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Are Foreign Firms More Productive, and Export and Technology Intensive, than Local Firms in Kenyan Manufacturing?

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ARE FOREIGN FIRMS MORE PRODUCTIVE, AND EXPORT AND TECHNOLOGY INTENSIVE THAN LOCAL FIRMS IN KENYAN MANUFACTURING?

Rajah Rasiah• and Geoffrey Gachino*

Abstract

This paper uses firm level survey data to examine productivity, and export, skills and technological intensities between foreign and local firms in Kenyan food and beverages, metal engineering, and textile and garment. Foreign firms enjoyed statistically highly significant higher labour productivity means than local firms in textile and garment manufacturing. Foreign firms were also more export and technology intensive than local firms in textile and garment (process technology and R&D), and metal engineering (HR). Foreign firms' enjoyed higher and statistically significant skills and overall technology (HR and R&D) means than local firms in food and beverage. The econometric exercise showed that foreign ownership enjoyed a statistically significant and positive relationship with overall technological and HR intensities. Against labour productivity, the coefficient of technology index was higher in the foreign firms' sample than in the local firms' sample. Local firms enjoyed higher value added in domestic than export markets. Export-intensity enjoyed a positive relationship in the process technology regressions, but an inverse relationship in the HR regressions in the foreign firms' sample. Overall, the significant Kenyan results suggest that foreign firms' technology, productivity and export-intensity levels in economies with weak institutions tend to be superior to local firms.

Keywords: Ownership, Productivity, Exports, Technology, and Kenyan manufacturing

JEL Classification: L0, L1, L6, O1

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1. INTRODUCTION

Firms in developing economies generally learn and upgrade their technologies through a combination of imports and domestic development. The participation of local firms in export markets too often arises from spillovers initiated by foreign firms (see Morawetz, 1981; Kessing, 1983; Rasiah, 1994). While licensing and imports have characterised the main initial source of learning enjoyed by Japan, South Korea and Taiwan, it is generally argued that foreign direct investment (FDI) became the major channel of technology transfer in Singapore, Ireland, Israel and Malaysia (see Teece, 1977; Davies, 1977; Rasiah, 1995; 2002a). While the role of FDI in the appropriation of knowledge, learning and innovation is growing in significance, little consensus exists on its impact on local firms. The anecdotal and analytical evidence on spillovers of tacit and experiential knowledge embodied in human capital in the creation of local firms remains scarce as the measurement of spillovers directly is both a tedious and difficult task (e.g. Rasiah, 1994; 2002b).

The estimation of aggregate spillovers at the national, industry and firm-levels has evolved considerably since Caves (1974; 1982) presented arguably the first systematic production function estimation. Subsequent empirical work using a similar framework has been carried out by Blomstrom and Kokko (1998), Blomstrom and Wolff (1994), Sjöholm (1999), Kokko and Sjöholm (1998), Aitken and Harrison (1992), Haddad and Harrison (1993), Aitken, Hanson and Harrison (1997) and Aitken and Harrison (1999), *inter alia*, took this approach to a new dimension by refining the methodology to address locational, industry-type, scale and demonstration effect variables. These works helped improve the original instruments that Caves had used to extend the understanding of spillovers. Two contradictory sets of findings have been unearthed using this methodology. On the one hand, Blomstrom and Persson (1983), Blomstrom and Wolff (1994), Sjöholm (1997) and Kokko and Sjöholm (1998) produced evidence of positive spillovers from the presence of foreign firms. On the other hand, Haddad and Harrison (1993) produce evidence of a lack of spillovers from foreign presence.

This paper attempts to examine differences in labour productivity, and export and technological intensities between foreign and local firms using an adapted version of the technological capability framework, which has its antecedents in Lall (1992), Westphal *et al* (1990), Ariffin and Bell (1999), Wignaraja (2002) and Figueiredo (2002). The potential impact of foreign firms on local firms can of course be interpreted with caveats. Although overall FDI levels in Gross

Capital Formation (GCF) in Kenya hovered between 0.3% in 1994 and 1.0% in 2000,¹ its commensurate shares in manufacturing were 69.1% in 1994 and 63.0% in 2001,² which enables a policy-relevant assessment of foreign and local firms in a country receiving low FDI inflows.

Food and beverages, metal engineering, and textile and garment industries were chosen for analysis on the basis of their high levels of value added. The three industries together accounted for over 63% of Kenya's manufacturing value added in 1995 (Kimuyu, 1999). The rest of paper is organised as follows. Section two discusses Kenya's economic background to locate the subsequent analysis. Section three introduces the methodology and data used. Section four examines statistical differences in labour productivity, and export, skills and technological intensities between foreign and local firms. Section five analyses the statistical relationships involving these variables, while section six concludes.

