

INFRASTRUCTURE QUALITY, FIRM CHARACTERISTICS AND FOREIGN OWNERSHIP IN AFRICA: EVIDENCE FROM FIRM LEVEL MANUFACTURING DATA

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Abstract

The primary objective of this study was to examine the role played by the quality of infrastructure and firm heterogeneity on the amount and probability of being foreign invested using maximum likelihood techniques like the Probit and Tobit models. Results show that firm size and skilled labour have a positive and significant effect in attracting FDI, whilst firm age, unionisation and power outages have a negative and significant effect. Water problems do not matter much in attracting foreign investors.

Keywords: Ownership, Corporate Governance, Africa

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INTRODUCTION

Foreign direct investment (FDI)²¹ has the potential to generate employment, raise productivity, transfer skills and technology, enhance exports as well as contribute to the long-term economic growth of the world's developing nations (UNCTAD, 2006). More than ever, countries at all levels of growth seek to leverage FDI for development (UNCTAD, 2007). FDI is also one of the most significant factors leading to the globalisation of the international economy, since it contributes towards building strong economic links between industrialised nations and developing countries. Although FDI is important in promoting growth and economic integration, the inflows of foreign direct investment into Africa have lagged far behind those of other developing regions in Asia and Latin America. According to the World Investment Report (2008), between 1980 and 2007, the average percentage share of global FDI received by the developed world was about 73.5%, with Asian countries getting about 14.3% and a meagre 2.3% flowing to Africa. This African share was four times less than that received by the Latin American countries during the same period 1980 to 2007. It also

appears that the continent's annual share of global FDI of about 3% converged to the region's shares in world exports and world output (UNCTAD, 2007). The sluggish inflows of FDI, particularly into the manufacturing sector, is dampening the continent's efforts to foster economic growth and economic integration, thus partly supporting the common belief that Africa will not be able to achieve the 2015 Millennium Development Goals (MDGs) [Economic Commission for Africa Report, 2005].

Development policy experts have for a long time been trying to explain factors behind low levels of FDI inflows in Africa. This interest in the pull factors of cross-border investment has resulted in location choices of multinational enterprises receiving a great deal of attention from researchers across the world. Most of these studies have sought to understand the nature of firm-specific as well as location-specific factors that are important to multinational firms. They identified the following location determinants: market size (Head and Mayer, 2004; Coughlin *et al.*, 1991), labour cost (Wei *et al.*, 1997; Cheng and Kwan, 2000; Kinoshita and Campos, 2004, etc.), infrastructure (Cheng and Kwan, 2000; Asiedu, 2002; Khadaroo and Seetanah, 2007; Wheeler and Mody, 1992; Loree and Guisinger, 1995; Morisset, 2000, etc), government policies (Head and Ries, 1996; Wu, 2000), tariffs (Grubert and Mutti, 1991; Kogut and Chang, 1996; Bloningen, 1997) and institutions (Wei 2000a, 2000b; Wheeler and Mody, 1992; Kinoshita and Campos, 2004; Kirkpatrick *et al.*, 2006; Stein and Daude, 2004). According to Khadaroo and Seenatah, (2007),

²¹ FDI is defined as the acquisition of sufficient assets or lasting interest in a foreign enterprise so as to have an effective voice in its management or to exercise managerial control (IMF, 1993:25; UNCTAD, 2009). However acquiring 10% or more of assets of a foreign firm is the standard definition commonly used in practice.

the quality of developing countries' infrastructure and institutions plays a role in attracting FDI. They argue that this is mostly because multinationals are profit-oriented entities that seek to minimise the costs of doing business and if moving to a developing economy to take advantage of lower labour costs means losing patent protection to imitators, making informal payments (bribes) to get things done, incur higher transport costs due to inadequate transportation and missed supply shipments due to communication problems, then they will not choose to do business there.

In this study, we want to examine the impact of location factors (like infrastructure) and firm characteristics on foreign direct investment in Africa using World Bank firm-level manufacturing data. We depart from the traditional approach that has been followed in the literature, particularly with regard to the measurement of infrastructure variables. We propose to use infrastructure indicators measured at firm-level as opposed to countrywide indicators commonly used in the empirical African literature (see Schoeman *et al*, 2000; Morrisset, 2000; Asiedu, 2002; Khadaroo and Seenatah, 2007).

