produce to the contractor.

After making similar adjustments¹⁰ for both the years, we finally worked on a sample containing 48086 and 39122 firms (estimated 4762,230 & 6804,357 units) respectively for 2001 and 2011.

Exploratory Analysis on Productivity

In this part of the analysis, we make use of the summary statistics for the average labour and capital productivity of sample T&G enterprises evaluated at 2004-05 prices.

Cluster Analysis

Average linkage method of Hierarchical agglomerative clustering was followed to identify groups such that observations within each group are similar to each other and the groups are dissimilar among them. The average

linkage method treats the distance between two clusters as the average distance of pairs of items when one item of each pair is from two different clusters (Dutta, 2013).

If we have N number of observations to work with the agglomerative hierarchical clustering begins with N clusters – each with one member observation. An NxN symmetric distance matrix, $D = \{d_{ik}\}$ is formed where d_{ik} is the average distance between i^{th} and k^{th} items, $i \neq k$. If U and V are two most similar clusters in this initial distance matrix, U & V are merged into a new cluster UV and an updated distance matrix is created incorporating the changed profile of cluster. The average distance between the newly formed cluster (UV) and any other cluster W can be calculated as

$$d_{(UV)W} = \frac{\sum_i \sum_k d_{ik}}{N_{(UV)}N_W}$$

The variables used for clustering are the mean values of log GVA (LN_VA) and log GVA per worker hour (LN_GVA_HR) for three enterprise-types (OAME, NDME & DME) and each type of enterprise for three industry sub-groups (Garments, PDUs & HMUs) i.e., total nine mean values for each variable. The nine groups are shown in table A1 in the Appendix. We carried out the cluster analysis considering these variables since the descriptive analysis indicated presence of a systematic inter-group variation with respect to these measures¹¹.

We get a proximity matrix showing the squared Euclidian distance between the scores of the nine groups. This matrix measures dissimilarities (distances) between two groups in a cluster. The results are visually represented in Dendrogram 1.

Modified Heckman Selection Model

One of the main objectives of this paper is to identify the impact of selection into a treatment such as choosing to have a prior marketing agreement on the outcome i.e., productivity of T&G firms. For this purpose we cannot however straightaway compare the productivities of the MA and NMA firms given in the data set due to potential non-randomness in the sample on MA and NMA firms. The non-random nature of the sample data derives from the fact that the T&G firms in the sample are not randomly assigned to enter in a marketing agreement. Actual incidence of MA depends on its demand as well as the availability of such opportunities. Decision to enter in a marketing agreement depends on firm-specific characteristics which also influence individual firm's performance on productivity. If firms are not randomly selected into MA with respect to such firm-

7 This gives a better idea of the income of the enterprise as well as of the surplus available for expansion (Basole et al 2014) in excess of the costs incurred on intermediate inputs.

8 This measure of labour productivity can provide us more accurate information on productivity than Log GVA per workdays as length of workdays typically varies across unorganized firms. The latter measure using work-days was used in the over-time comparison of productivity as information on length of workdays was not available in 2001 data.

9 K = the market value of (owned fixed assets + hired fixed assets), as recorded on the closing date of the reference year. The patterns of change between 2001 & 2011 remain the same as is indicated here when we used other measures of capital e.g. annualized present value of the fixed assets by perpetual inventory method – assuming a 10 per cent annual rate of interest and a lifetime of 15 years for the assets concerned;

10 Firms with non-positive reported values of output or inputs were excluded.

11 Average capital productivity on the other hand fell uniformly for all groups and enterprise-types although the rate of decline varied across these classifications.

level characteristics this will lead to biased and inconsistent estimates on the effect of marketing agreement on firm productivity. But randomness of the sample cannot be restored unless the process of selection into MA is modeled and the selection effects are explicitly accounted for. This necessitates the application of the method of Heckman correction for the sample selectivity.

We applied a modified Heckman sample-selection procedure since one of our objectives was to re-apply a part of the research exercise carried out for the Indian unorganized manufacturing sector as a whole for the year 2005-06 in Basole et al (2014) in the context of Indian T&G sector in 2011. It is important to note here that unlike in the classic *wage-offer* equation in the Heckman model, production and productivity-related information are available for all firms in the sample here irrespective of their status regarding marketing agreement. The modified model is specified below.

Model Specification

Let s_i be a dummy variable such that for firms entering MA, s_i takes the value 1 and it is zero for the NMA firms.

If s_i^* is the unobserved latent variable here – representing the decision to enter MA and

$$s_i^* = w_i \gamma + v_i$$

i.e., it is determined by observed covariates and unobserved stochastic error term v_i , w_i is the $(k \times 1)$ vector of covariates and γ is a $(1 \times k)$ vector of parameters. Thus,

$$s_i = 1[w_i \gamma + v_i > 0]$$

$s_i = 1(\cdot)$ being the index function. So s_i will be observed only if $s_i^* > 0$. Notably the error term v_i is assumed to have a standard normal distribution and to be independent of w_i .

