Labour Mobility and Export Productivity Spillovers: A case for Uganda manufacturing firms

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Abstract

This paper analyses the potential for productivity spillovers from foreign firms through worker mobility using panel data on manufacturing firms for Uganda. The hypothesis is that that the potential for spillovers from foreign firms can be particularly beneficial to domestic firm through worker mobility because the technological superiority and management experience of foreign firms yield various opportunities for learning, and this is evaluated empirically. Further the role of gender based skills in explaining productivity spillovers within firms is explored. Yet the importance of knowledge spillovers of foreign firms might vary with respect to the domestic firms' productivity level and firm size and export status. The results show that the potential for spillovers is importantly related to export status of firms and prior experience acquired from foreign firms. Firms that hire experienced workers from foreign firms reap more productivity spillovers in Uganda. Also spillovers differ markedly between small and large firms. In line with the absorptive capacity of firms, it is argued on the basis of an empirical analysis of Ugandan firms that large and more productive firms are more able to reap spillovers from foreign firms than smaller firms.

Keywords: foreign firms, domestic firms, worker mobility, productivity spilloverss
JEL codes: 012 D2Y F23

1 Background and study concern

Industrial development and international trade have been at the apex of the development policy debate as the key fundamentals for developing countries to realise their development agendas in order to reduce on the prohibitive poverty levels, unemployment, and enhance technological development for sustainable economic development. The role of foreign firms in enhancing technological development and attaining sustainable high growth rates especially in developing economies cannot be over emphasised because of the high productive technology gains and knowledge spillovers associated with their activities. The spillovers of firms are assumed to act through the cost variable, potentially lowering either the variable or the fixed cost of both the domestic and foreign firms.

Knowledge or productivity spillovers in an economy are assumed to occur through three main channels (Battese et al., 2004). First, "demonstration effects" is whereby both domestic and foreign firms learn through imitation from other foreign firms. Second, a "competition effect" where domestic firms face competition from more productive foreign firms and, therefore, have to improve their own performance in order to be able to compete successfully. Third, spillovers in an economy may occur through movement of labour, whereby workers trained by or working in foreign firms may decide to leave and join an existing or open up a new domestic firm or foreign firm, taking with them some or all of the firm specific knowledge of the foreign firm.

In order for labour mobility to be a possible channel for knowledge spillovers, there must be a certain flow of labour between foreign and domestic firms. Though some case study evidence of foreign to domestic firms labour mobility spillovers in developing countries exist, very little is known about the extent and pattern of knowledge spillovers between foreign and domestic firms in Uganda.

The principal objective of this study is to examine the effects of knowledge spillovers in case of the Ugandan Manufacturing sector. A detailed firm level data for a sample of manufacturing firms for the Uganda manufacturing sector is used to tackle

this issue. Specifically, data available on whether or not the firm manager formerly worked for a foreign multinational before joining the current firm or setting up his/her own firm is used to determine whether this experience was gained from foreign firms in the same sector or firms from other sectors. Furthermore, the data show whether production or non production workers received training by a foreign firm at any point before joining the present firm. Also, the data provides gender based skill providing the proportion of female skilled, unskilled and non production workers employed by the firm. These data are used to investigate whether firms which have workers and/or managers with foreign training and/or experience have a productivity advantage compared to other firms. Specifically, the study aims to examine spillovers from foreign owned firms in regard to worker mobility from foreign firms to domestic manufacturing firms in Uganda.

For informed policy making, it is desirable to develop an understanding on how spillovers materialise in Uganda in order to have a competitive business environment that can attract foreign direct investments (FDI) to boast the country's development efforts. In fact, several studies argue that spillovers from FDI depend on the existence of adequate absorptive capacity among domestic firms in the host country. Therefore, policy makers and delivery agencies need bear in mind that not all FDI will automatically generate productivity spillover benefits o domestic firms in the economy and not all domestic firms will be able to share the spillovers across different sectors. Domestic firms need to have suitable attributes to capture spillovers leakages from foreign firms. Of course, it is not known whether absorptive capacity of domestic manufacturing firms plays a role in Uganda manufacturing gaining spillovers from foreign firms. But where it does, the relevant policy should be developed in coordination with policies that are geared towards development of those firm specific attributes.