We control for infrastructure indicators by using the number of days or hours without electricity, telephone, water and customs, whilst at the same time highlighting the importance of firm specific factors. Our argument is that energy consumption or generation per capita, percentage of paved roads and telephone density convey very little about infrastructure quality, particularly if provision is characterised by poor maintenance of roads, intermittent power outages and poor telephone connections. It is true that a good measure of infrastructure quality should incorporate both infrastructure availability and reliability (Asiedu, 2002). The measures that we employ here however, only capture reliability. This is because infrastructure is of little use if it's not reliable and that is why we expect infrastructure reliability (how often are phone lines down) to be more important to foreign investors than availability (number of telephones lines per capita in a country).

The other problem with country level indicators is that there are not that many countries in the world on which there is good enough macro data on social infrastructure to derive robust statistical results²². Further, the proxies used as explanatory variables do not provide much specific guidance about what countries need to do to improve their investment climates (Dollar *et al*, 2004). In addition to the fact that very few²³ FDI studies in Africa employ firm-level data in their analysis, country level data assumes that the quality of infrastructure is the same across locations within a country, when in fact there may be

interesting variations based on local governance (Dollar *et al*, 2005). Additionally, a number of studies that have examined the site determinants of FDI using firm-level data have mostly looked at the characteristics of the investing firms not the characteristics of the firms that have attracted some foreign ownership (see for example Hong, 2008; Kinoshita, 1998; Chen and Moore, 2009; Dunning 1981). This study therefore provides another departure from this traditional approach. We attempt to investigate the nature of firm characteristics that make them more attractive to foreign multinationals. Thus the question that we want to answer is: Do multinationals prefer investing in large firms, older firms or in firms with a non-unionised labour force? This study will not only help us understand the importance of location-specific features but also the attributes of domestic firms that are attractive to multinational companies. This is helpful in the formulation of appropriate industrial policies.

LITERATURE REVIEW

Shatz and Venables (2000) distinguished between two main reasons why foreign direct investors would like to locate in a foreign country. The first one is to better serve the local market and is called 'horizontal' or 'market seeking' since it results in a duplication of production plants. The main motivation behind horizontal FDI is to economise on tariffs²⁴, transport costs and to tap into a new market. This type of FDI is a substitute for international trade and is mainly driven by market size and trade barriers. The second reason for locating in a foreign country is to have access to lower-cost inputs as well as to overcome distribution problems. This FDI is called 'vertical' or 'production cost minimizing' since there is fragmentation. The motivation here is to economise on production inputs so as to maximise profits on each good produced.

Dunning(1998) original eclectic theory argued that the structure and intensity of MNEs foreign direct investment decisions are influenced by three factors: ownership-specific (O) advantages, internalisation (I) advantages and location-specific (L) advantages. Whilst Dunning's original eclectic theory emphasized on locational advantages, he did not explicitly emphasize the role that infrastructure in the host country could play to influence industrial location. It was only after the early 1990s when there was growing emphasis on the role of infrastructure in economic growth that FDI theorists began to incorporate the role of these supply side variables in explaining FDI (Gwenhamo, 2009). In particular, recent extensions to the ownership location and internalisation (OLI) framework have placed a vital role on infrastructural factors as determinants of FDI in developing countries. Thus Dunning and Lundan

²² See also Levine and Renelt (1992; Dollar and Kray (2003); Blonigen (2005)

²³ See Harvey and Abor, 2009 on Ghana.

²⁴ Also referred to as tariff jumping FDI.

(2006) contributed towards fusing the traditional OLI framework with infrastructural factors. They argued that good infrastructure create location advantages that foreign firms seek before operating and investing in the host country.

In explaining the actual role that infrastructure plays in facilitating FDI and even trade, Kessides (1993), argued that the quality and availability of infrastructure facilities such as transport, water, telecommunication and power is important in enhancing the marginal productivity of factors of production like capital and labour. She went on to argue that infrastructure services are intermediate inputs and any reduction in their cost raises the profitability of production, thus resulting in higher levels of output, income and employment. By permitting the transition from manual to electrical machinery, reducing workers' commuting time, and improving information flows through electronic data exchanges, infrastructure services raise the productivity of factors of production such as labour and capital and this improves the competitiveness or profitability of production and this may attract foreign investment (Kessides, 1993). Therefore, as a result of this spillover effect, infrastructure is often described as an "unpaid factor of production", since its availability and quality leads to higher returns obtainable for other factor inputs (Kessides, 1993).