Therefore, the selection equation can be written as

$$s_i = \begin{cases} 1 & \text{if } s_i^* > 0 \\ 0 & \text{if } s_i^* \leq 0 \end{cases} \quad (1)$$

Let y_i denote the outcome variable i.e., log GVA per worker-hour. The two corresponding observation equations respectively for NMA and MA firms are:

$$y_{0i} = x_i \beta_0 + u_{0i} \quad (2)$$

$$y_{1i} = x_i \beta_1 + u_{1i} \quad (3)$$

where, (v_i, u_{0i}) and (v_i, u_{1i}) are jointly normally distributed and the error terms have zero mean and non-zero co-variance terms.

Using the inverse Mills ratio λ -evaluated at $(w_i \gamma)$ as an

additional regressor (equivalent to an omitted variable¹²) in the following equation:

$$E(y|w_i, s_i = 1) = x_{ji} b_j + \rho_j \sigma_j \lambda(w_i \gamma) \quad (4)$$

We estimate β_j ($j = 0$ for NMA firms and $j = 1$ for MA firms) the two-step Heckman sample selection regression. Here σ^2 and ρ respectively denote the non-unitary variance of the error term v_i in the selection equation and covariance parameter (between v_i and u_{ij} , ($j = 0, 1$)).

List of independent variables included in this analysis:

We have incorporated in the vector of covariates¹³

(a) independent dummies: (i) location of the firm in urban areas (denoted by ‘URBAN’) [+], (ii) whether an enterprise is female-headed or not (‘FHE’) [-], (iii) whether it is located inside household (‘HOUSE’) [-], (iv) whether its owner or major owner-partner is from relatively less disadvantaged social groups such as from non-ST/SC/OBC etc. (we call them ‘general’ here as against the ST/SC/OBC groups constitutionally scheduled as ‘reserved’ category referring to the relatively socially disadvantaged groups) (‘SOC_GR’) [+]; (v) if the owner or major partner engages in other economic activities (‘OEA’)¹⁴ [+], (v) proximity of the enterprise to institutional support system (‘SUPPORT’ = 1 if the unit was registered or had received any loan in last three years or had availed of institutional loan, and = 0 otherwise) [+]; (vi) whether the concerned firm hires labour or not (‘N_OAME’)- a proxy for size [+]; and

(b) Variables such as age of the firm (‘AGE’ equaling to the difference between the reference year – taken as 2011 and the year of initial operation) [+], and log value of total assets (‘LN_K’) [+];

Identification

Vector of covariates used in the observation equations should strictly be a subset of the vector of covariates used for selection equation. Otherwise it becomes very difficult to distinguish between two observationally equivalent equations or more specifically between sample selection and misspecified functional form (Wooldridge, 2009). Eliminating the possibility of multicollinearity between the two regressor terms in equation 4 of the last subsection depends on (i)

12 The set of other organizational characteristics of the MA firm is often a set of omitted variables. If these characteristics do indeed affect the likelihood of recording better productivity, they will induce correlation among the error terms leading to biased estimates.

13 Sign in parentheses indicate direction of causal influence;

14 We could consider these variables depicting owners’ or major owner-partners’ characteristics for regression as our sample consists of only proprietorship and partnership firms.

non-linearity of inverse-Mills ratio and more importantly on (ii) exclusion restrictions. Exclusion restrictions ensure that there is at least one variable considered that influences MA decision but not the productivity outcome. Exclusion restrictions used here are in terms of the variable – ‘HOUSE’ (used in all the alternative regression models reported in this work) and in terms of owner’s social group, SOC_GR (incorporated in selection equations of two models). Location within home and associated restricted mobility may affect such firms’ productivity – through strong association with two features: female ownership and size. Similarly, the less-disadvantaged social group (those other than ST/SC/OBC) may enjoy relative structural advantage in terms of better connectivity to market and greater ability to negotiate with formal institutions - often required for independent operations in the market - than the so-called ‘reserved’ category. Thus potential average labour productivity is likely to differ between these two groups. One might argue that owners from the reserved social groups may be relatively isolated and less likely to be registered under any act or authority and are likely to be systematically distant from the institutional support structure. Thus FHE, N_OAME and SUPPORT were included in relevant regression models to eliminate any differential impact of these two covariates.

4. MAIN FINDINGS

Comparative Analysis of Change in Average Productivity

Average labour productivity is measured by logarithmic value of annual gross value added (GVA)–evaluated at 2004-05 prices-per worker-day in the respective years. Average capital productivity was similarly expressed as the logarithmic value of the same annual GVA at 2004-05 prices per unit of capital in respective years. Table 1 demonstrates the pattern of change during the study period.

All the production units taken together in three constituent sub-groups – Garments, power-driven textile and hand-made textile segments in the unorganized T & G sector recorded positive and statistically significant growth in AP_L . For each time point, AP_L was the highest in the DMEs followed by those observed in the NDMEs and the OAMEs in each of the sub-groups. The only exception was the power-driven textile segment where labour productivity in the year 2011 was the highest in the NDMEs, followed by those recorded in the DMEs and the OAMEs.