The paper is organized as follows. In the sections that follow, the selected literature is presented. Section 3 presents out a description of the dataset used and the study methodology. The descriptive statistics of variables are also presented in this section. Section 4 presents and discusses the empirical findings while the last section concludes the study with the paper's implications for policy.

2 Reviewed Literature

According to Romer (1986) and Grossman and Helpman (1990), in their theoretical models in the endogenous growth literature, they emphasise that innovative activities of individual firms contribute to sustained long-run economic growth in an economy through industry-wide productivity spillover effects. According to this view, individual firms produce technological knowledge, which is privately known to the firm; but afterwards, it spills over to other firms and then to the rest of the economy as it can be copied immediately and at almost no cost by any number of firms, becoming social knowledge acting as an external effect in enhancing the productivity of all firms. With the spillover effect, an aggregate production function which would otherwise have either constant or decreasing returns to scale may exhibit increasing returns to scale allowing sustained long-run growth as in Romer (1986) and Raut (1995). An implication of this view is that a firm, not able to innovate on its own, can benefit from the research findings of firms working along similar lines. However, Cohen and Levinthal (1989), among others, have argued against this view.

Spillovers can arise when workers receive training or accumulate experience working for multinationals, and then move to domestic firms or set up their own enterprise. When moving, they will take with them some of the knowledge they have acquired in the multinational which can be usefully employed by the domestic firm and help improve its performance. This channel for spillovers has recently been theoretically investigated by Fosfuri et al. (2001) who look at the conditions under which such spillovers occur. In addition, the study by Glass and Saggi (2001) they provide formal evidence that shows that movement of trained workers from foreign firms to domestic firms is one of the key channels for productivity spillovers in an economy.

Empirical work in this area is, however, scarce. There is some evidence that multinationals are important providers of training activities in developing countries (ILO, 1981; Lindsey, 1986). Also, some studies found that in a comparison of domestic firms and multinationals, the latter provide more training than the

former. Gershenberg (1987) provides evidence to that extent from a survey of 72 managers in manufacturing firms in Kenya. He also finds some evidence for movements of managers from multinationals to domestic firms. Djankov and Hoekman (1999) analyse enterprise level panel data for the Czech Republic. In their summary statistics they show that multinationals provide higher levels of training than domestic firms. Sousa (2001) appears to provide the most comprehensive analysis of training activities of multinationals. Using detailed data on workplaces in the UK he finds that multinationals are more likely to provide training, and also provide higher intensities of training than domestic firms, controlling for a number of workplace and sector specific characteristics. Using a matched firm and worker level dataset for Ghanaian manufacturing firms, Grg, Strobl and Walsh (2002) find that workers who work for and receive training in foreign firms experience more rapid wage growth than workers being trained in domestic firms. This is consistent with their theoretical model which shows that training provided by foreign firms is more productivity than that of domestic firms and, hence, workers trained in foreign firms have steeper wage profiles.

The aforementioned studies show for a number of countries that the potential for spillovers through the movement of highly trained and experienced workers from multinationals to domestic firms exist. However, to date there is to the best of our knowledge, no study on Uganda, that attempts to determine whether the domestic firms that receive the new workers actually benefit from spillovers. Also, need to know whether foreign firm competition in the foreign and domestic market enhances other firms' performance in the economy. This is arguably at least partially due to the unavailability of detailed data at the micro level.

Many empirical studies have set out to measure the magnitude of such productivity spillovers for both developing and developed countries (e.g., Haddad and Harrison, 1993; Kokko, 1994; Aitken and Harrison, 1999; Girma et al., 2001; Barrios and Strobl, 2002). As such they usually regress total factor or labour productivity of domestic firms on a number of covariates, including a measure of the extent of multinational presence in an industry. A positive and statistically significant coefficient on that variable is then interpreted to indicate the existence of positive

productivity spillovers.