¹ Computed from the World Bank (2001).

² Computed from data supplied by the Ministry of Trade and Industry, Nairobi.

2 ECONOMIC BACKGROUND

Economic stagnation in the mid-1980s and 1990s affected Kenyan industrialisation with consequent effects on labour productivity (see Gachino and Rasiah, 2003). Political and macroeconomic stabilisation in neighbouring economies (especially Uganda) also drew away markets and investment from Kenya. Macroeconomic constraints arising from a collapse in the IMF's structural adjustment package (SAP) introduced in 1986, massive destruction to physical infrastructure from the El Nino rains and weakening of institutions had severely damaged the economy by 1997-98 (Kenya, 1998; Phillips and Obwana, 2000; Todaro, 2000).

MNCs targeting domestic markets in the past typically geared little production towards export markets beyond neighbouring economies (see Narula and Dunning, 2000). Kenya had in the past benefited from relative political stability to dominate exports to the Common Market of East and Central Africa (COMESA) and African exports to the European Union.³ Kenya still accounted for 42% of COMESA trade and 30% of COMESA exports to the European Union. The restructuring enforced following liberalisation also meant that from the mid-1980s but especially in the 1990s prevailing firms were restructuring to face external competition. While the new environment that has emerged since 1995 – a combination of globally driven deregulation following the opening of WTO– is conducive for greater regional market penetration, two major factors have restricted extensive participation by Kenyan firms. First, the emergence of imports – especially from South Africa (after the end of the Apartheid regime) has intensified competition. Second, institutional failure (e.g. frequent breakdowns in telecommunication and transport networks) has severely restricted the capacity of Kenyan firms to generate efficient exports.⁴ Hence, although Kenya introduced a number of instruments to promote FDI and export-oriented industrialisation, manufacturing stagnated. Among instruments introduced to promote exports were: Manufacturing Under Bond (MUB) in 1986, which was administered by the Investment Promotion Council (IPC) exempting firms from duties and value added tax; Export Processing Zones (EPZs) in 1990; Export Promotion Centre and the Export Programme Office (EPPO) in 1992 (Kimuyu, 1999; Glenday and Ndi, 2000). Exports from Kenya declined in the period 1994-2001. Interviews suggest that institutional

³ COMESA was formed in 1994 to promote regional integration. It had a membership of 20 countries in 2003.

⁴ Kenyan firms also faced a nominal interest rate of 20% and severe failures afflicting power supply, road infrastructure and telecommunication in 2002 (Interviews by Rasiah and Gachino, 4-16 April 2002).

failure in Kenya is so severe that several foreign firms have relocated to neighbouring economies.⁵

Although overall FDI in Kenya accounted for only 1% of GCF in 2000, its participation in manufacturing has been high. Foreign firms continued to enjoy over 60% of fixed capital ownership in the sector between 1994 and 2001 (see Figure 1), and over 50% of manufactured exports in the period 1994-2001 (see Figure 2).⁶

Source: Computed from Data compiled from Ministry of trade and Industry, Kenya, 2002.

Source: Computed from data compiled from Ministry of Trade and Industry, Kenya, 2002.

⁵ Interviews conducted by Rasiah and Gachino in Nairobi and Kampala on 4-16 April 2002.

⁶ Computed from data supplied by the Ministry of Trade and Industry, Nairobi.

3 METHODOLOGY AND DATA

This paper uses labour productivity and export-intensity as proxies of productivity and export performance, and employs indexes measured using related proxies to compare and examine the determinants of technological capabilities. The use of capability indexes in examining the capacity of firms to compete can be traced to Lall (1992), Bell and Pavitt (1995), Westphal *et al* (1990), Wignaraja (2002). Wignaraja adapted the Ernst, Mytelka and Ganiatsos (1998) taxonomy of capabilities to fit the narrow range of data available to examine upgrading in Mauritius' firms. The methodology developed here – drawn from Rasiah (2003a; 2003b; 2003c) - extracts elements from all the above but adapts it further to simplify and establish common specifications for cross-industry regressions. Institutional and systemic variables were excluded owing to the same NIS and cluster synergies facing firms in Kenya. The national sampling frame was used as the initial basis of the interview survey, which had the support of the Kenyan central bureau of statistics. However, the poor response rate prevented a strict adherence to the procedure. The proxies used in sections 4 and 5 were measured and defined as follows:

3.1 Productivity and Export Performance

The proxies of labour productivity and export-intensities were used to denote productivity and export performance respectively. Both variables have problems but they do allow useful assessments.

$$\text{Labour productivity} = VA_i/L_i$$

Where VA and L refer to value added, total employees of firm i in 2001.

$$\text{Export intensity} = X_i/Y_i$$

Where X and Y refers to exports and gross output of firm i in 2001. Local firms (64.8%) on average enjoyed higher export-incidence than foreign firms (35.2%): the breakdown by industry was 68.6% local and 31.4% foreign in textile and garment; 47.8% local and 52.2% foreign in metal engineering; and 70.2% local and 29.8% foreign in food and beverages (see Table 1).