NDMEs in the garments and power-driven subsectors also showed growth in AP_L , but not to the extent of the growth exhibited by the OAMEs in the respective sub-groups¹⁵.

15 We repeated this productivity comparison (between 2001

There was a statistically significant fall in the value of productivity for DMEs among the handmade textile units. The rate of improvement found for the DMEs among the PDUs was comparatively low. The observed decline in AP_L for the DMEs in the garments sector was not statistically significant.

Statistically significant fall in average productivity of capital was observed in all types of enterprises (OAMEs, NDMEs and DMEs) in all three sub-groups referred here and in the T&G sector as a whole.

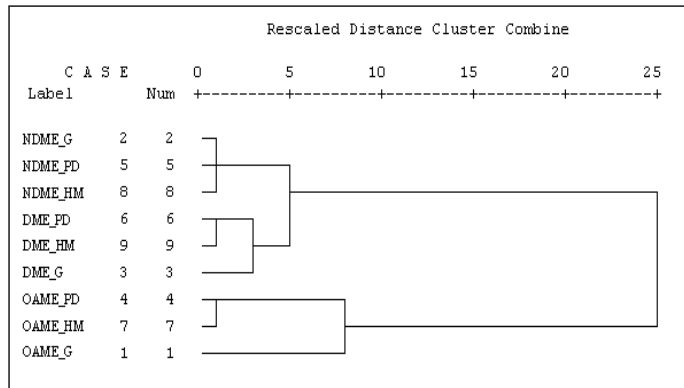
Thus, we find generally an improvement in average labour productivity-except for a few segments of unorganized T&G firms in 2011 relative to the values obtained for 2001. What is striking, however, is the faster rise in productivity of OAMEs than that experienced by non-OAMEs. This is contrary to the expectation that the larger units within the unorganized sector are better able to cope up with increased market-related risks and to improve their performance by taking advantage of new market-opportunities.

Results of Cluster Analyses

Dendrogram 1

Hierarchical Cluster Analysis Using GVA and Average productivity of labour

Dendrogram using Average Linkage (Between Groups)



Dendrogram 1 shows that we have three distinct clusters of OAMEs, DMEs and NDMEs (in the descending order of compactness) irrespective of the product markets they cater to.

& 2011) within the unorganized establishments using a differently computed series of Value Added (the difference between ‘total receipts’& cost of raw-materials and energy) as the relevant output-as used by Sen & Majumder (2014). Consistent with the findings of that study, we find a slow growth and an absolute decline in mean labour productivity for NDMEs and DMEs respectively for all three T&G sub-groups considered here. Mean capital productivity generally showed an all-round tendency of decline.

Table 1. Change in Average Productivities in Different Sub-Groups of the Unorganized T&G Industry Between 2001 & 2011

Classification of firms	Values#	2001		2011		Mean(2011)- Mean(2001)	t-value	Degrees of freedom	Pr(T > t)	Significance (at less than 5% level)
		No. of Obs.	Mean	No. of Obs.	Mean					
Garments										
All firms		26954	3.79	31043	4.33	0.54	74.96	57995	0.0000	**
OAMES	AP _L	20356	3.61	23633	4.27	6.64	78.95	43987	0.0000	**
NDMEs		5622	4.32	6658	4.50	0.18	17.01	12278	0.0000	**
DMEs		976	4.68	752	4.65	-0.03	-0.86	1726	0.3887	
All firms		26954	-0.56	31043	-0.74	-0.18	-19.91	57995	0.0000	**
OAMES	AP _K	20356	-0.63	23633	-0.78	-0.15	-14.27	43987	0.0000	**
NDMEs		5622	-0.36	6658	-0.60	-0.24	-14.69	12278	0.0000	**
DMEs		976	-0.17	752	-0.47	-0.30	-6.22	1726	0.0000	**
PDU's										
All firms		12099	3.51	3964	4.14	0.63	33.85	16061	0.0000	**
OAMES	AP _L	8796	3.28	2551	3.98	0.70	30.58	11345	0.0000	**
NDMEs		1829	4.05	926	4.45	0.40	12.38	2753	0.0000	**
DMEs		1474	4.25	487	4.42	0.17	4.43	1959	0.0000	**
All firms		12099	0.05	3964	-0.36	-0.42	-17.82	16061	0.0000	**
OAMES	AP _K	8796	-0.02	2551	-0.55	-0.53	-17.20	11345	0.0000	**
NDMEs		1829	0.17	926	-0.10	-0.27	-6.75	2753	0.0000	**
DMEs		1474	0.34	487	0.10	-0.24	-4.74	1959	0.0000	**
HMU's										
All firms		9033	3.95	4115	4.07	0.12	7.53	13146	0.0000	**
OAMES	AP _L	4506	3.47	2494	3.86	0.39	19.53	6998	0.0000	**
NDMEs		2164	4.32	995	4.38	0.06	2.1154	3157	0.0345	**
DMEs		2363	4.53	626	4.45	-0.09	-2.83	2987	0.0050	**
All firms		9033	-0.52	4115	-0.96	-0.44	-24.68	13146	0.0000	**
OAMES	AP _K	4506	-0.58	2494	-1.07	-0.49	-18.66	6998	0.0000	**
NDMEs		2164	-0.49	995	-0.84	-0.35	-10.81	3157	0.0000	**
DMEs		2363	-0.43	626	-0.71	-0.29	-8.27	2987	0.0000	**