3 Data and Econometric Strategy

3.1 Data

The empirical analysis is based on the data drawn from the Regional Programme for Enterprise Development (RPED) dataset for Ugandan manufacturing firms collected by the (World Bank, 2006). This survey dataset covers the universe of Ugandan manufacturing firms including, amongst other things, data on the level of output, total expenditures on wages, the replacement value of the capital stock, exports, investments, rent and royalties, energy usage, foreign licensing, and the level of employment. More importantly, the data collection provides the background of the firm ownership and firm workers' education attainment and work experience. Specifically, one is able to identify whether a firm manager or firm owner has received any explicit training by foreign firms in the past, whether their immediate previous experience was working with a foreign firm within the same industry as the industry of their current firm or in some other industry, and whether they have had any previous same industry experience in general. For the purposes here we are interested in investigating whether training and/or experience in a foreign firm by a firm manager or the owner affects firm level productivity growth, and we employ zero-one type dummy variables to indicate such. Finally, the RPED data also includes information on the years of schooling of the firm manager, which are used to proxy for the level of human capital, excluding foreign training and experience, of the individual in question.[1]

[1]The survey provides information on whether production or non production workers acquired training or experience with the foreign firm prior to their current occupation.

3.2 Summary Statistics

Table 1 presents some summary statistics for firms by ownership that employed managers with and without foreign experience/training and for the main variables in log used in this study. Different measures to compare firm performance are used, namely total output (y), output per worker (y/l), value added (val) and vale added per worker (val/l), total factor productivity (tfp), capital consumption per worker (k/l) and material input per worker (m/l) average wage per worker (wage/l). In general, foreign-owned firms tend to be larger, more capital-intensive and have a higher propensity to export than their domestic counterparts. They also grow more quickly in terms of both size and productivity. These differences are also observed when distinguishing between non-exporting and exporting firms. However, it is worthwhile noting that the differences are to some extent driven by the higher propensity to export of foreign-owned firms. Domestic exporting firms appear to be larger than non-exporting foreign-owned firms. Foreign-owned non-exporting firms dominate their domestic exporting counterparts in terms of capital-intensity and performance measures.

As can be seen, firms owned or run by those with experience and/or training from foreign firms display on average greater labour productivity in terms of both measures of labour productivity, namely output per worker and value added per worker. These differences are statistically significant at the 1 per cent level. Also, they are significantly larger, in terms of output, value added or employment. Furthermore, these firms are more intensive in both capital and labour usage. The summary statistics do not indicate that they have higher TFP, however. Also, we find that firms run by owners without such experience or training pay higher wages, although this difference is only statistically significant at the 10 per cent level.

One can argue that results in Table 1, provide some preliminary evidence supportive of the idea that there are labour mobility productivity spillovers from the movement of managers with prior experience in foreign firms to domestic firms, as firms run by managers who had such experience seem to have higher productivity,

at least in terms of labour productivity. However, we note that the picture on firm performance provided by the summary statistics in Table 1, is based on averages over fairly heterogeneous firms and the summary statistics may be confounding the effects of different sector, firm or owner characteristics. Therefore, we turn to an econometric analysis in order to be able to isolate productivity spillover effects associated with managerial training and skills acquired from foreign firms.

3.3 Econometric strategy

To study the role of productivity spillovers from foreign firm's activities, it is assumed that the presence of foreign firms in an industry affects total factor productivity of domestic firms in the same industry. This, in line with the literature, can be represented in the following way using an augmented Cobb-Douglas specification of a production function for firm i in industry j at time t, which explicitly incorporates the role of spillovers.

$$lny_{ijt} = \beta_0 + \sum_{m=1}^{M} \beta_m lnZ_{ijt} + \sum_{d=1}^{k} \phi_d X_{jt} + D_j + \varepsilon_{it} \tag{1}$$

The four basic factors inputs of production (Z) used include labour (L), capital (K), raw materials (M) and energy (E), while lny_{ijt} is a measure of firm productivity. Labour is measured by the number of employees and capital by capital consumption given by depreciation value. The regression includes firm characteristics X and a full set of industry and time dummies (D), while ε_{it} is a white noise error term. The error term consists of a time-invariant firm specific effect and a remaining white noise error term.

For empirical analysis, various model formulations are estimated in which y_{it} is the productivity measure of the firm i at time t (total output, output per worker, total value added, value added per worker, and the lag of firm productivity y_{it-1}. X_{ij} is a vector of firm characteristics like education attainment of the top manager,

gender, training and is equal to 1 if the manager/owner had any experience with a foreign firm prior joining or founding or acquiring the current firm.

Another important concern in the productivity literature is the problem of simultaneity of foreign firm activities. To correct for this, we also estimate the model with lagged explanatory variables as a robustness check.