Martin and Rogers (1995) modelled the role of different types of infrastructure (domestic and international) in influencing industrial location. They proposed a new way of modelling public infrastructure which makes it possible to analyse its effect on trade patterns and industrial location²⁵. Their model differs from that of Krugman (1991) in that poor infrastructure impose costs on trade within and between countries rather than only on international trade *a la* Krugman. Using iceberg transport costs as in Krugman (1991), they also differentiate between infrastructure that facilitates domestic production (domestic infrastructure) and infrastructure that facilitates international trade (international infrastructure). Thus the iceberg costs are modelled to affect the transportation of goods from foreign markets as well as transportation to final destination at home. In this case infrastructure costs are lower when the good is produced at home than when it is produced abroad because it has to incur both domestic and international trade costs. To take advantage of the high demand in the country with better domestic infrastructure and therefore returns to scale, firms will locate in this country. In Martin and Rogers (1991) model, differences in international infrastructure does not induce industrial location but good international

infrastructure increases the sensitivity of industrial location to differentials in domestic infrastructure. Thus agglomeration of firms will occur if the difference in domestic infrastructure is important and if international infrastructures are strong.

Root and Ahmed (1979) were among the first scholars to establish a positive role of general infrastructure on FDI. They used a data set of about 70 developing countries over the period 1966 to 1970 and employed a multiple discriminant analysis technique since they were dealing with categorical rather than continuous data. They measured infrastructure variables using transport expenditures as a proportion of GDP, communication expenditure as a percentage of GDP and electricity production per 1000 people. Their results show that developing countries that have attracted the most non-extractive direct foreign investment on a per capita basis are those *inter alia* that have relatively advanced infrastructure facilities. Similar results were also obtained by Wheeler and Mody (1992) using a panel data model of 42 countries from 1982 to 1988. They found that infrastructure quality (transport, communication and energy) is an important variable for developing countries seeking to attract FDI from the United States, but less important for developed countries that already have high quality infrastructure.

Kumar (2001) departed from using individual indicators of infrastructure and constructed a composite index which captured availability of transport, telecommunication, information and energy. He used data from 66 developed and developing countries across the world over the period 1982 to 1994 and employed principal component analysis. Using overseas affiliates of US and Japanese firms, he found that infrastructure availability is important for outward oriented FDI. He constructed an infrastructure index for the study countries for the periods 1982, 1989 and 1994. In differentiating between exports oriented FDI and domestic oriented FDI, Kumar argued that domestic oriented FDI is governed by different factors than is domestic market-seeking FDI. Thus, by being efficiency-seeking, export-oriented FDI could be more sensitive to availability of quality infrastructure than overall FDI.

Hong (2008) also departed from using country level data and employed firm-level analysis. He developed a model which indicates that foreign firms' location choices are determined jointly by site attributes and firm heterogeneity. The model is estimated using data on 2565 foreign manufacturing investments in China's 21 provinces gathered by the government between 2004 and 2005. The conditional logit estimates and simulation results provide supportive evidence. Road density and percentage of internet users included in the model were found to be important considerations when foreign investors choose locations. In order to examine whether the importance of infrastructure varies with firm-specific characteristics, he included interaction terms between

²⁵ They interpreted public infrastructure to include any facility or institution provided by the state which facilitates production and consumption. This interpretation incorporates not only transport and telecommunications but even law and order.

local communications infrastructure and firms' adoption of modern information technology. The resultant coefficient estimate was positive and significant suggesting that firms adopting modern information technology put more emphasis on local communications infrastructure when they make location decisions.

In the African context, Asiedu (2002) analysed 34 countries over the period 1980 to 2000 and used infrastructure indicators like the number of telephones per 1000 people while also controlling for classical FDI determinants (such as market size, cost of labour and skills) concluded that countries that improved their infrastructure were rewarded with more investments. Using OLS, Asiedu (2002) found that a unitary increase in telephone density leads to 1.12 percentage increase in FDI/GDP. Another macro level study that used African data was done by Khadaroo and Seetanah (2007). They applied static and dynamic panel data models like GMM to study the role of transport and communication infrastructure on FDI in 33 Sub Saharan African countries for the period 1984 to 2002. They also controlled for non-infrastructure variables such as market size (measured using per capita GDP) and labour quality proxied using general secondary education enrolment. Their results showed

$$Y_{ik} = \beta_0 + \sum_h \beta_{1h} \Psi_{ih} + \sum_c \beta_{2c} \Phi_{ick} + \mu_{ik} \quad (1)$$

where Ψ represents location determinants like infrastructure quality

Φ represents firm-level controls i.e. firm size, firm age, unionization, etc

Y_{ik} represents the probability or likelihood of a firm to have foreign ownership.

