Production Linkages between the Formal and the Urban Informal Manufacturing Sectors: A Case Study in Assam

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ABSTRACT

The paper looks into the pattern of linkages between the formal sector and the UIMS of Assam through a case study of the most urbanised area of Assam; v.i.z. Guwahati. The paper also tries to identify the factors influencing this linkage. Formal sector here implies formal manufacturing as well as formal trade sector. Two types of production linkages, backward linkage implying purchase of raw materials and intermediate goods from the formal sector and the forward linkage implying sale of the finished products of the informal sector to the formal sector are analyzed. To determine the probability of the existence of a linkage between the formal and the informal sector a logistic regression model is used. While assessing the nature of linkage between the formal sector and the informal manufacturing sector it is found that the extent of forward linkage between the two sectors is very small. The UIMS units of the state sell a major portion of their final products directly to the final consumers. However, a little more than half of the surveyed enterprises show existence of the backward linkage with the formal sector in terms of the purchase of raw materials and the intermediate goods. The presence of backward linkage between the formal sector and the informal manufacturing sector is found to be affected positively by the status of registration, number of workers, level of investment and income, credit accessibility, intention for expansion and attitude towards profits. Whereas, contrary to prior expectations; training of the entrepreneurs, duration and location of operation and introduction of economic reform, are found to affect the presence of backward linkage negatively. In other words these factors are likely to reduce the existence of the backward linkage between the formal and the informal sector.

Key words: Production linkage; formal and informal manufacturing sector

I. Introduction

The continuously changing nature of informal sector has aroused an interest among the researchers to study the growth dynamics of this segment of the economy (Leveson and Maloney 1998, Chi et.al 2010, Lalitha 2000, Kundu et.al 2001, Mukherjee 2004, Samal

2008, Jain 2008). It is found that recent rapid growth of the informal sector has made it the largest sector in many countries (ILO 2002). The average size of the informal economy in developing countries is found to be 39.1 percent, in transitional economies it is 40.1 percent and in highly developed countries it is 16.3 percent. (Schneider 2004). It is thus found that lower the level of a country's development, the larger and the more important is its informal sector. The sector employs one half to three fourth of the non agricultural employment and proved to be a dynamic sector for potential growth for these countries (Saini 2007, Gerxhani 2004). Informal workforce as a share of total urban employment is also significantly high. In Asian countries it ranges from 40-60 percent, in Africa it is 61 percent and in Latin American countries it is around 40 percent (Becker 2004). In view of the growing urbanisation process in the third world countries the recent estimates are sure to be much higher. Various studies have attempted to measure the size of the Informal sector in India which highlighted the significant role that it has been playing in absorbing labour and generating income for the urban poor (Romatet 1983, Mukhopadhyay 1998, Kundu et.al. 2001, Lalitha 2002, Natarajan 2007, Naik 2009). Since a large majority of the workforce in a developing country depends on the informal sector it can be said that productivity of a country depends on the productivity of this sector (Amin 2010, Mukherjee 2004, Taymaz 2009, Marjit 2007, Majumder 2004, Kathuria et.al 2010a, 2010b).The growth and productivity of the informal manufacturing sector is positively affected by its linkage with the formal sector; as, such links helps the informal sector to overcome the financial, managerial and technological skills (Böhme and Thiele 2012). The formal and the informal sector linkage imply the inter-dependencies between the two sectors. The linkage between the two can broadly be classified into direct and indirect linkage. Direct linkage implies transaction of resource inputs between the formal and the informal sector and takes the form of technology linkage, consumption linkage, credit financing linkage and market linkage (Mehta 1985, Milinga and Wells 2002). Technological links involve transfer of technology and skills between the two sectors. Such linkages are more pronounced when the employees of the formal units forms informal units. Consumption links involve direct links between the informal sector with the final consumer, who is a part of the formal sector. Credit financing links refer to the transfer of funds from the formal sector for investment and development in the informal sector (Samal 2008). Market linkages are established when a formal sector firm purchases some goods from the informal sector to sell by itself (Samal 2008). Another broad classification of the linkage between the formal and the informal sector is backward and forward production linkages. Backward linkages pertain to the provision of raw materials; equipment/machinery, finance and consumer goods from the formal sector to the informal sectors whereas the reverse flows of the same from the informal to the formal sector can be considered as forward linkage (Sethuraman 1992, Arimah 2001). Besides these input and the output linkage, subcontracting is another way of linking the formal and the informal economy (Hemmer and Mannel 1989). Subcontracting encompasses transactions where the principal firms places an order with an another firm either for the whole product or parts of the product, which is either sold directly to the consumers or are incorporated into the product that the principal firm manufactures (Ramasawmy 1999). Studies have shown that linkage between the formal and the informal sector is beneficial for the informal sector. In fact the very existence of the informal sector is dependent upon the formal sector. The linkage is more pronounced for the urban informal manufacturing sector. (Mukherjee 2003, Gupta 1993, Blunch et.al 2001, Böhme and Thiele 2012, Natarajan et. al 2008)