- All values are calculated at 2004-05 prices

Source: Authors' Calculation

²Omanbotantim is one of the Community-based organisations in the Kenyase community

Thus, notwithstanding the variation in the degree of compactness and distinctness of the clusters formed and represented by the Dendrogram, a clear pattern emerges: the OAMEs in all the three product-groups are similar among them in terms of GVA & productivity. Similarly, each of the groups NDMEs and DMEs also forms distinct clusters –demonstrating similarity between the same enterprise-types across product-classes & dissimilarity with other enterprise-types.

Thus the results from the exploratory analysis in the last two subsections show that the OAMEs and non-OAMEs in the T&G sector or in each of its different segments behaved differently - as distinct groups - with respect to the member firms' performance in terms of average productivity. If difference in terms of size and other organizational characteristics account for variation in responses to emerging market-related risks and opportunities it becomes necessary to examine impact of specific arrangements such as marketing agreement - representing such risks/opportunities on individual firm's performance.

Analysis of Marketing Agreement and Productivity

In this sub-section we make an attempt to understand how selected unit-level structural characteristics affect firms' marketing agreement (MA also) decision and to compare the labour productivity between the marketing agreement (MA) and non-marketing-agreement (NMA) firms classified by these enterprise-features.

Regression Results

Tables 2 through 4 report the results of five alternative Heckman selections models (the detail of covariates used in each regression model is given in Table A2 of the Appendix) for the full sample of firms. It is crucial to note that the Mills ratio in almost all the regression models is significant. This confirms the presence of significant selection bias in our sample and justifies the application of Heckman model in this context.

The first column in every model gives the PROBIT results which capture the selection effect of certain structural characteristics at the firm-level. The second and third columns of each regression model (with names 'NMA' and 'MA') in all the three tables show the coefficients of concerned covariates (a subset of covariates used in respective first columns i.e., used in respective selection equations). They measure the differential selection-corrected effects of the chosen determinants on productivity performance of the NMA and MA firms respectively. We discuss below how the selected characteristics influence the probability of

marketing agreement and average labour productivity.

We found positive coefficients for the variables 'HOUSE' and 'N_OAME' – each one statistically significant¹⁶ in the selection equation of all the regression models in Tables 2, 3 & 4. Thus, being located in a household or being a non-OAME (i.e., use of hired worker) improves the probability of entering marketing agreement. On the other side, log value of asset, being female-headed and operating in urban areas lower the probability of MA (indicated by statistically significant negative coefficients in all the regression models). While the observed signs for coefficients of 'HOUSE' and 'LN_K' corroborate the findings from Basole et al study (op cit.) on unorganized manufacturing sector as a whole, greater probability of non-OAMEs (rather than OAMEs) and non-FHEs (rather than FHEs) being in a marketing agreement seems to be a phenomenon specific to T&G sector.

All the regression models in Tables 2 and 3 show that operating in urban areas (than in rural areas) has a positive impact on productivity of NMA firms in the garments segment but has a negative impact on productivity of the NMA units in power-driven textile segment (at less than 5% level of significance). We did not find any statistically significant effect of the firm's urban location on productivity of MA firms in either of these two segments. On the other hand, urban location seems to decrease MA firms' productivity in the hand-made textile segment while its effect on the NMA units' productivity was generally statistically insignificant there (Table 4).

Like in Basole et al (op cit.), we found a higher asset elasticity of labour productivity (the coefficient of 'LN_K') for firms having marketing agreement than for enterprises without marketing agreement in garments and power-driven textile segments despite the latter group in both product-groups being relatively asset-poor. But the hand-made textile units show opposite trend. Given the relatively high average asset use by HMUs than by the firms in the other two segments, it is surprising to note that marketing agreement does not yield any positive impact on the productivity of HMUs with marketing agreement.

Following the same study we identified in our analysis 'marketing agreement penalty' or 'marketing agreement premium' (depending respectively on if the coefficient values for MA was high or low relative to the coefficient values for NMA firms). Consistent with their observation we noted a 'marketing agreement penalty' for FHEs in the garments as well as hand-made textile sections and a 'marketing agreement premium' for PDUs.

16 By 'statistically significant' results here we will refer to parameter estimates which are significant at less than 1%. Otherwise the levels of significance will be mentioned.

