Clustered vs. non-clustered SMEs: Productivity differences and Marshallian Externalities

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BIDS Research Almanac 2018

November 11, 2018

Motivation

SMEs have significant impact   (Little, 1987; Beck et al. 2005; Foghani et al. 2017)

- Economic growth
- Employment generation
- Rural non-farm growth
- Poverty reduction

SMEs and informal enterprises account for (Keskin et al. 2010)

- low income countries: 60% of GDP and 70% of total employment
- middle-income countries: 70% of GDP and 95% of total employment

In Bangladesh SMEs account for (BBS 2013)

- 50.9% of the country's industrial establishments
- 35.5% of industrial employment
- 47% of industrial gross value added

Cluster based SMEs

- Government promotes cluster based SME development

- easier to locate, intervention cost is lower, have an association

- The 7th Five Year Plan "An efficient strategy for capacity expansion of SMEs is through **agglomeration of co-located industries** to take advantage of scale economies in logistics and infrastructure and a host other ancillary facilities" (pag 228).

- SME Foundation: 177 SME clusters (2013)

Benefits of clustering (agglomeration)

- **Industries tend to agglomerate (Krugman, 1991, JPE)**
- Derive economies of scale

Benefits of agglomeration (Marshallian externalities)

1. Sharing

- opportunity of sharing indivisible goods
- firms can share large machines, intermediate goods

2. Matching

- **Labor market matching and other inputs**
- the number job seekers and vacancies may be in equilibrium quicker than in a non-cluster area.
- a smaller proportion of inputs will remain idle within a cluster.

3. Learning

- facilitate knowledge spillovers
- transfer of technological and business knowledge can easily be done in cluster areas

Research Questions

- Are the clustered SMEs different from the non-clustered SMEs?

- Are the clustered SMEs more productive? If positive, do Marshallian Externalities play any role?

Literature review

- India: (i) at the firm level from improved access to market centers, (ii) at the industry level from intra-industry localization economies, and (iii) at the regional level from inter-industry urbanization economies (Lall et al 2004, JDE)

- China: Through clustering an integrated production process can be divided into many incremental steps (Ruan and Zhang, 2009, EDCC)

- Peru, Clothing: Cost reductions and information spillovers are the dominant type advantages (Visser, 1999, WD)

- China, blue jeans: role of local cluster in global value chains (Bair and Gereffi, 2001, WD]

- Nairobi, handicraft: Existence of important agglomeration economies but informality also introduces particular diseconomies of agglomeration (Harris, 201 WD)

Sampling (sample 500: Cluster: 250 firms, Non-cluster: 25 firms)

15 Clusters: Leather, garments, jamdani, plastic, hosiery, light engineering, rice mill, electronic and electrical goods, home textile, agar-atar, cricket bat, nakshi katha

A Cluster is a concentration of 50 or above enterprises producing similar products or services and is situated within an adjoining geographical location of 3-5 kilometer radius (SME Foundation)

District	Upazila	Enterprise	Cluster	Sector	Sample Size (cluster/non-cluster)
Kishoreganj	Bhairab	2500	Leather	Leather Making and Leather Goods	44
Tangail	Delduar	2000	Clothing	Knitwear and Readymade Garments	35
Narayanganj	Rupganj	1364	Jamdani	Fashion-rich Wears, Personal Effects & Consumption Goods	25
Dhaka	Chakbazar	1100	Plastic	Plastics and Other Synthetics	25
Pabna	Pabna Sadar	800	Hosiery	Knitwear & Readymade Garments	20
Dhaka	Sutrapur	500	Light Engineering	Light Engineering and Metal Working	15
Nilphamari	Syedpur	500	Garments	Knitwear and Readymade Garments	15
Kushtia	Kustia Sadar	379	Rice Mill	Agro-processing /Agro-Business	10
Bogra	Bogra Sadar	300	Light Engineering	Light Engineering and Metal Working	10
Dhaka	Jatrabari	280	Electronics & Electrical Goods	Electronics and Electrical	10
Chittagong	CCC	275	Leather	Leather Making and Leather Goods	10
Bogra	Adamdighi	250	Home Textile	Handloom and Specialized Textile	10
Moulvi Bazar	Borolekha	100	Agar-Atar	Agro-processing /Agro-Business	7
Pirojpur	Nesarabad	52	Cricket Bat	Handicrafts and Miscellaneous Sector	7
Jamalpur	Sadar	50	Nakshi Katha	Handicrafts and Miscellaneous Sector	7
Total		10450			250

Comparison of clustered vs. non-clustered SMEs

➡ **Size and structure**

➡ Clustered SMEs are larger than the non-clustered SMEs in terms of capital stock, output but not in terms of labor employment