II. Objective: To study the nature of the production linkages (backward and forward production linkages) between the formal and the informal manufacturing sectors in Assam

III. Methodology and Data Source:

Production linkage between formal and informal manufacturing sector in Assam is being looked into through a case study in of the most urbanised area of Assam; v.i.z. Guwahati. Formal sector here implies formal manufacturing as well as formal trade sector. Two types of production linkage will be discussed; backward linkage implying purchase of raw materials and intermediate goods from the formal sector and the forward linkage implying sale of the finished products of the informal sector to the formal sector.

A primary survey of a group of informal manufacturing units is carried out which includes manufacture of food products and beverages, manufacture of textiles, manufacture of wearing apparel, manufacture of fabricated metal products, and manufacture of furniture. This industry group is selected as they together constitute more than 85 percent of the enterprises of the IMS of Assam (NSSO 2007). Guwahati is considered as the main sampling area because of the rapid urbanisation and consequent migration of people to this area. Within the city the study is restricted to G.S. Road- the most 'happening corridor' of the city in terms of its rapid expansion in business activities, Six mile area- which is a newly emerging business area and Maligaon, Athgaon, Santipur, Bharalumukh, Kumarpara- the old business cum residential area. To get information on the textile industry the study area is extended to Sualkuchi[1]. A dual criterion is used to label a unit as informal; those employing persons less than 10 and is not registered with district industrial centre (DIC). The questionnaire method is used for the survey. The questionnaire was intended to draw information on the pattern of linkage between the formal and the informal enterprises as well as the socio economic characteristics of these enterprises and the entrepreneurs. Total number of the enterprises interviewed was 116.

To determine the probability of the existence of a linkage between the formal and the informal sector a logistic regression model is used. The binary dependent variable; linkage, is assumed to be affected by a number of independent variables. These are Registration of the enterprise (Regist), total investment made (Invest), income of the entrepreneur (Income), access to credit facility (Credit), number of workers (Workers) , type of training received by the workers (Train), future expansion plan (Expand), profitability of the enterprise (Profit), whether the enterprises operates on a full time basis (Ftime), whether rent is paid on the premise of operation (Rent) , whether the unit was established after 1991 i.e., after the introduction of NEP. Thus,

L_i= f (Regist, Invest, Income, Credit, Workers, Train, Expand, Profit, Ftime, Rent, NEP)

Where, L_i represents the backward or forward linkage between the formal and the informal sector.

Table 1 describes the variables used and their description while estimating the pattern of linkages between the formal sector and the informal manufacturing sector.

Table 1: Variables Used to Determine Linkage and their Description

Variable	Definition
Registration	=1 if enterprise is registered*
Investment	Total initial investment (in `)
Income	Income of an enterprise (in `)
Credit	= 1 if entrepreneur has access to any form of credit facility*
Workers	Total number of workers
Training	=1 if the entrepreneur received vocational or special training for running the enterprise*
Expansion	=1 if the future expansion of the unit is intended*
Profit	=1 if the profit of the unit is increasing in recent times*
Full time	=1 if the enterprise operates on full time basis*
Rent	=1 if the entrepreneur pays rent on business premise*
NEP	=1 if the enterprise was established after 1991*

*0 otherwise

The justification for the variable selected rests on the following reasons. The dependent variable (L_i) pertains to the probability that an informal sector enterprise has backward and forward linkages with the formal sector. The existence of a link takes a value "1" and its absence is coded with "0".

Registration is a key variable affecting the formal - informal sector linkage. Registration provides some kind of legality and protection for the enterprise which is helpful in forming linkages with the formal units. Registration, thus, is assumed to affect the forward and backward linkage positively. The units which are registered are coded as "1" and absence of registration is coded as "0".

The financial status of an informal sector unit can affect its links with the formal sector. Informal units with high investment and income help them to maintain linkage with the formal sector. Availability of credit is another important determinant of the probable linkages between the formal and the informal sector. Informal sector units can enhance their purchase from the formal sector if an easy credit base is ready for them. These variables v.i.z., investment, income and credit are assumed to affect the linkage between the formal and the informal sector positively. Investment and income are continuous variables and the credit is a binary variable with its presence coded as "1" and its absence coded as "0"

Number of workers affects the plausible interaction between the formal and the informal sector. The informal units with large number of workers are assumed to maintain better linkage with the formal sector as they are better organised than the units with smaller number of workers.