Table 2. Results from Two-step Modified Heckman Selection Model: Garments Enterprises

Independent Variables	Dependent Variable: LN_GVA_HR														
	Reg_1			Reg_2			Reg_3			Reg_4			Reg_5		
	Selection equation	NMA	MA	Selection equation	NMA	MA	Selection equation	NMA	MA	Selection equation	NMA	MA	Selection equation	NMA	MA
URBAN	.147 (.031) ***	.095 (.011) ***	.061 (.049) *	.129 (.031) ***	.082 (.008) ***	.081 (.049) *	.120 (.032) ***	.075 (.008) ***	.078 (.049) ***	.120 (.032) ***	.070 (.008) ***	.074 (.048) ***	.129 (.031) ***	.076 (.008) ***	.078 (.049) ***
FHE	-.096 (.035) ***	-.125 (.011) ***	-.350 (.052) ***	-.111 (.035) ***	-.128 (.008) ***	-.359 (.053) ***	-.177 (.037) ***	-.142 (.009) ***	-.379 (.055) ***	-.172 (.037) ***	-.133 (.009) ***	-.378 (.055) ***	-.105 (.035) ***	-.119 (.009) ***	-.359 (.053) ***
OEA							-.178 (.045) ***	-.088 (.011) ***	-.048 (.069) ***	-.178 (.045) ***	-.084 (.011) ***	-.044 (.069) ***			
AGE							-.011 (.002) ***	-.002 (.0005) ***	-.004 (.003) ***	-.012 (.002) ***	-.002 (.0005) ***	-.004 (.003) ***			
HOUSE	.499 (.041) ***			.500 (.041) ***			.518 (.041) ***			.546 (.042) ***			.523 (.041) ***		
SOC_GR				.223 (.030) ***			.223 (.030) ***			.218 (.030) ***			.218 (.030) ***		
LN_K	-.024 (.014) *	.161 (.005) ***	.201 (.019) ***	-.029 (.014) **	.167 (.004) ***	.188 (.019) ***	-.034 (.014) **	.163 (.004) ***	.187 (.020) ***	-.039 (.014) ***	.158 (.004) ***	.186 (.020) ***	-.033 (.014) **	.162 (.004) ***	.186 (.020) ***
SUPPORT										.156 (.041) ***	.119 (.011) ***	.023 (.058) **	.133 (.041) **	.117 (.011) ***	.018 (.058) ***
N_OAME	.610 (.042) ***	.025 (.018) ***	.019 (.082) **	.591 (.042) ***	-.068 (.013) ***	.080 (.079) ***	.574 (.042) ***	-.070 (.013) ***	.067 (.078) ***	.547 (.043) ***	-.010 (.013) ***	.060 (.079) ***	.568 (.043) ***	-.096 (.013) ***	.075 (.081) ***
Mills lambda		-.856 ***	.307 **		-.173 ***	.427 ***		-.220 *	.415 ***		-.115 ***	-.407 ***		-.075 ***	.421 ***
No. of Obs.	31043			31043			31042			31042			31043		
Prob.>chi2	0.0000			0.0000			0.0000			0.0000			0.0000		

Note: The entries in each cell (below the values of coefficients) give the corresponding adjusted standard errors of the covariates; *, **, and *** refer to significance levels p<0.1, p<0.05 and p<0.01 respectively; NMA and MA denote respectively firms without and with marketing agreement.

Source: Authors' Calculation

Table 3. Results from Two-step Modified Heckman Selection Model: Power-Driven Textile Units (PDUs)

Independent Variables	Dependent Variable: LN_GVA_HR														
	Reg_1			Reg_2			Reg_3			Reg_4			Reg_5		
	Selection equation	NMA	MA	Selection equation	NMA	MA	Selection equation	NMA	MA	Selection equation	NMA	MA	Selection equation	NMA	MA
URBAN	-.160 (.046) ***	-.162 (.064) **	.017 (.049)	-.164 (.046) ***	-.139 (.054) **	.040 (.049)	-.186 (.046) ***	-.139 (.500) ***	.043 (.050)	-.178 (.047) ***	-.141 (.052) ***	.044 (.051)	-.155 (.046) ***	-.141 (.057) **	.039 (.049)
FHE	-.398 (.052) ***	-.299 (.081) ***	.300 (.071) ***	-.383 (.052) ***	-.267 (.069) ***	-.255 (.068) ***	-.386 (.054) ***	-.307 (.063) ***	-.267 (.070) ***	-.395 (.055) ***	-.317 (.069) ***	-.259 (.074) ***	-.396 (.052) ***	-.283 (.077) ***	-.250 (.072) ***
OEA							-.211 (.052) ***	-.099 (.053) *	.001 (.055)	-.222 (.052) ***	-.106 (.056) *	.009 (.056)			
AGE							.003 (.002) ***	-.009 (.002) ***	-.002 (.002) ***	.003 (.002) ***	-.009 (.003) ***	-.002 (.002) ***			
HOUSE	.450 (.059) ***			.456 (.059) ***			.457 (.060) ***			.422 (.060) ***			.425 (.060) ***		
SOC_GR				.117 (.048) **			.125 (.048) ***			.115 (.048) **			.106 (.048) **		
LN_K	-.098 (.018) ***	.103 (.029) ***	.124 (.024) ***	-.096 (.018) ***	.115 (.024) ***	.138 (.023) ***	-.100 (.018) ***	.122 (.022) ***	.140 (.024) ***	-.076 (.019) ***	.127 (.022) ***	.132 (.023) ***	-.072 (.019) ***	.122 (.024) ***	.130 (.022) ***
SUPPORT										-.332 (.067) ***	-.099 (.083) ***	.136 (.077) *	-.315 (.067) ***	-.131 (.091) ***	.123 (.075) ***
N_OAME	.380 (.056) ***	.350 (.086) ***	.240 (.059) ***	.370 (.056) ***	.314 (.073) ***	.208 (.058) ***	.367 (.056) ***	.278 (.066) ***	.198 (.058) ***	.406 (.057) ***	.297 (.076) ***	.178 (.064) ***	.406 (.057) ***	.341 (.085) ***	.193 (.063) ***
Mills lambda		-.1570 ***	-.034 ***		-.1347 ***	-.190 ***		-.1212 ***	-.211 ***		-.1262 ***	-.233 ***		-.1416 ***	-.201 ***
No. of Obs.	3964			3964			3962			3962			3964		
Prob.>chi2	0.0000			0.0000			0.0000			0.0000			0.0000		