3.2 Technological Capabilities

Firm-level dynamics include minor improvements to machinery and equipment, improved inventory control systems and training methods and R&D strategies. Since a number of characteristics and strategies have overlapping objectives and effects, it is methodologically better to integrate related proxies into a composition of indexes, which will not only help minimise double counting, but also avert multi-collinearity problems in statistical analysis. In addition, adjusting firms' responses involving specific variables, e.g. R&D– will offer a better approximation of its value than just any one proxy – e.g. R&D sales as a percentage of overall sales and R&D staff in workforce. Including all the proxies as separate variables can cause multi-collinearity problems. Because there are no *a priori* reasons to attach greater significance to any of the proxies used, the normalisation procedure was not weighted. However, the indirect effects of these proxies would still remain as the hiring of key R&D scientist or engineer by one firm from another would inevitably have a bearing on its R&D capability. The following broad capabilities and related composition of proxies were used.

Human Resources

Two alternative proxies were used to represent human resources. However, human resource capability was used separately to measure human resource practices that denote development in firms, and hence it excluded technical, professional and skilled human resource endowments. The exclusion allows the measurement of human resource capability that is developed by each firm –rather than those that are acquired or ‘poached’ from other firms.

Human Resource Practices

Human resource (HR) practice is expected to have a +ve relationship with labour productivity, process technology and skills intensity. Given the low value added nature of assembly and processing undertaken in the three industries in Kenya, a strong relationship is not expected between HR and R&D activities.

Human resource capability (HR) was measured as:

$$HR = 1/3[1/5(TM), TE, 1/6(CHR)] \quad (1)$$

Where TM, TE and CHR refer to training mode, training expense as a share of payroll, and cutting edge HR practices used respectively. TM was measured as a multinomial logistic variable of 1 when staff are sent out to external organisations for training, 2 when external staff

are used to train employees, 3 when staff with training responsibilities are on payroll, 4 when a training department is used, 5 when a separate training centre is used and 0 when no formal training is undertaken. CHR was measured by a score of one for each of the practices and divided by the total number of practices. The firms were asked if it was their policy to encourage team-working, small group activities to improve company performance, multi-skilling, interaction with marketing, customer service and R&D department, life long learning and upward mobility. The proxies were normalised using the formula below:

$$\text{Normalisation Score} = (X_i - X_{\min}) / (X_{\max} - X_{\min}) \quad (2)$$

Where X_i , $X_{\min}$ and $X_{\max}$ refer to the minimum and maximum values respectively of the related proxy of firm i .

Skills Intensity

Skills-intensity (SI) was used separately to capture the effects of different shares of managerial, professional, engineering, technical and supervisory personnel in the workforce. SI was measured as:

$$SI = H_i / L_i$$

Where H and L refer to human capital (managers, professionals, engineers, technicians and supervisors), and total employees respectively in 2001 of firm i .

Process Technology Capability

Process technology (PT) – being central to participation in export markets even in low value added operations – can be expected to show a +ve relationship with exports and HR. The same can also be expected with R&D since process improvements dominate early participation.

Data on four proxies facilitated the computation of PT, which was calculated using the formula:

$$PT_i = 1/4[1/3(E_i, M_i), 1/5(ICT_i), QC_i] \quad (3)$$

Where E, M, ICT and QC refer to equipment, machinery, information technology components and quality control instruments of firm *i*. E and M were computed as multinomial logistic variables with average age of over 5 years = 0, 3-5 years= 1, 2 to less than 3 years=2 and less than 2 years=3. Likert scale scores ranging from 1-5 (least to strong) was used to measure ICT. QC was measured as a dummy variable (QC=1 if cutting edge methods were used, QC=0 otherwise).

R&D Capability

The learning process leads firms to eventually participate in new product development. While beginners only learn and absorb, firms typically hire R&D personnel to learn and develop new products as they get closer to the technology frontier (Pavitt, 1984; Dosi, 1982). With the exception of funding of public labs and universities, firms seldom participate in basic research. Hence, firm-level R&D is largely focused on process technology and product development – especially diversification of use and proliferation. Given Kenya’s underdeveloped institutional and systemic facilities and the preponderance of labour-intensive assembly and processing operations, R&D is unlikely to produce statistically meaningful results involving export-intensity. Given also the R&D focus on process technology changes in low value added food and beverages, metal engineering, textile and garment and other manufacturing – a +ve relationship can be expected with process technology.

