

NEPAD Conference

Topic of the paper:

Productivity and efficiency spillovers for developing economies generated by the affiliation of multinational firms:

The South African economy as a case study.

1. The aim of the paper

To present the efficiency advantages and possible spillovers of foreign direct investment from multinationals for the South African business sector

2. Brief literature study on the relationship between foreign ownership and productivity

- Due to imperfections in the market for technology that creates high transaction costs, MNEs often prefer to produce internationally rather than licensing their products. Technology diffusion is mainly affected by direct contact, which is encouraged by foreign entry.
- Firms expand their production abroad if they possess some knowledge-based assets, which, acting as a joint input across plants, give rise to economies of scale at the firm level.

2. Brief literature study on relationship between foreign ownership and productivity (cont...)

- The degree of ownership that MNCs seek must affect the productive efficiency as well as the diffusion of technology in host economies since the intensity of foreign participation is likely to influence the incentive of parent firms to transform intangible assets (technology and management skills) to their affiliates.
- Productivity spillovers for the local economy should be stronger when foreign firms are in minority positions.

3. Methodology applied in the empirical analysis.

- Used a representative sample of prominent firms operating in South Africa.
- Firms were placed into the following categories:
 - a) South African owned firms (“domestic”) and
 - b) Foreign affiliates (“foreign”)

3. Methodology applied in the empirical analysis (cont...)

- Foreign affiliates divided into:
 - a) “majority” (50% and more foreign ownership and
 - b) “minority” (less than 50% foreign ownership)
- To account for difference in the size of the firms, the sample was examined separately for firms employing less than 50 persons (“small”) and those with more than 50 persons (“large”).
- The difference in the level of technology among firms were accounted for by distinguishing between firms belonging to the services sector and the manufacturing sector of the SA economy.

Table 1: Statistics on the percentage share of domestically owned firms and foreign owned firms per variable(% share of absolute values)

Variable	Domestic firms	Foreign firms	Majority foreign holding	Minority foreign holdings
Sales	68.25	31.75	20.25	11.50
Labour	84.00	16.00	10.00	6.00
Capital	69.45	30.55	21.15	9.40
Total assets	70.65	29.35	19.35	10.00

Source: Own calculations

3. Methodology applied in the empirical analysis (cont...)

- Domestic firms constitute the larger share in terms of all the variables.
- Foreign affiliates were unequally distributed between majority and minority owned firms. Majority affiliates have a greater share of sales, labour, capital and assets compared to minority affiliates.

Table 2: Statistics on the mean per variable of a typical firm in the sample (variable by type of ownership)

Variable	Domestic firms (mean value)	Foreign firms (mean values)	Majority foreign holding (mean values)	Minority foreign holdings (mean values)
Sales	1692	10802	12500	8900
Labour	60	215	241	192
Capital	810	4100	4522	3601
Total assets	1830	10900	13021	8272
Leverage ¹	1.45	1.12	0.81	1.44
Liquidity ²	0.61	0.72	0.68	0.66
Capital Intensity(K/L)	12.65	20.24	20.66	22.55
Labour productivity(Y/L)	23657	47544	49566	43220
Capital productivity(Y/K)	2453	2875	2544	2855

Source: Own calculations

Notes: ¹Leverage is the ratio of short- and long-term debt to own capital

²Liquidity is the ratio of working capital to total assets

3. Methodology applied in the empirical analysis (cont...)

- For the typical firm in the sample, on average, total sales, employment, capital and total assets in the foreign majority-owned firm exceeded by far both the domestic and the foreign minority-owned firm.
- The mean of foreign labour productivity was almost double the domestic one. No substantial differentiation was observed in terms of capital productivity.
- In terms of capital intensity it seems that foreign ownership also makes a difference.

Table 3: The relative position of foreign vs domestic firms (ratio of the mean of the “foreign” variable to the mean of the corresponding “domestic” variable).