Note: The entries in each cell (below the values of coefficients) give the corresponding adjusted standard errors of the covariates; *, **, *** and **** refer to significance levels p<0.1, p<0.05 and p<0.01 respectively; NMA and MA denote respectively firms without and with marketing agreement.

Source: Authors' Calculation

Table 4. Results from Two-step Modified Heckman Selection Model: Handmade Textile Units (HMUs)

Independent Variables	Dependent Variable: LN_GVA_HR														
	Reg_1			Reg_2			Reg_3			Reg_4			Reg_5		
	Selection equation	NMA	MA	Selection equation	NMA	MA	Selection equation	NMA	MA	Selection equation	NMA	MA	Selection equation	NMA	MA
URBAN	-.442 (.042) ***	-.234 (.124) *	-.254 (.095) **	-.437 (.042) ***	-.160 (.091) *	-.274 (.091) ***	-.439 (.043) ***	-.103 (.080) **	-.209 (.084) **	-.431 (.043) ***	-.093 (.077) **	-.163 (.079) **	-.430 (.043) ***	-.152 (.089) *	-.235 (.086) ***
FHE	-.416 (.052) ***	-.385 (.116) ***	-.342 (.095) ***	-.407 (.052) ***	-.323 (.086) ***	-.365 (.092) ***	-.405 (.054) ***	-.335 (.074) ***	-.363 (.084) ***	-.403 (.054) ***	-.327 (.072) ***	-.340 (.080) ***	-.404 (.052) ***	-.317 (.084) ***	-.343 (.088) ***
OEA							-.010 (.053)	.137 (.049) ***	-.075 (.047) **	-.010 (.053)	.137 (.048) ***	-.077 (.045) *			
AGE							.001 (.002)	-.009 (.002) ***	-.011 (.002) ***	.000 (.002)	-.009 (.002) ***	-.012 (.002) ***			
HOUSE	.278 (.056) ***			.263 (.056) ***			.262 (.056) ***			.274 (.057) ***			.274 (.057) ***		
SOC_GR				-.112 (.043) ***			-.112 (.043) **			-.105 (.044) **			-.105 (.043) **		
LN_K	-.121 (.018) ***	.071 (.042) *	.073 (.032) **	-.125 (.018) ***	.093 (.031) ***	.068 (.031) **	-.125 (.018) ***	.103 (.027) ***	.086 (.028) ***	-.133 (.018) ***	.098 (.027) ***	.067 (.028) **	-.133 (.018) ***	.089 (.032) ***	.048 (.031) ***
SUPPORT										.089 (.056)	.074 (.050)	.237 (.048) ***	.089 (.056)	.059 (.058) ***	.229 (.054) ***
N_OAME	.330 (.057) ***	.299 (.096) ***	.366 (.071) ***	.341 (.057) ***	.255 (.074) ***	.380 (.070) ***	.341 (.057) ***	.224 (.064) ***	.318 (.065) ***	.327 (.058) ***	.207 (.063) ***	.271 (.061) ***	.327 (.057) ***	.243 (.072) ***	.338 (.067) ***
Mills lambda		-.1564 ***	.871 ***		-.1249 ***	.949 ***		-.1071 ***	.730 ***		-.1052 ***	.647 ***		-.1236 ***	.885 ***
No. of Obs.	4115			4115			4115			4115			4115		
Prob.>chi2	0.0000			0.0000			0.0000			0.0000			0.0000		

Note: The entries in each cell (below the values of coefficients) give the corresponding adjusted standard errors of the covariates; *, **, and *** refer to significance levels p<0.1, p<0.05 and p<0.01 respectively; NMA and MA denote respectively firms without and with marketing agreement.
Source: Authors' Calculation

In other words, FHEs in garments and hand-made textile subsectors could improve their productivity had they not entered a marketing agreement while female-headed PDUs could reduce their productivity-related disadvantage relative to the non-FHEs when the former had prior marketing agreement.