The data collected enabled the computation of two R&D proxies, *viz.*, R&D expenditure as a percentage of sales and R&D personnel as a share of employment. It was not possible from the sample data to disentangle investment advanced between process and product R&D, and hence this proxy was measured to relate to both product and process R&D and was measured as:

$$RD_i = 1/2[Rdexp_i, Rdemp_i] \quad (4)$$

Where RD_{exp} and RD_{emp} refer to R&D expenditure as a share of sales and R&D personnel in workforce respectively of firm *i*.

Other Technology Variables

Three additional technological variables were computed when examining the determinants of HR, PT and RD to avert problems of multi-collinearity between them (see Appendix).

$$HRT_i = [HR_i + PT_i] \quad (5)$$

HRT refers to technological influences of human and process technology resources of firm i.

$$HRD_i = [HR_i + RD_i] \quad (6)$$

HRD refers to technological influences of human and R&D technology resources of firm i.

$$PRD_i = [PT_i + RD_i] \quad (7)$$

PRD refers to technological influences of process and R&D technology resources of firm i.

Wages

Wages were used to represent labour market conditions. Unions were dropped owing to their presence in only 9 firms (see Table 1).

Given the premium involving skilled and knowledge workers a +ve relationship can be expected between productivity and wages. Average monthly wages were used. Since it is difficult to obtain wages of workers alone, it was measured by dividing total salaries and remuneration with workforce. Average wages in million Kenyan Shillings per year was used in all the regressions and was measured as:

$$W_i = S_i / L_i$$

Where W and S refer to wages per worker and total monthly salary bill of firm i.

Other Critical Firm-Level Variables

Three other important firm-level structural variables were included in the analysis, *viz.*, ownership, management type and age. Mergers and acquisitions were dropped because these involved only 7 firms. Export-processing zone was also dropped owing to the low number of firms involved.

Ownership

There were only 5 joint-venture firms in the sample and all of them had 50% foreign equity. The classifications of whether any foreign equity was involved or at least 50% foreign was involved would not matter as a consequence. Ownership was measured as:

$FO_i = 1$ if foreign equity ownership of firm i was 50% or more; $FO = 0$ otherwise.

Where FO refers to status of ownership of firm i . Using this classification, there were 37 (35.2%) foreign and 68 (64.8%) local firms: the breakdown by industry was 11 (31.4%) foreign and 24 (68.6%) local in textile and garment; 12 (52.2%) foreign and 11 (47.8%) local in metal engineering; and 14 (29.8%) foreign and 33 (70.2%) local in food and beverage (see Table 1).

Size

There were only 3 firms with employment size exceeding 500, which is understandable given the low capacity utilisation rates caused by economic stagnation in Kenya. Hence, medium firms with employment size exceeding 100 were added to large firms, with the variable S representing this category. Size was measured as:

$S_i = 1$ if employment size exceeded 100; $S_i = 0$ otherwise.

Where S refers to size of firm i . Using this definition small firms (59.0%) still surpassed the number of large firms (41.0%): the breakdown by industry was 77.1% small and 22.9% large and medium in textile and garment; 43.5% small and 56.5 large and medium in metal engineering; and 53.2% small and 46.8% large and medium in food and beverages (see Table 1).

The variables of age and owner-managed firms were dropped, using stepwise regressions, owing to a lack of any statistical influence.

Specific industry-level questionnaires were designed, pilot tested and mailed to all firms listed in official government statistics records in Kenya. In addition, the authors distributed and collected some questionnaires personally. Case studies of at least three firms in each industry were undertaken by the authors to help extract industry-type characteristics. The survey and the case studies constitute the basis for the results and analysis in the paper.

The data collected is presented in Table 1. A total of 150 questionnaires were distributed personally by the authors. The response rate was high (around 80%) owing to the support from the Central Bureau of Statistics. The analysis in the paper used 105, which contained complete responses. The breakdown by industry was 35 textile and garment, 23 metal engineering and 47 food and beverage firms. The breakdown by ownership and size were 37 foreign and 68 local

firms, and 43 large and medium, and 62 small firms respectively. Of the total, 37 enjoyed export experience, while the remaining 68 only sold their products on the domestic market.

Table 1: Distribution of Sampled Firms by Ownership, Size and Export Incidence, Kenyan Firms, 2001

	N	Ownership			Size	Export Experience	
		FO=1	FO=0	S=1	S=0	X=1	X=0
Textile and Garment	35	11	24	8	27	11	24
Metal Engineering	23	12	11	13	10	12	11
Food and Beverage	47	14	33	22	25	14	33
Total	105	37	68	43	62	37	68

Note: X – refers to export incidence.