Trained entrepreneurs are assumed to establish better backward as well as forward linkage with the formal sector as training widens the scope of sale and purchase of these informal units. Enterprises run by the trained entrepreneurs are coded as "1" and those run by entrepreneurs without training are coded as "0".

The anticipated growth of the enterprise is another important determinant of the probable linkage between the formal and the informal sector. This is measured by the intention for future expansion and their attitude towards profit. Those informal units which feel that their profit is increasing in recent times are more likely to procure raw materials/ intermediate goods from the formal sector to speed up the production (as informal sector is unable to supply in large scale). Such enterprise are coded as "1" as against those who do not feel so. Similarly those units which intend to expand in near future are assumed to have positive impact on their linkage with the formal sector. Enterprises with the presence of such intention are coded as "1" and the absence of such intention are coded as "0".

The new economic policy (NEP) introduced in 1991 have significantly opened the economy and this openness is assumed to promote the interaction between the formal and the informal sector. Thus enterprises established after 1991 are coded as "1" and those established before 1991 are coded as "0".

The enterprises which operate on a full time basis are more likely to establish both backward and forward linkages with the formal sector. This is because the full time operation of the business earns name for the concerned business and the neighbouring formal units may like to indulge in sale and purchase relation with the former. Similarly, having permanent location, as measured by the variable rented premise, helps an informal unit to establish linkage with the formal sector.

The logistic regression model[3] is given by

$$L_i = \ln (P/1-P)$$

$$= Z_i$$

$$= \beta_1 + \beta_i X_i \ldots\ldots\ldots\ldots (1)$$

Solving for P

$$P/1- P = e^{\beta_1 + \beta_i X_i}$$

$$P = (1-P)\, e^{\beta_1 + \beta_i X_i}$$

$$P + P\, e^{\beta_1 + \beta_i X_i} = e^{\beta_1 + \beta_i X_i}$$

$$P\, (1 + e^{\beta_1 + \beta_i X_i}) = e^{\beta_1 + \beta_i X_i}$$

$$P = e^{\beta_1 + \beta_i X_i} / 1 + e^{\beta_1 + \beta_i X_i}$$

$$P = 1/ 1 + e^{- \beta_1 + \beta_i X_i}$$

$P = 1/1 + e^{-Z}{}_i$ ………. (2)

Where,

$P =$ Probability of presence of linkage
$1-P =$ Probability of the absence of linkage.
$L_i =$ the log of the odds ratio
$\beta_1 =$ the constant or the intercept
$\beta_i =$ the parameters to be estimated

$X_i =$ the values of the regressand

$Z_i = \beta 1 + \beta_i X_i$

Equation (1) is the cumulative logistic probability function. The estimates of the logit regressions are obtained through an iterative maximum likelihood procedure[4]. The maximum likelihood function in this case is given by

$$f (Y_1, Y_2 \ldots Y_n) = \prod fi (Yi) = \prod P_i{}^{Yi} (1-P_i) \ldots\ldots. (3)$$

Where Y_i is the observed categorical dependent variable

Taking the natural logarithm of equation (3) the log likelihood function is given by

$\ln f (Y_1, Y_2 \ldots Y_n) = \sum [Yi \ln P_i + (1-Y_{i)} \ln (1-P_i)]$

$$= \sum [Yi \ln P_i - Y_i \ln (1-P_i) + \ln (1-P_i)]$$

$$= \sum [Yi \ln (P_i / 1-P_i)] + \sum \ln (1- P_i)$$

Using equation (1) the log likelihood function can be written as

$$\ln f (Y_1, Y_2 \ldots Y_n) = \sum [Yi (\beta_1 + \beta_i X_i) - \sum \ln (1 + e^{(\beta 1 + \beta i\ Xi)}] \ldots\ldots. (4)$$

Equation (4) will be maximised by differentiating it partially with respect to the unknown parameters and setting the resulting expression to zero and then solving the resulting expressions.

IV. Results and Discussions

IV.1   General Background of the Surveyed Entrepreneurs and the Enterprises

The number and percentage of the surveyed enterprises are given in table 6.2 and the descriptive statistics of the enterprise and the entrepreneur characteristics are discussed in table 6.3.