Engaging in other economic activities (OEA) and age of the firm seem to decrease the probability of marketing agreement in the garments segment (as indicated by the negative coefficients observed in regressions 3 & 4 in Table 2). These two factors did not have statistically significant influence on MA decision in the two textile sub-groups (regressions 3 & 4 in Tables 3 and 4) but affected the performance on productivity. Both these factors lower productivity of NMA firms in garments and power-driven sections. While age decreases productivity in NMA firms in hand-made segment, pursuing other economic activity raises NMA units' productivities there.

Relatively weak social groups (ST/SC/OBC etc) displayed lower probability of having MA for PDUs and in the garments sector while exactly the opposite was true for the HMUs (reflected in regressions 2, 3, 4 & 5 in Tables 2, 3 & 4).

Institutional support improves the probability of marketing agreement among all garments units but has no significant role in increasing productivity of firms actually with marketing agreement. Interestingly, this factor has a productivity-enhancing role for units not in marketing agreement. On the other hand, proximity to such support has no significant effect on hand-made textile units' MA decision. But it displays a productivity-improving role for units actually having MA. This fact points at the possible complementarity between market-driven opportunities like marketing agreement and institutional support for firms in the hand-made segment which availed of such opportunities. Index of institutional support – an important variable in reducing the probability of MA among the PDUs – recorded no statistically significant impact on productivity¹⁷ (Table 3).

Finally, use of hired labour has a statistically significant and positive impact on productivity of garments firms without marketing agreement but not on the MA firms' productivity. But, non-OAMEs recorded higher productivity in the textile sub-group – both in and outside marketing agreement relation. Enterprise-type influences productivity performance in

17 Only one model - Regression 4 - shows a positive impact only for the power-driven firms with marketing agreement. This model controls for variation in all structural characteristics selected for regression. This observation may support the argument on the complementarity between market-opportunities and institutional support (actual & potential) in this section also.

the textile sub-sector but not in the garments section. We observed the presence of a 'marketing agreement penalty' and a 'marketing agreement premium' respectively among non-OAMEs in the power-driven and hand-made textile segments (Tables 3 & 4). This can possibly be explained by difference in the targeted markets of PDUs and HMUs. Power-driven units supply a large share of mass-produced articles for ordinary consumption in relatively local markets while hand-made textile units have been typically specializing in producing for high-end customers in distant markets (Roy, 1996; Niranjana et al, 2001). It may be that without a regular and assured access to such markets – made possible by arrangements such as MA¹⁸ - the bigger HMUs would have recorded even lower productivity.

5. CONCLUSION

Withdrawal of major protective measures favouring the small-scale Textile and Garments firms by the Textile Policy 2000 and general policy-emphasis on market-driven opportunities such as subcontracting for improving productivity of such units created a pro-competitive environment facing the unorganized T&G enterprises. Varied productivity-performances of firms with diverse structural characteristics and facing distinct product-markets are expected to reflect differential responses to these new opportunities as well as threats that liberalized and deregulated T&G market posed. In this context we sought to systematically explore the over-time change in labour and capital productivity for various sections of T&G producers classified by structural feature such as size and also by product-groups. Contrary to our expectation that bigger unorganized firms would adjust better in the new context, we observed that, the smaller firms exhibited greater adaptability by recording larger improvements in the values of labour productivity between 2001 and 2011. More specifically, the OAMEs exhibited maximum improvement. Capital productivity however fell uniformly in each group.

The cluster analysis with group averages of labour productivity indicated that the OAMES in 2011 form a distinct group from the non-OAMEs of the same year with respect to productivity performances. In other words, structural characteristics of firms (rather than their product group-wise classification) influenced their adaptability in the changed context.

This led us to the question: how did different groups of unorganized Textile and Garments firms adapt to market-driven opportunities like marketing agreement (MA) relation with relatively large T & G units? The sample firms were

18 The other important channel used is the set of fairs/exhibitions and *haats* sponsored and organized by government. But this is reportedly inadequate.

classified on the basis of selected organizational features. A modified Heckman selection model helped us identifying (i) the characteristics of firms – more likely to be in marketing agreement; and (ii) differential impact of such selected features on productivity of firms without and with marketing agreement (respectively the NMA & MA firms) separately.

The regression results demonstrated that the adaptability of unorganized textile and garments firms (in any of the sub-groups considered here) to the pro-competitive environment depends on how each group is structurally situated with respect to factors such as the firm's location, use of hired labour, access to institutional support, gender of the owner etc.

Thus, the present analysis highlights the need to supplement the market-driven opportunities with a concrete understanding of the specific ways in which the structural constraints interact with the opportunities to affect the adaptability of different segments of the same sector. Only then effective measures of intervention can be designed to enable the unorganized Textile and Garments firms to reap the benefits of a pro-competitive environment.