Variable	Service industries	Manufacturing industries	Small (Less than fifty employees)	Large (More than fifty employees)
Foreign				
Leverage	0.44	1.21	1.12	2.98
Liquidity	1.08	1.11	1.07	1.51
Capital intensity	1.83	1.25	1.99	1.37
Labour productivity	1.64	2.22	1.31	2.06
Capital productivity	0.90	0.94	0.77	1.12

Table 3: The relative position of foreign vs domestic firms (ratio of the mean of the “foreign” variable to the mean of the corresponding “domestic” variable).

Variable	Service industries	Manufacturing industries	Small (Less than fifty employees)	Large (More than fifty employees)
Majority holdings				
Leverage	0.38	1.09	1.15	1.02
Liquidity	1.07	1.11	1.04	1.05
Capital intensity	1.91	1.07	2.71	1.47
Labour productivity	1.66	2.26	1.71	2.08
Capital productivity	0.82	1.14	1.06	1.19

Table 3: The relative position of foreign vs domestic firms (ratio of the mean of the “foreign” variable to the mean of the corresponding “domestic” variable).

Variable	Service industries	Manufacturing industries	Small (Less than fifty employees)	Large (More than fifty employees)
Minority holdings				
Leverage	0.54	1.13	1.04	1.26
Liquidity	1.05	0.99	0.97	1.08
Capital intensity	1.41	1.99	1.47	1.35
Labour productivity	1.62	1.87	1.04	2.01
Capital productivity	0.82	0.68	0.64	1.04

3. Methodology applied in the empirical analysis (cont...)

- There is also an indication that an employee of a foreign affiliate has more capital to work with compared to an employee of a domestic firm.
- Advantage in the capital intensity of the foreign affiliates is concentrated in the services sector for the case of majority-owned firms but in the manufacturing sector in the case of minority owned firms. Highest relative capital intensity is to be found in the smaller firms of the majority-owned group.

3. Methodology applied in the empirical analysis (cont...)

- Financial variables revealed a comparative advantage of foreign firms in terms of lower leverage and higher liquidity.
- Foreign companies look much less constrained by financial considerations, believed to seriously influence investment decisions, which in turn affect production efficiency.

4. Estimation results of productivity determinants

Variables	Regression results
Constant	5.97(42.9)
Ln(K/L)	0.42(17.2)
Foreign	0.51(7.2)
Majority	0.29(5.1)
Size ¹	0.08(8.1)
Leverage ²	0.11(8.5)
Liquidity ³	1.13(15.1)
Adjusted R ²	0.92
F-statistic	498.7

Notes:

- T-values in parentheses
- All results significant at less than 1%
- ¹Size measured by the logarithm of total assets
- ²Leverage is the ratio of short and long term debt to own capital
- ³Liquidity is the ratio of working capital to total assets

Source: Own calculations

4. Estimation results of productivity determinants (cont...)

- Final augmented form of the production function (would counter possibility of collinearity with the error term)

$$\ln(Y_i/L_i) = \ln A + d\text{Foreign}_i + a\ln(K_i/L_i) + c_i \sum \ln X_i + u_i$$

L_i = linear function of labour input;

K_i = linear function of capital input;

A = fixed parameter measuring the exogenous level of technology;

U = random disturbance term that accounts for stochastic variations in the productive capabilities of the i^{th} firm);

4. Estimation results of productivity determinants (cont...)

(X_i = size, age, leverage and liquidity for each firm i . Thus, the size of the firm is controlled in the model since large firms are expected to create higher levels of productivity; “foreign” = dummy variable with a value of 1 if the firm is foreign-owned (partially or wholly). = shifts in the productivity level are assumed to arise not only from the presence of foreign ownership, but also from the degree of ownership in the firms).

4. Estimation results of productivity determinants (cont...)

- In first regression the capital/labour-ratio and the dummy variable was replaced by two separate dummy variables, namely one for minority and one for majority ownership.
 - Each regression was ran with industry dummy variables in order to capture industry-specific effects.
- The coefficients of both the capital/labour-ratio and the foreign variable were positive and statistically significant, indicating that the capital intensity as well as the presence of foreign-ownership affiliates increases the level of labour productivity.