Table 2: Number and Percentages of the Sampling Unit in the Total

	Frequency	Percent
Food	30	25.9
Tailoring	19	16.4
Furniture	27	23.3
Steel fabrication	20	17.2
Textile	20	17.2
Total	116	100.0

Source: Field Survey

The highest number of sample units belongs to the category of food enterprises, next stands furniture. Steel fabrication, textile and tailoring industries share equal number of sample units. Around 62 percent of these enterprises are proprietorship business. A very high percentage (83.3%) of the enterprises is run by the male entrepreneurs. The mean age for the workers in the informal sector is found to be 41 years. The minimum entry age of an entrepreneur to the informal sector is found to be 23 years. Aged people above 60 (1.7%) years were also found to be running such units. The entrepreneurs operating in this part of the state were found to be hailing from the native districts, mostly from Kamrup (25%), Nalbari (23.3%) and Barpeta (19%). A very small number of such entrepreneurs are found to be from outside the state such as Bihar (5.2%), Rajasthan (0.9), U.P (0.9) and west Bengal (0.9). A sound literacy level is found among the entrepreneurs. 46.6 percent of them have studied up to 10th standard ad 36.2 percent have studied up to 12th standard and above. Average family size is found to be of consisting of 4 members with the average size of the dependents 1.62; whereas the number of earning members in the family is 1.44. A significantly large number (95.7%) of the informal units were found to be established after the economic reforms of 1991. Majority (77.6%) of these informal units operate on a full time[5] basis. Nearly 70 percent of the enterprises carry their business on rented premise. Owner run enterprises or enterprises having no paid worker accounts for 9.5 percent of the total surveyed enterprises whereas OAMEs share is 14.7 percent. Heavy concentrations of enterprises (74%) are found in the category of the NDMEs. Nearly 82 percent of these enterprises are run by the entrepreneurs without any training. Regarding prior work experience, it is found that only 15 percent of the entrepreneurs were engaged in formal sector; the rest are found to be actors of the informal sector itself. Lack of job opportunities seems to be the most important factor for a

worker to indulge in an informal sector activity, over other factors such as family tradition or higher returns than other economic engagement. Educational qualification of the workers do not seem to be an important factor for their employment as only 14 percent of the employers wanted their workers to know the minimum reading and writing skills. The owners of the rest of the units wanted their workers to know the basic skills required in the process of manufacturing the respective goods. 62 percent of the informal units were found to be registered under Guwahati Municipality Corporation (G.M.C). Investment made by these informal units varies from a minimum of ` 3500 to a maximum of ` 400000.

Table 3: Frequency and the Descriptive Statistics of the Entrepreneur and Enterprise Characteristics

Variable		Frequency	Percentage	Mean	S.D
Gender	Male	97	83.3		
	Female	19	16.4		
Age	Minimum(23)	1	0.9	41.3	8.8
	Maximum(62)	2	1.7		
Marital Status	Married	87	75		
	Unmarried	26	22.4		
	Spouse died	3	2.6		
Education Qualification	Illiterate	5	4.3		
	Up to primary	14	12.1		
	Up to 10th class	54	46.6		
	Up to 12th class and above	42	36.2		
Size of the family	Minimum(2)	6	5.2	4	.99
	Maximum(7)	1	0.9		
No. of dependents	Minimum(0)	6	5.2	1.62	.83
	Maximum(5)	1	0.9		
No. of earning members in the family	Minimum (1)	67	57.8	1.44	.549
	Maximum (3)	3	2.6		
Nature of Business ownership	Family ownership	24	20.7		
	Partnership with others	19	16.4		
	Proprietorship	72	62.1		
Training for running the business	No	95	81.9		
	Yes	21	18.1		
Nature of operation	Part-time	26	22.4		
	Full time	90	77.6		
Registration status	Non registered	44	37.9		
	Registered	72	62.1		
Investment(in `)	Minimum (3500)	1	.9	76400	86450.72
	Maximum (400000)	2	1.7		
Income (in `)	Minimum (3000)	1	0.9	11720	6296
	Maximum(30000)	2	1.7		
Accessibility to credit	No	67	57.8		
	Yes	49	42.2		
Whether increasing profit	No	32	27.6		
	Yes	84	72.4		
Whether rented premise	No	34	29.3		
	Yes	82	70.7		
Year of establishment	Pre1991	5	4.3		
	Post 1991	111	95.7		
No. of workers	Minimum (0)	11	9.5	2.63	1.708

	Maximum(8)	2	1.7		
Job selection	Family tradition	8	6.9		
	Higher returns than others	20	17.2		
	Being unemployed	75	64.7		
	Others	12	10.3		
Encouraging children to join formal sector	No	40	34.5		
	Yes	42	36.2		
Willingness to join formal sector in future	No	66	56.9		
	Yes	41	35.3		