➡ Clustered SMEs are more capital intensive

Variable	Full sample	Cluster SME	Non-Cluster SME
	(1)	(2)	(3)
Capital stock (1st July 2018) (lac taka)	7.03 (0.77)	9.01 (1.35)	5.05 (0.74)
Total employment	17.1 (2.6)	17.8 (4.1)	16.4 (3.3)
Total Output (lac taka)	64.9 (4.40)	75.6 (7.22)	54.3 (4.99)
Capital-Labor ratio (thousand taka per labor)	60.8 (5.1)	69.4 (8.2)	52.2 (6.2)

Access to credit

Outstanding loan is higher for clustered SMEs

SMEs in clusters have greater access to SME loan of banks

Non-clustered SMEs rely more on NGO loans

Variable	Full sample	Cluster SME	Non-Cluster SME	Mean difference between cluster and non-cluster (p-value)
	(1)	(2)	(3)	(4)
Total outstanding loan (Lac taka)	3.96 (0.4)	4.92 (0.7)	3.0 (0.5)	0.0446
Average rate of interest of the last 3 loans taken	12.68 (0.25)	12.5 (0.3)	13.25 (0.3)	0.1367
Major source of credit (share in last 3 loans)				
- SME loan from bank	0.135 (0.01)	0.207 (0.03)	0.060 (0.019)	0.0001
- SME loan from SMEF's CWP	0.015 (0.00)	0.024 (0.01)	0.006 (0.00)	0.2070
- Non-SME loan from bank	0.215 (0.02)	0.227 (0.03)	0.202 (0.03)	0.5848
- NGOs	0.441 (0.027)	0.364 (0.03)	0.522 (0.03)	0.0036
- Mahajan	0.033 (0.00)	0.036 (0.014)	0.030 (0.013)	0.7682
- Friends/relatives	0.146 (0.01)	0.119 (0.02)	0.175 (0.02)	0.1510
Extent of ease the credit is available (Measured on a 1 to 4 scale: 1=very difficult, 2=difficult, 3= easy, 4= very easy)				
- SME loan from bank	1.880 (0.03)	1.979 (0.04)	1.766 (0.05)	0.0037
- SME loan from SMEF's CWP	2.106 (0.05)	2.120 (0.06)	2.087 (0.08)	0.7539
- Non-SME loan from public bank	1.930 (0.03)	1.975 (0.05)	1.885 (0.05)	0.2193
- Non-SME loan from private bank	2.002 (0.03)	2.065 (0.05)	1.938 (0.05)	0.0907
- NGOs	2.92 (0.03)	2.914	2.935	0.7727

Technology adoption

Variable	Full sample	Cluster SME	Non-Cluster SME	Mean difference between cluster and non-cluster (p value)
	(1)	(2)	(3)	(4)
Purchased new machine in last 5 years (yes=1, no=0)	0.236 (0.01)	0.256 (0.02)	0.216 (0.02)	0.2932
New machine replaced an old one (yes=1, no=0)	0.389 (0.04)	0.421 (0.06)	0.351 (0.06)	0.4415
Degree of replacement (partially=0, fully=1)	0.869 (0.05)	0.888 (0.06)	0.842 (0.08)	0.6515

No such differences in technology adoption in last 5 years

Extent of formalities

Clustered SMEs are more formal than non-clustered SMEs

Variable	Full sample	Cluster SME	Non-Cluster SME	Mean differenc between cluster non-cluster (p-va
	(1)	(2)	(3)	(4)
Legal type of the firms (number of firms)				
- Single ownership	468	228	240	
- Joint ownership	32	22	10	
Registered (yes=1, no=0)	0.8 (0.01)	0.912 (0.017)	0.688 (0.02)	0.0000
Regulatory bodies received license from (number of firms)				
- City corporation	105	55	50	
- Municipality	149	112	37	
- Union council	151	65	86	
Member of the association (yes=1, no=0)	0.46 (0.02)	0.828 (0.02)	0.092 (0.01)	0.0000
Written contract for permanent employees (number of firms)	12	8	4	
Oral contract for permanent employees (number of firms)	411	205	206	

Is TFP higher for clustered SMEs?