μ is a random error term.

Thus we employed this model to test the hypothesis that a location with good infrastructure and firms larger in size, older and with a high proportion of skilled production workers are more attractive to foreign investor than ones without. Our dependent variable is a dummy which takes the value of one if the firm has foreign equity participation that is greater or equal to 10% and zero otherwise. 10% is the general level of participation at which the direct investor is normally regarded as having an effective say in the management of the enterprise involved (UNCTAD, 2009; IMF, 1993). Since our dependent variable is in binary form, we will therefore use a cross sectional probit model for estimation. We also supplement our estimations by using the tobit model to examine the impact of these location and firm specific features on the amount invested by foreign individuals or institutions. This alternative approach would be helpful in checking for robustness of our results.

DATA AND VARIABLES MEASUREMENT

The World Bank's Enterprise Surveys on manufacturing firms done in 10 Sub Saharan African

that transport and communication infrastructure are important in attracting FDI and the same is true for market size as well as quality of labour.

Although many studies found a positive relationship between FDI and infrastructure measures, some studies however failed to confirm the positive relationship. In a cross country study, Shepotlylo (2006) was not able to find any correlation between a measure of infrastructure stock and the pattern of geographical location of FDI in 24 transitional countries. Bronzini (2004) using a maximum likelihood tobit model, did not find any significant impact of public infrastructure on the spatial distribution of FDI inflows across Italian regions. Quazi (2005) could also not establish a positive and significant relationship between infrastructure and FDI using a panel data from 1995 to 2000 from a sample of East Asian countries.

THE MODEL

The model employed for this study relates infrastructure and firm specific variables to the probability or likelihood of a firm having foreign ownership and is specified as follows:

countries namely, South Africa, Tanzania, Uganda, Zambia, Mauritius, Madagascar, Malawi, Kenya, Ethiopia and Eritrea is the main source of data for this study. The surveys in these respective countries were done between 2002 and 2005 and the countries were chosen primarily on the basis of availability of data on variables of interest such as water, customs, power and telephones. Thus some World Bank country surveys did not elicit data on all infrastructure variables relevant to this study making it difficult for us to use these data sets. The total number of manufacturing establishments covered is 2841²⁶.

The quality of telecommunication, water and electricity infrastructure was measured using variables such as, average number of hours per day or days per

²⁶ The data are collected through firm surveys that include a common set of questions for all countries surveyed. The sample is selected by a simple random or stratified random sampling method controlling for size sub sector, geographic distribution based on company registration records or manufacturing census information available from government. The sample size varies ranging from about 100 for small African economies like Lesotho to more than 1000 for big countries such as India, China, etc.

month without power, water and telephone connection as well as percentage of output lost due to power outages. The assumption on these variables is that quality infrastructure is important in enhancing productivity, competitiveness and hence creates an environment attractive to foreign investors. Thus high number of days and many hours without infrastructural services as well as high percentage of output lost due to power outages indicate poor infrastructure quality and therefore expected to have a negative impact on FDI inflows.

The empirical literature also suggests that the size of the firm does matter in foreign direct investment (see Horst, 1972; Kravis and Lipsey, 1982; Kinoshita, 1998). Although evidence support the fact that large firms are more likely to invest abroad than small firms, our study however seeks to find out whether multinationals or foreign investors also take the size of the firm into account when deciding whether to invest or not? Since we do not have data on the size of the firm before it was foreign owned we assume that if the firm is relatively larger in size now, then it was also relatively larger in size even before accepting foreign ownership²⁷. Descriptive statistics on the sampled firms in this study show that most of the firms that have some foreign investment are larger in size than domestically owned. Thus the average size of a firm with some foreign ownership is 455 employees compared to 153 for domestic owned firms (see Table 1 below). This may indicate that foreign investors also target large firms when making investment choices. This could be due to the fact that large firms have better access to local credit facilities and that large scale production implies that the firm is likely to produce goods more efficiently, may also have more market power and thus less risky than small firms (Kinoshita, 1998). We include the size variable and proxy it by the number of permanent employees in the firm.