Source: SPSS results of the field survey

Mean investment was found to be ` 86185. Relatively very small percentages of these enterprises fall in the very high and very low investment limit (0.9% and 2.6% respectively). Steel fabrications and some of the wooden furniture units are found to have incurred high investment. 42 percent of the informal units have the accessibility to credit; of which 28 percent approach to the formal sector (banks etc.) and 14 percent takes informal source of credit financing (friends, relatives, past savings etc). Monthly income of the owners of these urban informal manufacturing units varies from a minimum of ` 3000 to a maximum of ` 30000, with a mean income of ` 11720. While enquiring whether their profit is increasing, 72 percent of the enterprises reported to have an increasing trend of profit, because of which intention for future expansion of the unit is high among the entrepreneurs.
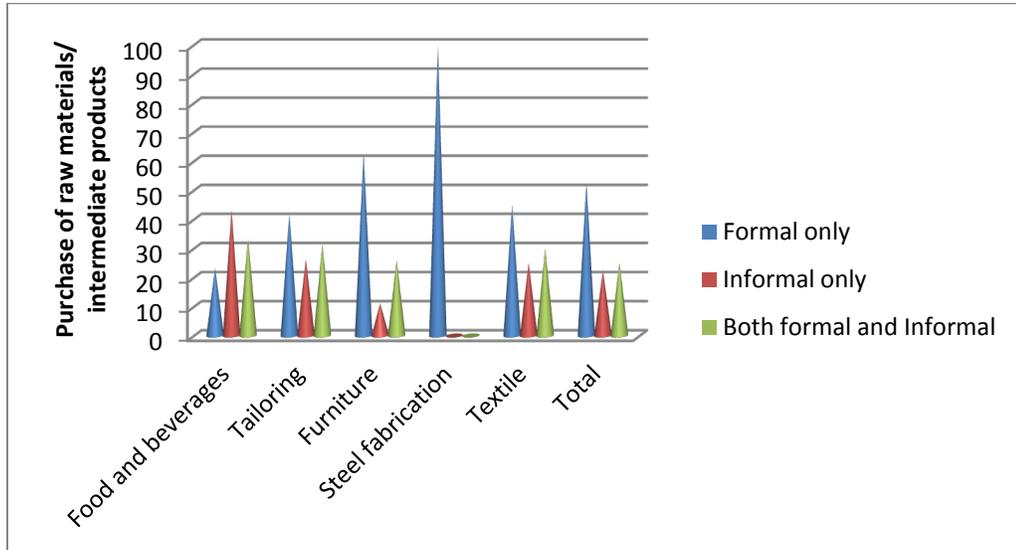
IV.2   Backward and Forward Production Linkage

A little more than half of the informal units show existence of the backward linkage between the formal sector (formal manufacturing and formal trade sector) and the informal manufacturing sector of the state. As revealed by the field survey 52.6 percent of the surveyed enterprises do maintain direct backward linkage with the formal sector in terms of the supply of the raw materials, equipment/machinery and consumer goods from the formal sector to the informal sector. Direct backward linkage with the informal sector itself is observed in 22.4 percent enterprises and in 25 percent of the cases industries depend upon both on formal and Informal sources for the raw materials and intermediate goods (Table 4)

Table 4:
Distribution of Enterprises by Major Source of Purchase of Raw Materials/Intermediate Goods and Final Products from the Formal Sector (in %)

Industry	Formal only	Informal only	Both formal and Informal
Food and beverages	23.3	43.3	33.3
Tailoring	42.1	26.3	31.5
Furniture	62.9	11.1	25.9
Steel fabrication	100	0	0
Textile	45	25	30
Total	52.6	22.4	25

Source: Field survey

Figure 1: Distribution of Enterprises by Major Source of Purchase of Raw Materials/ Intermediate Goods and Final Products fromthe Formal Sector(%)

Source: Table 4

It is seen that the pattern of backward linkage vary across the industry groups. The steel fabrication and the wooden furniture industry show heavy dependence on the formal sector for its raw materials / intermediate goods; almost all steel fabrication units and a high 62.9 percent of the furniture units purchase their raw materials / intermediate goods entirely form the formal sector. For the rest of the industries informal sector is also found to be a major supplier of the raw materials/ intermediate goods.
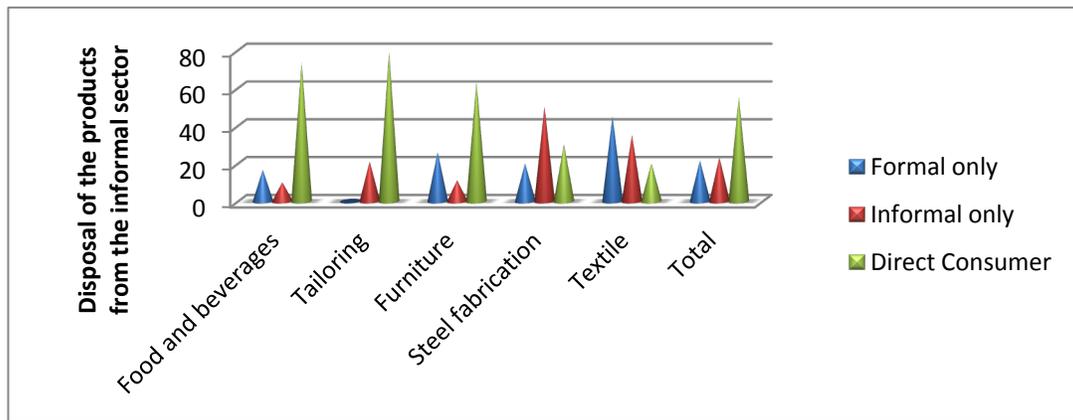
The forward linkage in terms of the sale of the final products by the informal manufacturing sector to the formal sector is found to be weak as only 21.5 percent of the sample enterprises are reported to sell their products directly to the formal sector. Direct forward linkage with the informal sector is maintained by 23.2 percent of the enterprises. Highest number of enterprises (55.1%) sells their products directly to the final consumers. Strong direct forward linkage with the final customers is observed in food and beverages (73.3%), tailoring (78.9%) and the furniture (62.9%) industries. The maximum forward linkage with the formal sector is observed in the case of the steel fabrication industries where 50 percent of the informal fabrication units sell their products to the formal units. Thus the informal manufacturing sector of the state is catering to the demand of the consumers to a large extent.