Source: Tabulated from UNU-INTECH Survey (2002) using Stata Package 7.0.

3.3 Statistical Analysis

Two-tail t tests were used to examine if statistically significant differences involving VA/L, X/Y and SI, and the technology variables of TI, HR, PT and RD existed between foreign and local firms. Two tail tests were preferred over one-tail test owing to the possibility of the means of foreign firms (H_0) being less or more than that of local firms (H_1) (see Kmenta, 1971; Gujarati, 1988).

The following models were specified to estimate the statistical determinants of labour productivity and export intensity. OLS regressions were used when the dependent variable was value added per worker. Tobit regressions were preferred when export-intensity, skills-intensity and the technological variables were used because they are censored both on the right and the left side of the data sets. The models were run with industry dummies:

$$OLS: VA/L = \alpha + \beta_1 X/Y + \beta_2 TI + \beta_3 FO + \beta_4 W + \beta_5 S + \mu \quad (8)$$

$$Tobit: X/Y = \alpha + \beta_1 TI + \beta_2 FO + \beta_3 W + \beta_4 S + \mu \quad (9)$$

$$Tobit: TI = \alpha + \beta_1 X/Y + \beta_2 SI + \beta_3 FO + \beta_4 W + \beta_5 S + \mu \quad (10)$$

$$Tobit: HR = \alpha + \beta_1 X/Y + \beta_2 SI + \beta_3 PRD + \beta_4 FO + \beta_5 W + \beta_6 S + \mu \quad (11)$$

$$Tobit: PT = \alpha + \beta_1 X/Y + \beta_2 HRD + \beta_3 FO + \beta_4 W + \beta_5 S + \mu \quad (12)$$

$$\textit{Tobit: RD} = \alpha + \beta_1 X/Y + \beta_2 \text{HRT} + \beta_3 \text{FO} + \beta_4 \text{W} + \beta_5 \text{S} + \mu \quad (13)$$

Regressions (8), (9), (10), (11), (12) and (13) were repeated using foreign and local firm samples separately. All independent variables that showed problems of multi-collinearity – either statistically or through overlapping composition with other independent variables were dropped (see Appendix).

4. STATISTICAL RESULTS

The methodology employed produced interesting results. Significant differences were found to exist between foreign and local firms, especially involving overall technology and human resource index variables, and foreign ownership was also an important determinant of labour productivity and technology and human resource intensity. The lack of convergence prevented an assessment of the sample by foreign and local firms. All tests easily passed the White test of heteroskedacity.

4.1 Statistical Differences

The two-tail t-tests results are shown in Table 2. It can be seen that foreign firms enjoyed statistically highly significant higher labour productivity means compared to local firms in textile and garment manufacturing. The differences were not statistically significant in the metal engineering and food and beverage industries. Foreign firms enjoyed statistically significant higher export-intensity means than local firms in the textile and garment, and metal engineering industries. The results show that foreign firms were more productive and export-intensive than local firms in textile and garment manufacturing. Foreign firms were more export-intensive than local firms in metal engineering. Foreign firms enjoyed statistically significant higher skills-intensity only in food and beverages. There was no statistically meaningful difference between foreign and local firms in the remaining industries.

The results involving TI were statistically significant with foreign firms enjoying higher means than local firms in all industries, though the margin was not very high in metal engineering. Decomposing TI into HR, PT and RD produced interesting results too. Foreign firms enjoyed statistically significant higher human resource intensities in metal engineering and food and beverages. Given that skilled labour was not used as a component, it demonstrates clearly higher HR practices in foreign firms than in local firms in these industries. Foreign firms enjoyed statistically significant and higher process technology intensity mean than local firms only in textile and garment manufacturing. Foreign firms enjoyed statistically significant and higher RD means than local firms in textile and garment, and food and beverage industries.

Interestingly, foreign firms enjoyed higher means in all the statistically significant results involving labour productivity, export-intensity, skills-intensity and technological intensity. Despite the presence of stand-alone firms, the results tend to conform to expectations. Local

firms in underdeveloped locations generally lack the technological capabilities to match the technologies foreign firms have access to from foreign markets.