Another variable that we have also decided to include is firm age. Our argument is that foreign investors might be attracted to older firms because they may have a deeper and broader understanding of the local market conditions. The number of years they have been in existence enables them to have a better knowledge of the dynamics of local market conditions and survival strategies than younger firms. Descriptive statistics on table 1 show that firms with foreign ownership are relatively slightly older than those domestic owned. Even though it may be true that firms gain knowledge and resources with the passage of years, younger firms can get required resources and capabilities via using short cut mechanisms such as hiring highly experienced and competent managers (Reuber and Fischer, 1997). We proxy firm age here by using the difference between

the years the firm started operating and the one when the firm-level survey was done.

The quality of labour is another variable that has been identified in the literature as a major FDI determinant (see Merlevede and Schoors, 2005; Borensztein et al, 1998). High labour quality not only raises output but enables firms to use advanced production techniques. This is particularly true for FDI from countries that use capital-intensive and skilled labour-intensive production methods. We measure labour quality in this study by using the proportion of the firm's production workforce that is skilled²⁸. We assume that the percentage of skilled labour force in the firm is indicative of the firm's ability to access skilled manpower in the country. Another closely related variable that we use in this chapter is unionisation of labour, Coughlin and Segev (2000) argue that the extent of unionised labour is a characteristic of labour market widely publicized by promoters of economic development in countries with low unionisation rates. The argument is, in less unionised countries firms have the managerial freedom to pursue profit maximization unencumbered by union contract restrictions. This is advantageous to foreign firms who want to introduce new managerial practices. We measure unionisation in this study by using a firm level dummy that indicates whether employees in the firm belong to a union or not.

Dummies were also created to capture country heterogeneity. This is because some countries are political and economically stable than other countries and this might also be a pull factor for FDI. These dummies could also capture comparative advantage based on the countries' factor endowments differences relative to other competing countries (Yoshino 2008). To avoid running into a dummy variable trap problem, we used South Africa as our comparator dummy.

²⁷ We make the same assumption even for the firm age variable.

²⁸ In the survey, skilled workers include technicians (with diploma or other formal qualification) Foremen and Supervisors Machine maintenance and repair (i.e. electricians, plumbers, welders, general repair workers).

Table 1. Foreign investment and firm characteristics

COUNTRY	NUMBER OF FIRMS	% FIRMS FOREIGN OWNED	FIRM SIZE		FIRM AGE		PERCENTAGE OF SKILLED WORKERS (PRODUCTION)		UNIONISATION (% OF FIRMS)	
			Foreign Invested	Not Invested	Foreign Invested	Not Invested	Foreign Invested	Not Invested	Foreign Invested	Not Invested
South Africa	603	19.05	672.68	264.23	32.42	23.83	0.4331	0.4355	87.72	80.75
Uganda	300	23.00	242.33	24.70	16.51	12.31	0.6023	0.5655	20.29	4.76
Zambia	207	29.47	433.53	144.96	14.23	21.69	0.4160	0.4268	70.49	60.27
Malawi	160	26.25	1243.24	305.81	17.75	16.96	0.3099	0.3377	40.48	27.12
Madagascar	293	08.19	280.21	168.43	14.88	17.68	0.3629	0.3202	37.50	31.60
Mauritius	212	16.04	305.68	148.07	21.85	25.79	0.5359	0.6225	44.12	28.09
Kenya	284	19.01	329.37	133.93	53.04	27.33	0.5271	0.3713	18.52	13.04
Ethiopia	427	06.56	210.04	103.29	19.25	15.46	0.7638	0.6361	100.00	100.00
Eritrea	79	11.39	41.06	104.29	28.11	30.30	0.1203	0.1091	100.00	100.00
Tanzania	276	23.19	183.49	70.16	18.02	17.98	0.4821	0.5340	76.56	50.94
ALL COUNTRIES	2841	17.57	455.47	153.19	24.22	19.65	0.4553	0.4359	58.84	54.07

Source: Authors' own calculations using World Bank survey data.