Table 5: Major Sources of Disposal of the Informal Sector Products (in %)

Industry	Formal only	Informal only	Direct Consumer
Food and beverages	16.6	10	73.3
Tailoring	0	21	78.9
Furniture	25.9	11.1	62.9
Steel fabrication	20	50	30
Textile	45	35	20
Total	21.5	23.2	55.1

Source: Field survey

Figure 2: Major Sources of Disposal of the Informal Sector Products

Source: Table 5

In view of the significant existence of the backward linkage between the formal and the informal manufacturing sector of the state, an attempt is made to estimate the probability of the existence of the backward linkage statistically. The following section discusses the results of the fitted regression model.

V.   Discussion of the Regression Model

The overall fit of the logistic regression model is tested by 'Omnibus test of the model coefficient' and the 'Likelihood ratio test' as the Hosmer- Lemeshow test is inapplicable because of the small sample size[6]. The model is found to be a good fit when tested by the 'omnibus tests of the model coefficient' (Table 6.6), which predicts the joint capability of all the predictors in the model to predict the dependent variable i.e., backward linkage. The test confirms that one or more of the predictor variables included in the model are significantly related to the response variable.

Table 6: Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	108.141	11	.000
	Block	108.141	11	.000
	Model	108.141	11	.000

Source: SPSS result of the field data.

The likelihood ratio test also confirms the goodness of fit of the model as the prediction percentage of the full model [7] increases from 52.6 percent to 87.9 percent as compared to the null model[8] (Table 7 and Table 8). This implies the selected independent variables assume significant importance in influencing the dependent variable.

Table 7: Classification Table of the Null Model [a,]

	Observed		Predicted		
			Backward Linkage		Percentage Correct
			Absence of backward linkage	Presence of backward linkage	
Step 0	Backward Linkage	Absence of backward linkage	0	55	.0
		Presence of backward linkage	0	61	100.0
	Overall Percentage				52.6
a. Constant is included in the model.					

Table 8: Classification Table for the Full Model

	Observed		Predicted		
			Backward Linkage		Percentage Correct
			Absence of backward linkage	Presence of backward linkage	
Step 1	Backward Linkage	Absence of backward linkage	48	7	87.3
		Presence of backward linkage	7	54	88.5
	Overall Percentage				87.9

Source: SPSS result of the field data (Table 7 and table 8)

The fitted logistic regression model explains more than 80% of the variation in dependent binary (backward linkage) as explained by the Nagelkerke R square. (Table 9).

Table 9: Amount of Variation Explained by the Model

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	52.359[a]	.606	.809

Source: SPSS result of the field data

The significance of the individual predictors is given by the score test or the Lagrange multiplier test which shows that except the variables training, expansion and NEP; all other predictors are expected to improve the fit of the model (Table 10). The significance of the individual parameters is also tested by constructing correlation coefficient matrix which confirms the results of the score test.

Table 10: Score Test

Variables	Score	df	Sig.
Registration	29.354	1	.000[*]
Investment	33.400	1	.000*
Income	39.576	1	.000[*]
Credit	32.883	1	.000[*]
Workers	55.828	1	.000[*]
Training	.214	1	.644
Expansion	3.013	1	.083
Profit	4.161	1	.010[*]
Fulltime	31.929	1	.000[*]
Rent	23.549	1	.000[*]
NEP	.332	1	.564