In an effort to disentangle the different effects we exploit information on both production and non production workers trained or acquired experience from foreign-owned firms. That is, the regression is extended with relevant indicators of foreign presence, disaggregated by examining effect the training or experienced gained from foreign firms by production and non production workers of firm productivity. This is investigated by estimating the following model specification.

$$y_{it} = \alpha_0 + \alpha_1 y_{it-1} + \sum_{m=1}^{M} \alpha_m lnH_{it} + \alpha_3 Tu_i + \alpha_4 Ts_i + \alpha_5 S_i + \varepsilon_{it} \qquad (2)$$

where y_{it} is the growth rate of the productivity measure of the firm i at time t, y_{it-1} is the lagged log of the productivity measure y. H_{it} is a vector of owner characteristics like education attainment, nationality, gender and is equal to 1 if the owner had any experience with a foreign firm prior founding or acquiring the current firm. S_i are sector and time dummies, while ε_{it} is a white noise error term.

The variables included to capture any spillovers from experience or training acquired or received from a foreign firm include Tu where Tu_i is equal to 1 if the owner or worker received training by a foreign firm, Ts_i is equal to 1 if a firm's manager acquired working experience or training by working with a foreign firm in the same industry j prior to joins the current firm, and Ts_{is} is equal to 1 if previous experience or training was gained in a foreign firm in a different industry s such that $s \neq j$.[2] We estimate a number of specifications of the productivity equation because Spillovers may not only affect labour productivity but may also

[2]If all or part of the knowledge accumulated by workers is industry specific we would expect that experience gained in the same industry would allow the manager to improve the performance of the domestic firm, while this effect would be less if experience were gained outside the industry.

change the input mix and capital utilisation, therefore impacting on total factor productivity (TFP) as in Barrios and Strobl (2002).

4 Results

Different measures of firm productivity are used as dependent variables to examine the effect of labour mobility productivity spillover from foreign to domestic manufacturing firms in the Uganda manufacturing firms. For empirical analysis, four basic firm inputs are used to estimate the augmented production function, namely capital consumption, labour costs, raw material consumption and energy. Table 2 presents the results of estimating different specifications of equation (1) not controlling for any firm characteristics in order to examine the effect of input stock and their growth rates on firm productivity. The firm productivity augmented production function estimations are based on different productivity measures in logarithm. The economic intuition in this approach is that the interest is whether the manufacturing firms efficiently utilise the scarce available inputs so as to show whether there is higher levels of productivity to justify the argued productivity spillover associated with foreign firms.

First, the lag of the dependent variables exhibit a negative effect in the four estimations and statistically significant at 1%. Labour growth rates have a positive correlation with all the measures of firm productivity. Also the labour stock employed by the firm has a positive coefficient with valued added of the firm. This point out the efficiency in labour utilisation by manufacturing firm in Uganda. In regard to capital consumption growth has a negative coefficient in the value added per worker regression, which may indicate under utilisation of available capital stock and use of absolute technology due to limited new investments. The results show that energy growth rate has the expected positive sign in the output per worker regression but carries a negative coefficient in the value added per worker regression. Furthermore, energy stock variable is negatively correlated with output per worker and value added per worker. This reflects the higher costs of energy in

the country as one of the factors that limit the industrial development efforts. The raw material consumption variable is positively correlated with the total output growth of the firm and whiles the raw material growth rates is positively correlated with output per worker and value added. However, it is negatively correlated with value added per worker.

Table 3 presents the results of estimating equation 2 to examine the effect of sector specific experience acquired from multinational firms on the productivity of domestic firms employing managers with prior experience and/or training with foreign firms. The results show that experience acquired from foreign firms in the same industry has a consistently significant positive effect on firm level productivity in the total output regression. This variable has the expected positive coefficient but it remain insignificant in the other regressions. As expected, the coefficients on experience attained in other industries are negative and statistically significant in the total output and output per worker regression. This indicates the foreign firm provide specific skill to workers which consequently limit the extent of productivity spillovers in the host country. The exporting variable has a positive sign as expected in all estimates of firm productivity except for the value added per worker regression. The capacity utilisation variable is positively correlated with all firm productivity measures except value added per worker. This implies that domestic firms put the available capacity to full usage in the sector and this enables firm to reap from the spillover effects of the multinationals. The results indicate a positive correlation with the agriculture and construction sectors variables which indicate that domestic firms in these sectors reap from foreign firms' presence. However, in terms of value added per worker, there is a negative coefficient. This may point out a low absorptive capacity among domestic firms. The results in terms of firm size analysis indicate that medium and large domestic firm are more productive compared to the small firms in terms of the different productivity measures except value added per worker.