Table 2. Infrastructure indicators in days and hours

Countries	Infrastructure quality in days					Infrastructure quality in hours		
	Export clearing days	Import clearing days	Telephone disruptions	Water disruptions	Power outages	Telephone disruptions	Water disruptions	Power outages
South Africa	9	35	0.49	0.42	2.06	3.94	3.42	4.49
Tanzania	7	31	10.8	8.74	12	10.8	13.23	7.88
Uganda	7	34	13.5	0.51	11	13.5	20.82	10.07
Zambia	9	73	3.34	2.08	3.59	13.5	9.75	2.94
Mauritius	6	14	5.04	2.06	3.22	5.04	11.35	3.22
Madagascar	4	7	1.04	1.05	6.50	9.68	8.34	2.93
Ethiopia	5	15	7.69	5.86	5.26	-	-	-
Eritrea	3	12	1.00	6.60	8.79	-	-	-
Kenya	5	9	2.98	7.10	2.82	14.10	17.25	5.67
Malawi	5	6	2.08	2.30	6.31	15.33	10.29	4.40

Source: Authors' own calculation based on World Bank's Investment Climate Surveys data

Table 3. Probit Model to analyse impact on the likelihood to be foreign invested

Variables	Probit using days (1)	Probit using hours (2)	Probit model with (interactions) using hours (3)	Marginal effects using (2)
Dependent variable	FDI dummy ¹	FDI dummy	FDI dummy	FDI dummy
Country dummies	Yes	Yes	Yes	Yes
Unionisation dummy	-0.3245 (0.0907)***	-0.1817 (0.0750)***	-0.2142 (0.2783)	-0.0439 (0.0183)**
Skilled labour	0.0567 (0.1342)	0.1331 (0.1034)**	0.0793 (0.2852)***	-0.317 (0.0246)
Firm size	0.2724 (0.0329)***	0.2792 (0.0251)***	-0.2845 (0.0729)***	0.0664 (0.0058)***
Firms age	-0.1742 (0.0433)***	-0.1206 (0.0340)***	-0.2132 (0.1005)**	-0.0287 (0.0081)***
Power outages	0.0005 (0.0073)	-0.0139 (0.0038)***	-0.1158 (0.0108)***	-0.0033 (0.0009)***
Water problems	-0.0071 (0.0073)	-0.0081 (0.0046)*	-0.0082 (0.0046)*	-0.0019 (0.0011)*

Telephone problems	-0.0031 (0.0055)	-0.0018 (0.0039)	-0.0017 (0.0039)	-0.0004 (0.0009)
Firm age x firm size			0.0205 (0.0207)	
Firm size x skilled labour			0.1489 (0.0672)**	
Firm size x unionisation			0.0167 (0.0535)	
Skilled labour x unionisation			-0.0903 (0.2189)	
Firm size x power outages			0.0004 (0.0023)	
Telephone x internet connection			0.0245 (0.0037)***	
constant	-0.9373 (0.0173)***	-0.2832 (0.0124)***	-0.3296 (0.0563)***	
No of observations	1258	2093	2093	2093

¹ FDI dummy takes the value of 1 if a firm has at least 10% of its equity being in the hands of foreign owners and 0 otherwise. ***significant at 1%; ** significant at 5%; * significant at 10%: Standard errors in parenthesis

Table 4. Tobit Model to analyse impact on amount foreign invested in each firm

Variables	Tobit using days (1)	Tobit using hours (2)	Tobit model with (interactions) using hours (3)	Marginal effects using (2)
Dependent variable	FDI as a % ¹	FDI as a %	FDI as a %	FDI as a %
Country dummies	Yes	Yes	Yes	Yes
Unionisation dummy	-77.5338 (22.5951)***	-45.0451 (17.7894)**	-37.2756 (64.6170)	-45.0451 (17.7890)**
Skilled labour	7.7190 (32.3227)	27.9174 (24.4329)	174.4461 (67.8860)***	-27.9174 (24.4330)
Firm size	62.6324 (9.3720)***	65.0762 (7.2111)***	-57.2147 (16.9334)***	65.0742 (7.2111)***
Firms age	-48.8497 (11.0034)***	-35.5643 (8.2053)***	-56.1829 (23.6064)**	-35.5643 (8.2053)***
Power outages	0.0492 (1.7385)	-3.4964 (0.9268)***	-5.9680 (2.5694)**	-3.4964 (0.9268)***
Water problems	-1.3586 (1.7316)	-1.9260 (1.0790)*	-1.9200 (1.0797)*	-1.9260 (1.0790)*
Telephone problems	-1.8525 (1.4677)	-0.6762 (0.9131)	-0.6360 (0.9172)	-0.6763 (0.9132)
Firm age x firm size			4.4699 (4.7607)	
Firm size x skilled labour			28.9716 (15.9194)**	
Firm size x unionisation			4.3143 (12.3434)	
Skilled labour x unionisation			-50.0098 (51.8714)	
Firm size x power outages			0.5630 (0.5338)	
Telephone x internet connection			3.4364 (1.7805)*	
constant	-448.9036 (67.3445)***	-519.3832 (56.6591)***	-498.1371 (89.1079)***	
No of observations	1253	2083	2083	2083