*Significant at 1% level of significance

Source: SPSS result of the field data

In Case of the binary regressand models, the expected signs of the regression coefficients and their statistical and/or practical significance are more important than the goodness of fit of the model (Gujarati and Sangeeta 2007). Each slope coefficient is a partial slope coefficient and measures the change in the estimated logit (ln P/ 1-P), for a unit change in the value of the given regressor (holding other regressors constant). A more meaningful interpretation of the effect size is found in terms of the 'odds ratios' which is the ratio of the probability of the presence of the backward linkages to the probability of the absence of the backward linkage. It describes the effect of the independent variables on the binary dependent. Table 11 presents the slope coefficients and the odds ratio

The estimated regression model (from table 11) can be written as

Ln (odds backward linkage) = -3.865+0.584 regist+ .00045 invest + .00072 income+ 0.240 credit+ 1.167 workers+ (-1.143) tranin+ .686 expand+ .527 profit+ (-2.329) ftime+ (-1.211) rent+ (-10.714) NEP.

The status of registration is found to be affecting the backward linkage positively and significantly as shown by the positive regist coefficient 0.584. The corresponding odds ratio is 1.794, which shows that registered units are 1.79 times more likely to have backward linkage with the formal units than the non registered units or in other words a registered unit has almost 80 percent more chances of having backward linkage with the formal sector as compared to the non registered units. This confirms the assumption that registration has a positive impact on backward linkage. The correlation between these two variables is also found to be positive and significant (Table 12).

It is found that the level of investment affects the backward linkage of an IMS to the formal sector positively and significantly. However the effect size is very small as shown by the odds ratio of just 1.00006. This implies ` 1 increase in investment by an informal unit increases the likelihood of having backward linkage with formal units by 1.0006 times as compared to those units which do not increase their investment. The same is the situation with the predictor variable income, where a positive relation is shown between the income and the probability of existence of backward linkage, but the magnitude of the relation is very small (1.00003). This implies high investment and high income have marginal impact on the existence of the backward linkage. Informal units irrespective of their level of investment and income do purchase raw material/ intermediate goods from the formal sector. A reason for the small magnitude change reflected by the model is that they are related to ` 1 change in investment and income thus fail to capture the large changes. The correlation between backward linkage and the level of investment and the correlation between backward linkage and the average monthly income are found to be positive and significant (Table 12).

Access to credit is found to have a positive effect on backward linkage as indicated by the positive credit coefficient 0.240. The odds ratio shows that informal units which have better access to credit are 1.27 times more likely to establish backward linkage than those who do not have such access. The correlation coefficient between the accessibility to credit and backward linkage is significant at 1 percent level of significant and thus confirms the initial assumption.

The model confirms the initial assumption of the positive relation between the number of workers and the existence of backward linkage. The coefficient for this variable is found to be positive and significant. This implies informal units with more hired workers are more likely to establish backward linkage with the formal units. The corresponding odds ratio shows that such units are 3.21 times more likely to have backward linkage when compared with the informal units with fewer hired workers. The correlation between these two is also found to be significant.

Contrary to the initial assumption that training helps in establishing backward linkage, it is found that it has a negative relation with the later. This is indicated by the negative coefficient -1.143 for this regressor. The effect factor as measured by the odds ratio shows that enterprises run by

trained entrepreneurs are 0.319 times less likely to establish backward links with the formal units. However, the regression coefficient as well as the correlation coefficient between backward linkage and training are found to be non significant.

Table 11:   Parameter Estimated and their Log Odds

Variables in the equation	B	Exp(B)
Registration(1)	0.584	1.794
Investment	.00045	1.00006
Income	.00072	1.00004
Credit(1)	.240	1.271
Workers	1.167	3.213
Training(1)	-1.143	.319
Expansion(1)	.686	1.986
Profit(1)	.527	1.693
Ftime(1)	-2.329	.097
Rent(1)	-1.211	.298
NEP(1)	-10.714	.000
Constant	-3.865	.021

Source: SPSS result of the field data

The positive coefficient associated with the variable expansion i.e. intention for future expansion for this variable shows that intention for future expansion affects the existence of backward linkage positively. It is found that those units which intend to expand in future are 1.98 times more likely to have backward linkage with the formal sector. This confirms the initial presumption of the positive association between the backward linkage and the intention for future expansion. However when tested by score test the parameter is found to be non significant. The correlation coefficient between the backward linkage and the intention for future expansion is also found to be non significant [9].

The effect of the variable profit contradicts the initial assertion that higher profits tend to improve the linkage. The coefficient for this variable is found to be negative -0.673, showing that informal units with higher profit are less likely to establish backward links with the formal units. The informal units with higher profit are 0.510 times less likely to purchase raw materials/ intermediate goods form the formal sector as compared to the informal units with low profit. The negative correlation coefficient between these two variables confirms this finding.