Table 4 presents results of productivity spillovers controlling for the different measures of local absorptive capacity among domestic firms. First, controlling for the level of education of the domestic firms' managers in terms of level of attainment,

the results show that primary education variable has a negative coefficient in the estimates. This implies insufficient management skills to run a domestic firm efficiently and hence limited absorptive capacity to reap productivity spillovers from multinational firms. The vacation and university variables have an expected positive impact on firm productivity. This implies that domestic firms managed by individuals with reasonable education training benefit from productivity spillovers from foreign firms in the host country. Further, the results obtained by controlling for the education attainment of firm workers in terms of years of schooling reveal interesting findings. A positive correlation between workers' education between 7-12 years and 13 years and above is observed with total output, output per worker and value added. However, all workers' education exhibit a negative correlation with value added per worker. The positive sign on workers' education variable indicate the possibility of local absorptive capacity in the domestic firms to imitate production technology use by foreign firms and also their product design and packaging. Workers education determines how easy they are in terms of retraining on new production techniques to enhance better and high production. The lagged variable in all specification has a consistently significant positive coefficient, which implies that previous productivity growth does increase the current productivity growth of the firms. The positive coefficient on the capacity utilisation variable implies domestic firms' ability to exploit productivity spillovers in the economy. The positive coefficient on the export variable of the domestic firm indicates their ability to reap from productivity spillovers of foreign firms. For exporting firms this is important because of the need to meet the stiff competition on the international market. Absorptive analysis of productivity spillovers indicate that medium and large sized domestic firms stand high chances to gain from the presence of foreign firms.

Results in Table 5 indicate the effect of foreign firm presence on domestic firms' productivity. First, the lagged variable in all specification has a consistently significant positive coefficient, which implies that previous productivity growth does increase the current productivity growth of the firms. The positive sign on the capacity utilisation variable in the total output and output per worker regressions indicates that domestic firms reap productivity growth from presence of foreign

firms. Also, with the presence of multinational firms, the size of the domestic firm is a key factor on the firm's ability to reap from productivity spillovers. Further, specific management skills and experience acquired from foreign firms is in the same industry influence the ability of domestic firms' ability to reap productivity spillovers in terms of a firm's total output and value added. However, general training offered by foreign firms to their workers, when these are hired by domestic firms they reduce the firm productivity. The export dummy has a positive coefficient in all estimates, which indicates that exporting domestic firm are more likely to reap from productivity spillovers in the host country. The results obtain on the measure of capital and labour intensity index, show no significant effect of productivity spillovers in the Ugandan domestic manufacturing firms.

In Table 6, focus is on the attention to exploit information on the gender based skills in explaining labour mobility productivity spillovers in domestic firms. For this purpose, measures of female worker skills in domestic firms were decomposed into skilled, unskilled and non production female workers. Overall, mixed results were found for the different skills for female workers. It appears that domestic skilled female workers tend to affect the productivity of domestic firms positively except in the value added per worker regression. The unskilled production female workers and the non production female workers negatively affect domestic firm productivity, hence limited room to reap knowledge spillovers from foreign firms. For other controls, sector specific experience variable is positively correlated with firm productivity. This means that domestic firm managed by manager with prior experience with multinationals benefit from foreign firm presence in the host nation. The coefficient on the export status variable is positive and significant which indicates that domestic exporting firms enjoy high knowledge gains. Also quite impressive results were obtained on the firm size dummies that are statistically significant in that the large domestic firms are more productive compared to the small firms in the country. However, firm size is negatively correlated with value added per worker. Finally, the sector dummies show that there is declining production in construction and agro industries in terms of all the measures of firm productivity.