Table 2: Two-Tail t Test Results Comparing Foreign and Local Firms, Kenya Sample, 2001

	Foreign	Local	<i>t</i>		Foreign	Local	<i>t</i>
VA/L				TI			
Textile and garment	3.248	0.688	3.76*	Textile and garment	1.198	0.732	3.44*
Metal engineering	0.314	0.404	-0.67	Metal engineering	0.878	0.625	1.88***
Food and beverage	1.599	0.907	1.51	Food and beverage	1.097	0.709	2.79*
X/Y				HR			
Textile and garment	0.284	0.112	2.17**	Textile and garment	0.381	0.351	0.43
Metal engineering	0.476	0.177	2.07**	Metal engineering	0.331	0.176	2.77*
Food and beverage	0.237	0.131	1.21	Food and beverage	0.461	0.245	3.23*
W				PT			
Textile and garment	0.073	0.136	1.30	Textile and garment	0.456	0.203	4.00*
Metal engineering	0.058	0.174	-1.30	Metal engineering	0.275	0.278	-0.06
Food and beverage	0.124	0.094	0.49	Food and beverage	0.399	0.315	1.55
SI				RD			
Textile and garment	0.715	0.685	0.38	Textile and garment	0.363	0.175	2.55*
Metal engineering	0.597	0.651	-0.66	Metal engineering	0.275	0.172	1.12
Food and beverage	0.568	0.418	2.14**	Food and beverage	0.236	0.150	1.70***

Note: *, ** and *** - Significant at 1%, 5% and 10% levels respectively.

Source: Computed from UNU-INTECH Survey (2002) using Stata Package 7.0.

4.2 Statistical Relationships

This section presents the statistical relationships involving the critical explanatory variables. The results presented in Tables 3 and 4 easily passed the White test for heteroskedasticity. The results involving the Tobit regressions on TI, HR, PT and RD by ownership samples are not reported since all of them did not converge. The industry dummies used were also excluded from the tables.

Labour Productivity and Export-intensity

TI enjoyed a statistically strong and positive relationship with VA/L in all the three regressions, its coefficient well exceeding 1 (see Table 3). Clearly technology intensity is highly correlated with labour productivity. The coefficient is much stronger involving foreign firms than with

local firms, suggesting more productive utilisation of technology in the former than the latter. Export-intensity was statistically insignificant in both the overall and foreign firms' samples, but was inversely correlated with labour productivity in the local firms' sample. The inverse relationship could be a result of external markets offering lower margins than domestic markets. The control variable of age was statistically significant only in the overall sample and its coefficient negative but small, suggesting a marginal influence over on labour productivity. Size was inversely correlated with labour productivity in the overall and foreign firms' samples. The high coefficient of S showed that large and medium firms were less productive than small firms. Whereas small firms are lean and often flexible to switch production from one product to another, medium and large firms lack these features, especially under circumstances of economic stagnation, which affected capacity utilisation rates in Kenya.

The results were somewhat different involving export-intensity. Regressions involving the local firms' sample did not converge. TI did not enjoy a statistically significant relationship with X/Y, owing to export specialisation in sub-Saharan regional markets where both competition and technological demand are relatively low. Size was positively correlated with export-intensity in the overall sample, and though statistically insignificant its coefficient in the foreign firms sample was also positive. Medium and large firms tend to enjoy higher export-intensity than small firms. FO was positively correlated with export-intensity, showing that foreign firms were more export-intensive than local firms.

Table 3: Labor Productivity and Export-intensity, Kenya Sample, 2001

	VA/L			X/Y		
	All	Foreign	Local	All	Foreign	Local
X/Y	-0.226 (-0.50)	0.397 (0.44)	-0.850 (-2.10)**			
TI	2.525 (7.87)*	2.822 (4.60)*	1.737 (5.58)*	0.116 (0.66)	0.071 (0.31)	0.121 (0.42)
S	-0.647 (-2.32)**	-0.816 (-1.18)	-0.096 (-0.41)	0.376 (2.39)**	0.565 (2.02)**	0.313 (1.44)
FO	0.403 (1.39)			0.223 (1.45)		
W	0.374 (0.56)	1.449 (0.79)	0.475 (0.96)	-0.174 (-0.44)	-4.672 (-1.77)***	0.239 (0.54)
μ	-0.710 (-2.12)**	-0.128 (-0.14)	-0.534 (-2.04)**	-0.404 (-2.00)**	0.100 (0.27)	-0.457 (-1.69)***
N	105	37	68	105	37	68
F, χ^2	13.50*	6.50*	7.80*	24.81*	13.24**	5.62**
R ²	0.494	0.565	0.434			
Adj. R ²	0.457	0.479	0.379			

Note: *, ** and *** - Significant at 1%, 5% and 10% level respectively; Figures in parenthesis refer to t ratios.

Source: Computed from UNU-INTECH Survey (2002) using Stata Package 7.0.