4. Estimation results of productivity determinants (cont...)

- Results clearly indicate (after the second regression) that the majority of foreign-owned firms contribute the most to raising productivity in the host economy.
- A third regression was run to account explicitly for other possible determinants of labour productivity. Hence, the size of the firm, approximated by the logarithm of total assets was introduced, with the two financial variables: Leverage and Liquidity.
 - Conclusion =
 - 1) Borrowing capacity and cash availability could play a significant role in explaining a firm's productivity.
 - 2) The degree of foreign ownership had a strong impact on productivity giving the productivity advantage to the majority foreign-owned firms.

Table 5: Estimation results by sector and size

Variables	Small	Large	Service industries	Manufacturing industries
Constant	4.81(20.4)	4.82(24.5)	6.0(32.7)	5.82(35.5)
Ln(K/L)	0.26(9.0)	0.50(14.8)	0.42(14.2)	0.45(15)
Majority	0.16(1.0)	0.34(6.0)	0.13(1.2)	0.38(5.8)
Minority	-0.14(-1.5)	0.16(2.3)	-0.06(-0.5)	0.07(0.80)
Size	0.32(9.4)	0.12(5.0)	0.10(6.0)	0.11(5.6)
Leverage	0.12(7.9)	0.08(3.8)	0.14(7.0)	0.08(4.8)
Liquidity	0.92(9.8)	1.30(13.1)	1.08(10)	1.12(12.8)
Adjusted R ²	0.74	0.84	0.72	0.78
F-statistic	290.1	286.2	254.3	238.2

Notes:

- t-values in parentheses
- All results significant at less than 1%

Source: Own calculations

4. Estimation results of productivity determinants (cont...)

- Proceeded further by re-estimating the best-fitted productivity equation at a disaggregate level. Large differences were observed in labour productivity between domestic and foreign-owned firms when disaggregating the sample by the number of labour employed. Disaggregating was done for the number of labour employed (<50 and >50) and the R&D intensity (manufacturing and service industries)
- Results = Majority foreign-owned firms have a stronger productivity advantage relative to minority ones, raising productivity twice as much in the large firms and absorbing all the effects in the manufacturing sector.

4. Estimation results of productivity determinants (cont...)

- Results suggest that not only the presence of foreign direct investment, but also the degree of foreign business involvement in the host economy can drive labour productivity to substantially higher levels.
 - Results are suggestive of a direct effect of the financial constraints in the form of borrowing capacity and cash flow availability on productivity, while the foreign direct investment origin had no important effect.

Table 6: Productivity spillovers and foreign ownership

Variable	Sales	Employment	Capital (Fixed)
C	6.14(48.25)	6.04(45.67)	6.08(51.34)
Ln(K/L)	0.39(16.45)	0.40(18.25)	0.41(17.55)
Size	0.08(7.27)	0.10(6.88)	0.09(17.35)
Liquidity	1.05(13.55)	1.06(14.05)	1.03(13.55)
Leverage	0.10(8.22)	0.09(7.90)	0.11(8.35)
FOR ¹	0.12(3.50)	0.06(1.90)	0.08(2.87)
MAJ ²	0.04(2.45)	0.02(1.55)	0.02(0.45)
MIN ³	0.09(2.88)	0.07(1.98)	0.05(2.65)
Adjusted R ²	0.76	0.78	0.79
F-statistic	468.25	466.25	467.89

Notes:

- t-values in parentheses
- All results significant at less than 1%
- ¹Share of sales, employment or fixed capital of foreign firms to their sector's
- ²Share of sales, employment or fixed capital of majority owned foreign affiliates
- ³Share of sales, employment or fixed capital of majority owned foreign affiliates

Source: Own calculations

4. Estimation results of productivity determinants (cont...)

- To test the existence of productivity spillovers in the domestic economy, the effect of the relative size of foreign presence in a sector on the productivity of the domestic firms were estimated. Three measures of foreign presence were used, namely the share of foreign firms in a sector's sales, employment and capital (in model MIN = minority foreign ownership; MAJ = the equivalent share of firms with majority foreign ownership). The methodology adopted was to estimate the general foreign effect on domestic productivity and to derive the two different shares belonging to minority and majority holdings.