5 Summary and Conclusions

This paper analysed the presence of productivity spillovers in domestic firms from foreign firms associated with movement of workers from foreign to domestic firms in Uganda. The paper attempted to improve an understanding of the potential of productivity spillovers in the manufacturing firms by looking at the role of knowledge spillover from foreign firms to domestic firms. Empirically, this was implemented by exploiting data on worker movement from foreign to domestic firms in the manufacturing, construction and agriculture manufacturing sectors. Second, the role of gender based skills was explored looking at the effects of skilled, unskilled and non production female workers in explaining productivity spillovers within industries.

Interestingly, consistently positive productivity spillovers of sector specific managers' experience and training from foreign firms to domestic firms were found. This role of skilled workers has often been hypothesised in the literature to have a positive effect on firm productivity, thus, direct evidence has been provided to sustain this claim. The important evidence is that the magnitude of spillovers differs in different sectors and within sector in different firms of Ugandan manufacturing industries. Specifically, the results suggest that positive knowledge transfer affect firm productivity in domestic firms. Taken together, these results suggest that domestic firms which are run by entrepreneurs who gained experience working for multinationals in the same industry before running their own firms, show higher productivity growth than other firms.

The coefficients on the specific sector experience and training in general may be interpreted as a sign that the domestic managers hired from foreign firms bring with them some of the knowledge accumulated in foreign firms which can be usefully employed in the new domestic firm. The findings indicated that there is a consistent negative effect if the firm managers gained experience in foreign firms in a different sectors suggests that the knowledge obtained in multinationals is largely sector specific and can therefore not be easily transferred to businesses in different sectors.

This study also presents a number of useful insights for policy-makers. First of all, one should be careful not to exaggerate the positive effects of foreign firms on the productivity of domestic firms. Second, the potential of productivity spillovers depends importantly on the firm size which consequently depends on management education level attained and capacity utilisation. These results concerning experience gained in foreign firms provide some evidence to the suggestion that there are spillovers from worker mobility. However, there is no evidence to suggest that the training variable only captures explicit training provided by foreign firms it may be the case that we are thus not able to measure adequately other types of more informal acquisitions of human capital and/or that explicit training only constitutes a small proportion of total human capital acquired in a foreign owned firm. This is because, more educated workers could be the one given further training by the foreign firms, as our results reveal some evidence that female unskilled workers reduce the ability of domestic firms' productivity spillovers.

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6 Appendix: Estimation Results

Table 1: Summary for firm inputs and Outputs used in the study

	$Msexp = 0$				
Variable	obs	mean	Std.Err.	Min	Max
sal	378	19.226	2.580	13.449	25.428
ss	374	15.678	1.562	8.814	21.278
kk	183	19.223	1.865	14.550	23.333
vv	266	-11.420	1.837	-17.108	-2.974
val	255	18.388	2.409	12.808	24.026
tfpsal	83	-0.180	1.006	-6.865	3.638
tfpval	78	-1.336	0.972	-4.059	1.871
tfpss	86	3.640	1.029	-3.223	8.025
tfpvv	86	3.640	1.029	-3.223	8.025
	$Mexp = 1$				
sal	208	18.795	1.967	14.039	23.660
ss	204	15.532	1.433	12.058	19.376
kk	130	19.029	1.422	15.089	23.157
vv	152	-10.876	1.679	-15.714	-6.235
val	151	17.981	0.443	-1.161	1.863
tfpval	58	-1.415	1.011	-5.782	2.001
tfpss	56	3.826	0.547	2.959	5.375
tfpvv	56	3.826	0.549	2.959	5.375

Source: Author's computations from RPED Survey (2003)