- $log\, Y = \alpha\, log\, K + \beta\, log\, L + \gamma\, log\, R + u$ [R = raw material]

- $\hat{u} = TFP$

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Linear regression                                 Number of obs   =        500
                                                  F(3, 496)       =     330.05
                                                  Prob > F        =     0.0000
                                                  R-squared       =     0.7449
                                                  Root MSE        =     .59987
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lnQ	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
lnLabor	.3579423	.0647302	5.53	0.000	.2307632	.4851214
lnK	.0712995	.0190009	3.75	0.000	.0339673	.1086317
lrm	.5518358	.0306234	18.02	0.000	.4916682	.6120035
_cons	2.712175	.5035514	5.39	0.000	1.722818	3.701532

If firms have
information
productivity
choosing K
endogeneity
problem ari

$$TFP = \alpha \ cluster \ dummy + \beta\left(\frac{K}{L}\right) + \gamma size + \delta sector + u$$

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	(i)	(ii)	(iii)	(iv)
Cluster dummy (cluster=1, non-cluster=0)	0.101* (0.053)	0.104** (0.052)	0.113** (0.052)	0.112** (0.051)
Technology (K/L)		-9.68e-08 (2.73e-07)	-1.18e-07 (2.75e-07)	1.56e-07 (3.68e-07)
Size (total L hour)			-1.54e-07** (7.21e-08)	-1.58e-07 ** (7.35e-08)
Sector dummies	No	No	No	Yes
Constant	-0.050 (0.041)	-0.045 (0.044)	-0.038 (0.043)	-0.191 (0.079)
R^2	0.007	0.008	0.02	0.10
N	500	500	500	500

Sources of productivity differences: Marshallian Externalities

➡ **Sharing**

eater sharing of
nsport by clustered
IEs stands out!

Variable	Full sample	Cluster SME	Non-Cluster SME	Mean difference between cluster and non-cluster (p-value)
	(1)	(2)	(3)	(4)
Share machine with other firms (% of firms)	0.186 (0.017)	0.18 (0.02)	0.192 (0.02)	0.7309
Share labor with other firms (% of firms)	0.026 (0.007)	0.04 (0.012)	0.012 (0.00)	0.0493
Share transport with other firms (% of firms)	0.092 (0.01)	0.152 (0.02)	0.032 (0.01)	0.0000
Share raw materials with other firms (% of firms)	0.014 (0.005)	0.012 (0.006)	0.016 (0.007)	0.7042
If shared, degree of sharing (on 1-5 scale; the higher, the more sharing)				
- Sharing machine (mean value)	2.66 (0.08)	2.75 (0.13)	2.58 (0.09)	0.2927
- Labor (mean value)	2 (0.22)	2 (0.25)	2 (0.57)	1.0000
- Transport (mean value)	2.73913 (0.12)	2.842105 (0.13)	2.25 (0.36)	0.0837
- Raw materials (mean value)	2.28 (0.35)	3 (0.57)	1.75 (0.25)	0.0784

Matching

Non-labor inputs are found with greater ease by the clustered SMEs

Variable	Full sample	Cluster SME	Non-Cluster SME	Mean difference between cluster non-cluster (p-va
	(1)	(2)	(3)	(4)
Number of days taken to find labor	4.20 (0.15)	4.09 (0.21)	4.31 (0.21)	0.4737
Number of days taken to find non-labor inputs	2.35 (0.05)	2.30 (0.07)	2.40 (0.08)	0.3502
Extent of ease the firm finds labor/raw material (on 1-5 scale; the higher the value, the faster the proce is)				
- Labor (mean value)	2.46 (0.03)	2.52 (0.05)	2.41 (0.04)	0.1132
- Non-labor inputs (mean value)	3.24 (0.02)	3.32 (0.02)	3.15 (0.02)	0.0000

Learning

MEs learn from ach other and this arning is higher for ustered SMEs

Variable	Full sample	Cluster SME	Non-Cluster SME	Mean difference between cluster and non-cluster (p-value)
	(1)	(2)	(3)	(4)
Leant anything from other firms (share of firms)				
Technological knowledge	0.246 (0.01)	0.264 (0.02)	0.228 (0.02)	0.3510
Business related knowledge	0.556 (0.02)	0.616 (0.03)	0.496 (0.03)	0.0069
Skill related knowledge	0.502 (0.02)	0.592 (0.03)	0.412 (0.03)	0.0001
If learnt, degree of learning (on 1-5 scale; the higher, the more learning)				
Technological knowledge	2.96 (0.07)	3.04 (0.09)	2.87 (0.11)	0.2396
Business related knowledge	3.06 (0.04)	3.06 (0.05)	3.05 (0.06)	0.9236
Skill related knowledge	3.14 (0.04)	3.14 (0.06)	3.14 (0.07)	0.9753

$$ME = \alpha\, cluster\, dummy + \beta\left(\frac{K}{L}\right) + \gamma\, size + \delta\, sector + u$$

ME = sharing/matching/learning

sharing: dep. variable: if the firm shared anything

stered SMEs
re significantly
her than non-
stered SMEs

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Average marginal effects                          Number of obs    =        500
Model VCE      : Robust