¹ FDI variable represents amount of equity taken up by foreign investors expressed as a percentage and also greater or equal to 10%. ***significant at 1%; ** significant at 5%; * significant at 10%: Standard errors in parenthesis

RESULTS ANALYSIS

The objective of this study was to find out whether being mature, large in size, having a unionised and skilled labour force as well as operating in an area with inadequate infrastructure facilities has an effect in attracting foreign investment. Thus we used the Probit model to analyse the likelihood of attracting foreign investment whilst the Tobit model was used to examine the impact on the amount that is invested by foreign companies or individuals.

Results on Table 3 and Table 4 above show that having a unionised labour force has a negative and

significant effect on both the likelihood to be foreign invested and the amount invested. This result supports the argument that firms with an organised labour force in the form of unions are less attractive to foreign investors than firms without. Thus, restrictive labour contracts may make it difficult for multinational managers to introduce new managerial practices so as to pursue the goal of profit maximisation. This is true as long as these new managerial practices have negative effect on employment conditions. However, it is possible that this variable could be endogenous particularly if we assume that unionisation in a firm could be introduced

by foreign investors from countries with organised labour so as to effectively deal with employee related matters. However, descriptive statistics on Table 1 above show that the average number of firms with unionised labour force is not very different in the two groups of firms (foreign and domestic owned). This may indicate that trade union membership might not be influenced by foreign ownership and therefore the unionisation variable might not be endogenous.

The skilled labour variable, proxied by the proportion of the production workforce that has a diploma and other formal qualifications, is generally positive but only significant when measuring infrastructure quality using the number of hours without services. This is true for both amount invested and the likelihood to invest. The significance of this variable suggests that skilled labour is important to foreign investors because it facilitates easy transference of technology and expertise necessary for efficient production. Descriptive statistics also show that the average percentage of skilled production workers is slightly higher amongst foreign invested firms than domestic owned enterprises. The inclusion of firm size in the model was to find out whether firm size matters in influencing FDI inflows. The results from the estimations support the existence of a strong positive relationship between these two variables. It can hence be concluded that firm size does matter in enhancing the amount and probability of attracting foreign investment. Thus technical, marketing and financial economies characteristics of large firms probably make them more attractive to foreign investors. The other reason could be that the ability to access cheap credit facilities and market power make it easier for a foreign investor to realise good returns from their investment and also recoup fixed production costs in large firms within a short period of time. Descriptive statistics on Table 1 also support this finding in that generally the average size of foreign invested firms is roughly three times larger than that of locally owned establishments. The results also show that a large firm with more skilled manpower enhances the likelihood of attracting FDI. This is because the firm size and skilled labour interaction variable is positive and significant.

The firm age variable was intended to capture or to examine whether the number of years a firm has been in existence could proxy in-depth knowledge of local market conditions, a feature that may be attractive foreign investors. Results show that firm age has a negative and significant impact in enhancing the probability of attracting foreign investment. This result suggests that firm maturity is not attractive to these multinationals and probably knowledge of local market conditions is not directly related to firm age. As argued by Reuber and Fischer, (1997) younger firms can get required resources and capabilities via using short cut mechanisms such as hiring highly experienced and competent managers. Younger firms are more likely to be less risk-averse,

more adventurous and flexible to changes in technological demands than conservative, mature firms and this could be the feature attractive to foreign investors. The interaction of firm size and firm age was to find out the effect of being older and larger in size on FDI inflows. Results show that the variable is weakly positive and this could probably suggest that the size effect on FDI dominates the age effect. This could also explain why interacting firm size and unionisation result in a weakly positive impact.