Table 2: Fixed effect (GLS) estimates for Domestic Firms' Inputs Productivity

Variables	$Output$	$Output/L$	$Valueadded$	$Valueadded/L$
$lag(log(Dependent))$	0.628***	0.701***	0.389***	0.701***
	(0.0786)	(0.0704)	(0.0839)	(0.0704)
$\Delta log(Labour)$	0.257***	0.246***	0.449***	0.246***
	(0.0455)	(0.0496)	(0.119)	(0.0496)
$log(labour)$	0.0557	0.0627	0.205*	0.0627
	(0.0526)	(0.0427)	(0.113)	(0.0427)
$\Delta log(Capital)$	0.0502	-0.00569	0.0219	-0.305***
	(0.0392)	(0.0238)	(0.0532)	(0.0661)
$log(Capital)$	0.0103	-0.0192	0.0597	-0.0192
	(0.0332)	(0.0403)	(0.0913)	(0.0403)
$\Delta log(Energy)$	0.0456	0.487***	-0.00630	-0.214***
	(0.0487)	(0.0610)	(0.0970)	(0.0471)
$log(Energy)$	0.0196	-0.141**	0.109	-0.842***
	(0.0253)	(0.0602)	(0.106)	(0.0980)
$\Delta log(Material)$	0.340***	0.184***	0.316***	-0.114**
	(0.0592)	(0.0509)	(0.0854)	(0.0451)
$log(Material)$	0.275***	0.00225	0.0850	0.00225
	(0.0533)	(0.0271)	(0.0728)	(0.0271)
$Constant$	0.531	1.029*	-0.448	1.029*
	(0.748)	(0.604)	-1.668	(0.604)
$Observations$	50	47	49	47
$Waldchi2$	1545.92	1416.58	293.73	3436.05
$Loglikelihood$	2.59	3.31	-40.27	3.31

Standard errors in parentheses*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3: Fixed effects (GLS) estimates of Sector Specific Productivity spillover

Variables	$Output$	$Output/L$	$Valueadded$	$Valueadded/L$
$lagDependent$	0.445***	0.535***	0.558***	0.587***
	(0.0378)	(0.0435)	(0.0522)	(0.0486)
$Sectorexp$	0.335***	0.154	0.235	0.160
	(0.128)	(0.114)	(0.160)	(0.187)
$Training$	-0.519***	-0.410**	-0.190	-0.123
	(0.184)	(0.165)	(0.224)	(0.259)
$Exporter$	0.623**	0.522**	0.815**	-0.265
	(0.294)	(0.266)	(0.375)	(0.421)
$CapacityUtilisation$	0.0127***	0.0108***	0.00817**	-0.00144
	(0.00281)	(0.00254)	(0.00362)	(0.00425)
$Construction$	0.394**	0.0792	0.280	-0.178
	(0.178)	(0.161)	(0.222)	(0.257)
$Agriculture$	0.365***	0.246**	0.0396	-0.444**
	(0.138)	(0.124)	(0.170)	(0.204)
$Mediunsize$	1.118***	0.223*	0.704***	0.0886
	(0.159)	(0.134)	(0.221)	(0.226)
$Largesize$	1.903***	0.0751	1.563***	-0.421
	(0.300)	(0.254)	(0.386)	(0.402)
$Constant$	9.521***	6.981***	7.057***	-4.156***
	(0.772)	(0.733)	-1.009	(0.723)
$Observations$	320	311	210	211
$Wald\chi^2$	741.39	315.79	425.7	199.18
$Loglikelihood$	-480.75	-428.63	-311.80	-347.74

Standard errors in parentheses*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4: Fixed effects (GLS) Productivity Spillover estimates for Local Absorptive Capacity

Variables	$Output$	$Output/L$	$Valueadded$	$Valueadded/L$
$lagsal$	0.397***	0.480***	0.433***	0.608***
	(0.0365)	(0.0441)	(0.0496)	(0.0486)
$Primaryeduc$	-0.357*	-0.224	-0.394	-0.0557
	(0.216)	(0.200)	(0.266)	(0.353)
$Secondaryeduc$	-0.0229	0.0101	0.150	-0.0265
	(0.205)	(0.191)	(0.255)	(0.335)
$Vocational$	0.442**	0.362*	0.730***	0.0113
	(0.222)	(0.207)	(0.276)	(0.363)
$University$	0.645*	0.418	0.0690	-0.670
	(0.329)	(0.317)	(0.385)	(0.541)
$0-6yeareduc$	0.000635	0.0110*	0.00671	-0.0238*
	(0.00699)	(0.00644)	(0.00924)	(0.0123)
$7-12yeareduc$	0.0113*	0.0183***	0.0168*	-0.0255**
	(0.00684)	(0.00630)	(0.00904)	(0.0120)
$13-yeareduc$	0.0129*	0.0176***	0.0178*	-0.0237*
	(0.00684)	(0.00630)	(0.00911)	(0.0121)
$capacityUtilisation$	0.00711**	0.00572**	0.00226	-0.00128
	(0.00276)	(0.00257)	(0.00334)	(0.00444)
$Mediumsize$	1.021***	0.176	0.774***	0.163
	(0.151)	(0.129)	(0.200)	(0.225)
$Largesize$	2.047***	0.247	1.871***	-0.787*
	(0.283)	(0.246)	(0.354)	(0.428)
$Construction$	0.289	-0.0907	-0.0233	-0.236
	(0.178)	(0.166)	(0.211)	(0.278)
$Agriculture$	0.520***	0.304**	0.227	-0.416**
	(0.134)	(0.123)	(0.152)	(0.203)
$exporter$	0.701**	0.536**	0.805**	0.160
	(0.278)	(0.264)	(0.346)	(0.444)
$Constant$	8.912***	5.775***	7.693***	-1.633
	(0.948)	(0.919)	-1.234	-1.339
$Observations$	306	301	200	203
$Wald\chi^2$	866.88	354.27	533.34	212.08
$Loglikelihood$	-431.73	-399.62	-267.92	-330.01