Expression     : Pr(sharing), predict()
dy/dx w.r.t.   : cluster_dummy1 capital_labor_ratio total_labor_hour sector_dummy2
                 sector_dummy3 sector_dummy4 sector_dummy5 sector_dummy6 sector_dummy7
                 sector_dummy8 sector_dummy9
```

	dy/dx	Delta-method Std. Err.	z	P>|z|	[95% Conf. Interval]	
cluster_dummy1	.0791417	.0329092	2.40	0.016	.0146409	.1436425
capital_labor_ratio	-7.68e-08	1.40e-07	-0.55	0.583	-3.51e-07	1.97e-07
total_labor_hour	-1.68e-07	2.19e-07	-0.77	0.442	-5.97e-07	2.61e-07
sector_dummy2	1.409234	.0918163	15.35	0.000	1.229277	1.589191
sector_dummy3	1.144121	.1061668	10.78	0.000	.9360375	1.352204
sector_dummy4	1.21289	.0874074	13.88	0.000	1.041575	1.384206
sector_dummy5	1.6374	.1643392	9.96	0.000	1.315301	1.959499
sector_dummy6	1.163022	.1058254	10.99	0.000	.9556084	1.370436
sector_dummy7	1.123554	.0896541	12.53	0.000	.9478353	1.299273
sector_dummy8	1.549208	.0813692	19.04	0.000	1.389728	1.708689
sector_dummy9	.9827366	.1029848	9.54	0.000	.7808901	1.184583

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Matching

- Dependent variable: number of days taken to find suitable labor

o fferences etween ustered nd non-ustered MEs

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Linear regression                              Number of obs   =        483
                                               F(11, 471)      =      11.99
                                               Prob > F        =     0.0000
                                               R-squared       =     0.1505
                                               Root MSE        =      3.168
```

days_take_labor	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
cluster_dummy1	-.1729312	.2916839	-0.59	0.554	-.746094	.4002316
capital_labor_ratio	-2.98e-06	1.28e-06	-2.34	0.020	-5.49e-06	-4.76e-07
total_labor_hour	2.02e-08	4.82e-08	0.42	0.675	-7.44e-08	1.15e-07
sector_dummy2	2.460802	.5241468	4.69	0.000	1.430846	3.490757
sector_dummy3	1.327684	.8352808	1.59	0.113	-.3136537	2.969022
sector_dummy4	.7583766	.5108656	1.48	0.138	-.2454811	1.762234
sector_dummy5	2.191113	.69563	3.15	0.002	.8241908	3.558035
sector_dummy6	.4890498	.5734579	0.85	0.394	-.6378027	1.615902
sector_dummy7	.6303672	.3703084	1.70	0.089	-.0972938	1.358028
sector_dummy8	-.6344109	.3392725	-1.87	0.062	-1.301086	.0322641
sector_dummy9	3.864271	.7330215	5.27	0.000	2.423874	5.304668
_cons	3.437063	.3459666	9.93	0.000	2.757234	4.116892

Learning

- Dependent variable: if the firm learnt anything

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Average marginal effects                          Number of obs      =          500
Model VCE     : Robust

Expression    : Pr(learning), predict()
dy/dx w.r.t.  : cluster_dummy1 capital_labor_ratio total_labor_hour sector_dummy2
                sector_dummy3 sector_dummy4 sector_dummy5 sector_dummy6 sector_dummy7
                sector_dummy8 sector_dummy9
```

	dy/dx	Delta-method Std. Err.	z	P>|z|	[95% Conf. Interval]	
cluster_dummy1	.1193308	.0365445	3.27	0.001	.0477049	.1909567
capital_labor_ratio	3.53e-07	1.87e-07	1.88	0.060	-1.43e-08	7.20e-07
total_labor_hour	-9.06e-08	4.84e-08	-1.87	0.061	-1.85e-07	4.25e-09
sector_dummy2	.1685451	.1051818	1.60	0.109	-.0376074	.3746976
sector_dummy3	.4907957	.1217814	4.03	0.000	.2521086	.7294828
sector_dummy4	.2276242	.0942146	2.42	0.016	.042967	.4122815
sector_dummy5	.4036934	.1808338	2.23	0.026	.0492656	.7581211
sector_dummy6	-.2138425	.1149574	-1.86	0.063	-.4391549	.0114699
sector_dummy7	.3517754	.0931612	3.78	0.000	.1691827	.534368
sector_dummy8	.5627651	.1029836	5.46	0.000	.360921	.7646092
sector_dummy9	.2073117	.1007388	2.06	0.040	.0098672	.4047562

Conclusion

- SMEs in clusters

  - Larger

  - More capital intensive

  - Greater access to banks' SME credit

  - More formal

  - Productivity is higher, controlling for size, technology and sectors

  - Marshallian externalities such as sharing and learning might play a role in productivity differences

- Externalities justify a policy of protection to allow and encourage clusters to emerge