ACKNOWLEDGEMENT

The authors wish to acknowledge Sarmila Banerjee of the University of Calcutta and Rajesh Bhattacharya of Indian Institute of Management, Calcutta for their analytical inputs. Sabitri Dutta of Dum Dum Motijheel Rabindra Mahavidyalaya is acknowledged for her technical help in running the cluster analysis. The usual disclaimers apply.

REFERENCES

- Basole, A., Basu, D., & Bhattacharya, R. (2014). Determinants and impact of subcontracting: Evidence from India's informal manufacturing sector'. Economics Department Working Paper Series, Amherst, USA: University of Massachusetts – Amherst.
- Dutta, S. (2013). Indoor air pollution and the pattern of morbidity: A study on urban India'. Unpublished doctoral thesis, University of Calcutta
- Galab, S., & Revathy, E. (2009). Understanding Powerloom Weavers' Suicides in Sircilla. *Economic and Political Weekly*, 44(8), 12-15.
- Government of India. (2007). Annual Report, Ministry of Textiles, New Delhi.
- Government of India. (2006). The Textile Turnaround 2004-05, Ministry of Textiles, New Delhi.
- Kathuria, L. M., & Mamta. (2012). *Understanding financing practices and constraints of small and medium enterprises in textile and clothing sector: An empirical study*. Retrieved from <http://abr.sagepub.com/content/8/3/303>
- Liebl, M., & Roy, T. (2001). Handmade in India - Preliminary Analysis of Crafts Producers and Crafts Production in India: Issues and Interventions, A report prepared for the Policy Sciences Center, Inc. as part of the Multi-Country Crafts Study Project.
- Liebl, M., & Roy, T. (2003). Handmade in India: Preliminary Analysis of Crafts Producers and Crafts Production, *Economic and Political Weekly*, 38(51/52), 5366-5376.
- NCAER (2009). Assessing the Prospects for India's Textile and Clothing Sector, Study Report by the National Council of Applied Economic Research, retrieved from http://texmin.nic.in/reports/Report_NCAER_CITInmcc_20091001.pdf
- National Commission for Enterprises in Unorganized Sector, (NCEUS.). (2007). Report on Conditions of Work and Promotion of Livelihoods in the Unorganized Sector. New Delhi: Government of India.
- Niranjana, S., & Vinayan, S. (2001). Report on growth and prospects of the handloom industry, Study commissioned by the Planning Commission. New Delhi: Government of India.
- Roy, T. (1996). Market resurgence, deregulation, and industrial response: Indian cotton textiles in 1990s. *Economic and Political Weekly*, 31(21), M31-M41.
- Roy, T. (1998a). Development or Distortion?: 'Powerlooms' in India, 1950-1997'. *Economic and Political Weekly*, 33(16), 897-911.
- Roy, T. (1998b). Economic reforms and textile industry in India. *Economic and Political Weekly*, 33(32), 2173-2182.
- Teewari, M. (1999). Successful adjustment in Indian industry: The case of Ludhiana's woolen knitwear cluster. *World Development*, 27(9), 1651-1671.
- Teewari, M. (2000). 'The Challenge of Reform: How Tamil Nadu's Textile and Apparel Industry is Facing the Pressures of Liberalization'. Paper prepared for the Government of Tamil Nadu, India and the Center for International Development, Harvard University, Cambridge MA.
- Sen, S., & Majumder, S. (2014). *Relative efficiency and employment intensity of organized and unorganized segments of Indian textile and garments industry: A preliminary exploration*. Paper presented in the Fifth National Seminar on Industrial Statistics, organized by the CSO-IS Wing held on 29th October, 2014.
- Wooldridge, J. M. (2009). *Econometrics*, New Delhi: Cengage Learning.

APPENDIX

Table A1. Groups in T&G Industry used for Cluster Analysis

Name of the group	Description
1	OAMEs in the Garments segment
2	NDMEs in the Garments segment
3	DMEs in the Garments segment
4	OAMEs in the Power-driven Textiles segment
5	NDMEs in the Power-driven Textiles segment
6	DMEs in the Power-driven Textiles segment
7	OAMEs in the Hand-made Textiles segment
8	NDMEs in the Hand-made Textiles segment
9	DMEs in the Hand-made Textiles segment

Source: Authors' classification for this work

Table A2. Detail of the Variables Used in the Reported Regression Models of Heckman Two-step Estimation Procedure

Regression Models	Dependent Variable	Explanatory Variables	Exclusion restriction
Model 1	LN_GVA_HR	URBAN, FHE, HOUSE, LN_K, N_OAME	HOUSE
Model 2		URBAN, AGE, FHE, SOC_GR, HOUSE, LN_K, N_OAME	HOUSE & SOC_GR
Model 3		URBAN, AGE, FHE, SOC_GR, OEA, HOUSE, LN_K, N_OAME	HOUSE & SOC_GR
Model 4		URBAN, AGE, FHE, SOC_GR, OEA, HOUSE, LN_K, SUPPORT, N_OAME	HOUSE & SOC_GR
Model 5		URBAN, FHE, SOC_GR, HOUSE, LN_K, SUPPORT, N_OAME	HOUSE & SOC_GR