Standard errors in parentheses*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5: Fixed effect (GLS) Productivity Spillover estimates for Foreign Presence

Variables	$Output$	$Output/L$	$Valueadded$
$lagDependent$	0.494***	0.541***	0.565***
	(0.0390)	(0.0435)	(0.0477)
$CapacityUtilisation$	0.00812***	0.0102***	0.00557
	(0.00298)	(0.00253)	(0.00360)
$Mediumsize$	0.650***	0.221	0.205
	(0.153)	((0.135)	(0.172)
$Largesize$	1.438***	0.0663	1.499***
	(0.249)	(0.255)	(0.297)
$Sectorexp$	0.266*	0.160	0.294*
	(0.136)	(0.114)	(0.156)
	(0.890)	0.0912	0.0278
$Labourintensity$	0.121	(0.0701)	(0.0948)
	(0.0826)	-2.816	-1.548
$Capitalintensity$	-2.007	-2.267	-3.005
	(2.640)	-2.267	-3.005
$Training$	-0.549***	-0.392**	-0.0245
	(0.192)	(0.165)	(0.230)
$Exporter$	0.768**	0.549**	1.250***
	(0.300)	(0.265)	(0.366)
$Constant$	63.64	84.16	49.41
	(73.08)	(62.75)	(83.16)
$Observations$	316	311	208
$Wald\chi^2$	660.36	314.10	447.21
$Loglikelihood$	-486.83	-429.05	-304.53

Standard errors in parentheses*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6: Fixed effects (GLS) Gender based Skills Productivity Spillover estimates

Variables	$Output$	$Output/L$	$Valueadded$	$Valueadded/L$
$lagDependent$	0.242***	0.391***	0.0620	0.457***
	(0.0743)	(0.0878)	(0.0780)	(0.109)
$Sectorexp$	0.905***	0.623***	0.550***	0.316
	(0.162)	(0.155)	(0.165)	(0.242)
$Femaleskilled$	0.0189***	0.0140***	0.0213***	-0.0231***
	(0.00444)	(0.00405)	(0.00506)	(0.00652)
$F-unskilled$	-0.00962**	-0.00213	-0.0147***	0.0132**
	(0.00450)	(0.00418)	(0.00495)	(0.00667)
$F-nonproduction$	-0.0175***	-0.0103***	-0.0114***	0.0351***
	(0.00368)	(0.00343)	(0.00394)	(0.00675)
$Exporter$	0.754**	0.199	2.051***	1.584***
	(0.371)	(0.317)	(0.486)	(0.613)
$Mediumsize$	0.153	-0.0957	-0.136	-1.718***
	(0.376)	(0.358)	(0.349)	(0.462)
$Largesize$	1.925***	0.227	2.544***	-1.399***
	(0.435)	(0.376)	(0.440)	(0.519)
$Construction$	-0.308	-0.227	-0.344	-1.084***
	(0.230)	(0.219)	(0.256)	(0.370)
$Agriculture$	-0.208	-0.449**	-0.0155	0.442
	(0.224)	(0.220)	(0.236)	(0.346)
$Constant$	14.00***	9.581***	16.48***	-5.518***
	-1.414	-1.444	-1.345	-1.324
$Observations$	63	61	47	45
$Wald\chi^2$	386.60	119.77	459.10	204.12
$Loglikelihood$	-56.03	-49.6	-35.4	-45

Standard errors in parentheses*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$