Full time operation of the informal unit is expected to improve its linkage with the formal sector. But contrary to the expectation, it is found that informal units which operate on a full time basis are less likely to purchase intermediate goods form the big formal sector units. The negative coefficient shows the existence of the inverse relation between the dependent and the independent variable. Informal units which operate on a full time basis are 0.158 times less likely

to establish backward linkage with the formal sector as compared to the units which do not operate on a full time basis. The negative correlation between the variables is significant at 5 percent level of significance.

The variable rent is found to have negative impact on the existence of backward linkage between the formal and the informal sector as indicated by the negative coefficient -1.483 for this variable. Thus business run on rented premises are less likely to have backward linkage. Interpreting in terms of odds ratio it is found that informal units based on rented premises are 0.227 times less likely to purchase raw materials from the formal sector units, which contradicts the a priori assumption.

Table 12: Correlation Matrix of Interdependencies Among the Backward Linkage its Determinants.

	BKDL	REGIST	Invest	Income	Credit	Worker	Train	Expan	Profiit	Ftime	Rent	NEP
BKDL	1											
REGIT	.503**	1										
Invest	.554**	.517**	1									
Income	.584**	.624**	.868**	1								
credit	.532**	.489**	.702**	.659**	1							
Worker	.694**	.583**	.672**	.688**	.631**	1						
Train	.043	.045	-.076	-.100	-.085	-.089	1					
Expan	-.161	-.005	.107	.075	.059	-.197*	.040	1				
Profit	-.238	-.045	-.009**	-.134	-.111	-.268**	.065	.490**	1			
Ftime	.525**	.517**	.374**	.476**	.418**	.558**	.038	-.054	-.072	1		
Rent	.451**	.433**	.346**	.382**	.359**	.503**	-.091	-.016	-.109	.471**	1	
NEP	.053	-.078	-.145	-.003	-.076	-.132	.100	.059	-.025	-.012	-.137	1

** Correlation is significant at 1% level of significance.
 *Correlation is significant at 0.05% level of significance.

The effect of new economic policies on enhancing the backward linkage is found to violate our initial assumption. The coefficient for this variable i.e. NEP is found to be negative implying a negative relation between the introduction of economic reforms and the existence of the backward linkages. However its impact effect on backward linkage is very small; only 0.010, which implies the informal units established after 1991 are 0.010 times less likely to have backward linkage than the units established before 1991. This implies the structural change brought about by the reforms of 1991 has failed to bring about any linkage between the formal and the informal sector of the state.

VI. Conclusion

This paper discusses the existence of linkage between the formal sector and the informal manufacturing of Assam and tries to identify the factors influencing this linkage. The surveyed enterprises have a mean income and investment of ` 11720 and ` 86185 respectively. A large number of these enterprises are NDMEs in nature where male dominate female over proprietorship. GMC seems to be the only registration agency for these enterprises from where they get trade license to continue their operation. Most of the entrepreneurs hailed from the native districts of Kamrup, Nalbari and Barpeta with a few number of entrepreneurs coming from other states like Bihar, Uttar Pradesh, West Bengal and Rajasthan. A sound literacy level is observed among the entrepreneurs. However the educational qualification does not seem to be an important factor for the appointment of the workers. While assessing the nature of linkage between the formal sector and the informal manufacturing sector it is found that the extent of forward linkage between the two sectors is very small. The UIMS units of the state sell a major portion of their final products directly to the final consumers. However,   a little more than half of the surveyed enterprises show existence of the backward linkage with the formal sector in terms of the purchase of raw materials and the intermediate goods. The presence of backward linkage between the formal sector and the informal manufacturing sector is found to be affected positively by the status of registration, number of workers, level of investment and income, credit accessibility, intention for expansion and attitude towards profits. Whereas, contrary to prior expectations; training of the entrepreneurs, duration and location of operation and introduction of economic reform, are found to affect the presence of backward linkage negatively. In other words these factors are likely to reduce the existence of the backward linkage between the formal and the informal sector.

NOTES:

1. Also known as the "Manchester of the East", Sualkuchi is a 'census town' in kamrup district. It is the textile centre of the state.
2. Details available in Gujarati, D.N. and Sangeetha (2007).
3. Details of the logistic regression model are available in Arimah (2001), Gujarati, D.N and Sangeetha (2007).
4. Maximum likelihood estimation method is used as the case of categorical dependent variables could not be solved by the usual OLS method.
5. If a unit operates for more than half of a year that unit is considered as a permanent unit.
6. Hosmer Lemeshow test is applicable for samples of 400 or more; details available in Hosmer & Lemeshow (2000) *Applied logistic regression* (2nd Edition).
7. The full model is the one which includes the selected independent variables.
8. The null model is the model with no independent variable.
9. If a parameter is found to be statistically non significant, it does not mean it has no effect, probably a large sample could have captured the effect (Davies 2009).

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