4. Estimation results of productivity determinants (cont...)

- Results = productivity of domestic firms increase as the relative presence of foreign firms becomes stronger = clear that domestic firms do benefit from the presence of foreign firms in their respective sectors.
- The stronger spillover effects were those of the sales and fixed capital formulations.

Table 7(a) : Productivity spillovers and foreign ownership: The services and manufacturing sectors in terms of sales

Variable	Service sector	Manufacturing sector	Small	Large
C	6.11(31.02)	6.54(26.31)	5.12(19.52)	5.08(17.25)
Ln(K/L)	0.41(14.01)	0.39(11.24)	0.25(8.05)	0.45(11.22)
Size	0.07(4.45)	0.08(4.60)	0.25(8.22)	0.11(4.35)
Liquidity	1.06(11.20)	1.06(6.90)	0.90(8.77)	1.15(9.80)
Leverage	0.07(4.02)	0.11(5.45)	0.10(6.24)	0.06(3.25)
MAJ	0.06(2.90)	0.11(2.70)	0.07(2.30)	0.04(0.96)
MIN	0.03(0.40)	0.16(3.50)	0.13(2.86)	0.05(1.00)
Adjusted R ²	0.62	0.64	0.61	0.75
F-stat	186.22	195.12	248.45	169.15

Table 7(b): Productivity spillovers and foreign ownership: The service and manufacturing sectors in terms of capital

Variable	Service sector	Manufacturing sector	Small	Large
C	5.89(31.02)	6.31(27.44)	4.92(18.96)	5.02(18.24)
Ln(K/L)	0.39(13.25)	0.36(11.91)	0.25(8.22)	0.45(11.22)
Size	0.07(4.55)	0.08(4.45)	0.24(8.12)	0.11(4.24)
Liquidity	1.06(10.80)	1.06(8.90)	0.91(8.95)	1.15(9.72)
Leverage	0.06(4.18)	0.12(14.99)	0.10(6.15)	0.70(3.18)
MAJ	0.08(3.16)	0.02(0.50)	0.02(0.19)	0.02(0.22)
MIN	0.05(1.18)	0.12(2.95)	0.08(2.35)	0.07(1.90)
Adjusted R ²	0.63	0.66	0.65	0.82
F-stat	171.22	180.56	241.99	179.78

4. Estimation results of productivity determinants (cont...)

- Further estimation was attempted disaggregating the sample into manufacturing and service industries, as well as small and large firms
 - Results:
 1. Large domestic firms were not affected by the presence of either majority or minority foreign holdings.
 2. The productivity of small firms was affected positively by both majority and minority foreign holdings.

4. Estimation results of productivity determinants (cont...)

■ Results...

3. Small domestic firms benefited most from the presence of minority-owned firms in their sectors.
4. The degree of foreign ownership seemed to create different spillovers for domestic firms depending on their size and the kind of industry they are operating in.
5. With the exception of manufacturing industry firms being influenced by the presence of majority foreign holding, all other categories of domestic firms seemed to enjoy spillovers stemming from minority foreign holdings as suggested by the literature.

Managerial implications

1) The most important issues that management of domestically-owned firms will have to deal with in order to attain the same level of efficiency as foreign-owned firms are the transfer of technology, access to capital, acquisition of technical and managerial skills and expansion into international markets.

2) Study suggests three possible options (most probably combinations thereof): (a) gain access to better technology and skill levels by attracting skilled managers and employees from multinational firms (b) become a partially-owned affiliate either through mergers or some managerial arrangement (c) the constant searching, identification and implementation of managerial strategies that would limit financial constraints, remove productivity caps and gain access to higher levels of technology.