Technological Intensity

Tobit regressions involving technological variables produced interesting results (see Table 4). The results of the industry dummy variables were excluded. Regressions involving the disaggregated samples by ownership did not converge and hence the results are not reported here. The lack of correlation between TI and X/Y is confirmed with the reversed equation. FO was positively correlated and statistically highly significant, showing that foreign firms enjoy higher technological intensity than local firms, which is consistent with the t-test results reported earlier in the paper. TI was positively correlated with SI, but its influence was marginal. Higher shares of human capital are necessary to drive technical change. Size was positively correlated with TI suggesting that large and medium firms enjoyed higher technological intensity than small firms.

X/Y was inversely correlated with HR, which is likely to be spurious given that much of the limited exports generated actually go to neighbouring markets where demand patterns are similar to Kenya. FO enjoyed a statistically highly significant and positive relationship with HR, showing that foreign firms are better endowed with HR practices than local firms. Size and wages were positively correlated with HR, demonstrating that medium and large firms and firms paying higher wages were better endowed with HR practices. PTD was positively correlated with HR, which is expected given the close relationship between choice of techniques and R&D focus and the requisite HR practices. Age was positively correlated but its influence was marginal.

Age and HRD enjoyed statistically significant results with PT. Foreign ownership was not statistically significant here. Age was inversely correlated but its influence was marginal. HRD was statistically highly significant, which is expected given that the choice of process technology employed is strongly related to HR practices and R&D activities. HR in particular is the prime determinant here since firms in Kenya are little engaged in R&D activities

Only HRT enjoyed a statistically significant relationship with RD. The weakly developed R&D capabilities in Kenyan firms obviously meant that it enjoyed little statistically meaningful relationship with the explanatory variables. RD intensity as expected enjoyed strong relationship with HR expenses and practices, and process technology.

Table 4: Technological Intensity, Kenya Sample, 2001

	<i>TI</i>	<i>HR</i>			<i>PT</i>			<i>RD</i>		
		<i>All</i>	<i>Foreign</i>	<i>Local</i>	<i>All</i>	<i>Foreign</i>	<i>Local</i>	<i>All</i>	<i>Foreign</i>	<i>Local</i>
<i>X/Y</i>	0.026 (0.19)	-0.109 (-1.69)***	-0.208 (-2.02)**	-0.022 (-0.28)	0.055 (1.02)	0.133 (1.67)***	-0.047 (-0.70)	0.143 (1.60)	0.102 (1.35)	0.177 (1.35)
<i>SI</i>	0.004 (2.04)**	0.003 (4.00)*	0.003 (1.43)	0.003 (4.21)*						
<i>PTD</i>		0.135 (2.27)**	0.339 (3.31)*	0.041 (0.54)						
<i>HRD</i>					0.296 (5.56)*	0.345 (4.55)*	0.252 (3.63)*			
<i>HPT</i>								0.280 (3.27)*	0.276 (2.58)*	0.213 (1.58)
<i>S</i>	0.218 (2.66)*	0.038 (0.96)	-0.057 (-0.71)	0.074 (1.63)	0.023 (0.69)	0.062 (1.01)	0.057 (1.51)	0.070 (1.26)	-0.026 (-0.28)	0.152 (2.12)**
<i>FO</i>	0.295 (3.54)*	0.107 (2.65)*			0.027 (0.77)			0.033 (0.57)		
<i>W</i>	0.090 (0.44)	0.154 (1.67)***	0.176 (0.84)	0.163 (1.67)***	0.049 (0.61)	0.015 (0.10)	0.096 (1.19)	-0.241 (-1.58)	-0.387 (-1.21)	-0.153 (-0.85)
<i>U</i>	0.476 (3.44)*	0.023 (0.33)	-0.039 (-0.24)	0.064 (0.91)	0.076 (1.95)***	0.150 (1.91)***	0.048 (1.11)	-0.002 (-0.04)	0.137 (1.14)	-0.026 (-0.30)
<i>N</i>	105	105	37	68	105	37	68	105	37	68
<i>X²</i>	33.23*	40.47*	15.91**	29.54*	46.34*	24.37*	30.90*	28.97*	11.88***	13.70**

Note: *, ** and *** - significant at 1%, 5% and 10% level respectively; Figures in parenthesis refer to t ratios. The TI regressions by foreign and local firms' samples were statistically insignificant for interpretation (X^2 was statistically insignificant).

Source: Computed from UNU-INTECH Survey (2002) using Stata Package 7.0.