Location specific variables such as infrastructure show mixed results. Power outages measured in hours have a robust negative and significant effect on FDI. This implies that quality or reliable power infrastructure is important in creating an attractive environment for FDI location. The insignificance effect when using the number of days per month without power may partly indicate that measuring infrastructure quality using days may not be appropriate. Hours without infrastructure services like power are a better indicator of quality compared to using days. This is true in that if two firms (firm 1 and firm 2) in different locations experience about 2 days of power outages per month but firm 1 experiences more hours of power disruptions a day than firm 2, then firm 1 faces severe power problems than the other firm. Thus days without power may not be a good measure of the severity of power infrastructure problems than hours without electricity a day²⁹. The negative and significant results imply that power is important for production. Hence, power problems negatively affect the industrial location decisions of multinationals. There is therefore need for governments that are interested in attracting FDI to improve the quality of electricity infrastructure so as to improve the productivity and competitiveness of foreign investors. This will not only attract more FDI but will also ensure that the current foreign investors are retained and do not relocate to better locations.

The variable, hours without a telephone connection, is however consistently negative but insignificant at different levels of foreign investment. However, due to the fact that it appears that most foreign invested firms have an internet connection³⁰, we decided to control for internet connection by interacting the variable with telephone disruptions. The variable is positive and significant at 5% using the probit model. This may imply that internet connection may minimise the negative effect of telephone disruptions on FDI. Therefore, good internet infrastructure is important to ensure quality internet services and governments should consider this if they want to lure foreign investors.

²⁹ We therefore decided to base our results' interpretations and conclusions on the regressions using hours without power a day.

³⁰ About 70% of foreign owned firms are connected to the internet compared to 45% amongst locally owned enterprises.

Although water plays a very important role in the production of various manufactured goods, results from this study however show that this variable is negative but statistically insignificant. This result is robust to model specification and therefore mean that the quality of water infrastructure is a weak determinant of the probability to attract foreign investors. This implies that water is not a major productive input and thus not important in attracting FDI. The other thing is FDI firms could be aware that they can easily minimise water related production problems by using boreholes. Descriptive statistics show that about 47% of foreign owned firms have a borehole compared to 31% amongst locally owned firms.

CONCLUSIONS AND POLICY RECOMMENDATIONS

The primary objective of this study was to examine the role played by the quality of infrastructure and firm heterogeneity on the probability of being foreign invested. Results show that firm size and skilled labour have a positive and significant effect in attracting FDI, whilst firm age, unionisation and power outages have a negative and significant effect on FDI. Water problems do not matter much in attracting foreign investors. This means that governments must create an environment conducive for firm growth and invest more into education and skills development if they want to attract FDI inflows into the manufacturing sector. Improving internet and electricity infrastructure facilities provides a conducive environment for FDI location. There is therefore a need for the governments in countries such as Tanzania, Uganda, Madagascar, Malawi and Kenya, where many firms complain about electricity as a major obstacle (see Tables 2 and 5), to incorporate electricity infrastructure development in their foreign direct investment promotion policies.

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APPENDIX SECTION

Table 5. Infrastructure perception indicator (% of firms)

Countries	Firms complaining about Transport as major obstacle		Firms complaining about Telecommunication as major obs		Firms complaining about Customs as major obstacle		Firms complaining about Electricity as major obstacle	
	All firms	Foreign Invested	All firms	Foreign Invested	All firms	Foreign Invested	All firms	Foreign Invested
South Africa	10.12	12.17	3.48	20.87	16.75	21.74	8.96	13.91
Tanzania	22.88	26.98	11.76	09.52	31.48	40.32	58.89	66.67
Uganda	22.90	29.85	5.19	06.06	27.44	37.50	44.48	49.25
Zambia	30.43	29.51	32.85	29.51	32.37	34.43	39.61	40.98
Mauritius	14.29	11.11	5.37	0.000	22.66	25.93	12.68	11.11
Madagascar	16.10	25.00	16.38	12.50	32.79	57.14	41.30	50.00
Ethiopia	15.00	28.57	29.40	50.00	37.35	55.56	42.45	39.29
Eritrea	18.18	22.22	14.10	11.11	11.48	0.000	37.66	0.000
Kenya	37.41	55.10	44.12	65.31	39.92	48.00	48.15	54.17
Malawi	38.99	63.41	19.50	48.78	24.20	58.54	60.38	78.05
All firms	21.08	29.13	18.05	11.33	29.01	37.26	36.85	41.41

Source: Author's own calculation based on World Bank's Investment Climate Surveys