Taken together, foreign firms were more productive, export and technology intensive than local firms. Foreign firms enjoyed substantially higher labour productivity and were more export-oriented in textile and garment than local firms. Foreign firms were also more export-oriented in metal engineering. Foreign firms enjoyed higher TI in all three industries. Foreign firms had higher HR means than local firms in metal engineering and food and beverages, PT mean in textile and garment, and RD means in textile and garment, and food and beverages. The econometric exercise showed that foreign ownership was positively correlated with overall technological and HR intensities. The higher coefficient of TI in the foreign firms' sample compared to the local firms' sample showed that foreign firms' technology influenced labour productivity more than local firms. Local firms enjoyed higher value added in domestic markets rather than export markets. Export-intensity enjoyed a positive relationship in the PT regressions, but an inverse one in the HR regressions in the foreign firms' sample.

5. CONCLUSIONS

Kenya presents an interesting case of an underdeveloped economy with high amounts of FDI in manufacturing. Despite its poor infrastructure, low overall FDI levels in GCF and macroeconomic weaknesses since 1986, ownership in the manufacturing sector is still dominated by foreign ownership. However, economic stagnation and weak institutions have forced firms to face poor market – factor and final demand - conditions. Despite these problems, the analysis in the paper produced interesting results that can serve as assessment material for Kenya and other economies with similar endowments.

The statistically significant t-tests results showed that foreign firms were more productive, export-intensive and technology-intensive than local firms. Foreign firms enjoyed substantially higher labour productivity, and were also more export-oriented in textile and garment than local firms. Foreign firms were also more export-oriented in metal engineering. Foreign firms clearly enjoyed higher overall technology intensity in all three industries. Foreign firms had higher HR means than local firms in metal engineering and food and beverages, PT mean in textile and garment, and RD means in textile and garment, and food and beverages.

Foreign ownership enjoyed a statistically significant and positive relationship with overall technological and HR intensities. The regressions by ownership showed that firms' reliance on firm-level technology is higher in the foreign firms' sample as its coefficient was much higher than in the local firms' sample. Local firms enjoyed higher value added in domestic markets than through exports. Export-intensity enjoyed a positive relationship in the process technology regressions, but an inverse one in the human resource regressions in the foreign firms' sample. Overall, the significant Kenyan results suggest that foreign firms' technology, productivity and export-intensity levels in economies with weak institutions tend to be superior to local firms.

It is still early to draw policy conclusions from Kenya's experience given that the political environment in much of sub-Saharan Africa remains uncertain. However, the Kenyan experience shows that foreign firms' technology, productivity and export-intensity levels in economies with very low development tend to be superior to local firms. Although a panel study is necessary to confirm the results, these results do show that foreign firms' productive, export-intensity and technological superiority can be harnessed by governments to stimulate spillovers. The careful promotion of entrepreneurs with affordable loans and access to infrastructure as well as stepping up of the supply of human capital and high tech infrastructure may offer local firms' the fillip to benefit from demonstration effect, competition and markets arising from the participation of foreign firms.

APPENDIX:

Correlation Matrix of Independent variables, Kenya Sample, 2001

	<i>HR</i>	<i>RD</i>	<i>PT</i>	<i>X/Y</i>	<i>A</i>	<i>S</i>	<i>SI</i>	<i>PTD</i>	<i>HRD</i>	<i>HRT</i>	<i>TI</i>	<i>FO</i>	<i>W</i>
<i>HR</i>	1.000												
<i>RD</i>	0.175	1.000											
<i>PT</i>	0.356	0.466*	1.000										
<i>X/Y</i>	-0.037	0.239	0.164	1.000									
<i>A</i>	0.075	0.017	-0.210	-0.165	1.000								
<i>S</i>	0.179	0.165	0.166	0.273	-0.271	1.000							
<i>SI</i>	0.359#	0.132	-0.039	0.082	0.049	0.045	1.000						
<i>PTD</i>	0.304	0.873*#	0.839*#	0.239	-0.104	0.190	0.062	1.000					
<i>HRD</i>	0.779*#	0.754*#	0.533*	0.125	0.062	0.221	0.324#	0.758*#	1.000				
<i>HRT</i>	0.851*#	0.376	0.794*#	0.069	-0.068	0.208	0.213	0.669	0.806*#	1.000			
<i>TI</i>	0.704*#	0.733*#	0.795*#	0.158	-0.043	0.227	0.217#	0.890	0.937*#	0.906*#	1.000		
<i>FO</i>	0.291	0.304	0.289	0.324	-0.014	-0.035	0.144	0.347	0.386	0.351	0.396	1.000	
<i>W</i>	0.098	-0.146	0.005	-0.093	-0.042	-0.083	-0.007	-0.086	-0.028	0.068	-0.017	-0.092	1.000

Note: * high correlation; # - overlapping composition.

Source: Computed from UNU-INTECH Survey (2002) using Stata Package 7.0.

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