UNITED NATIONS UNIVERSITY

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#2006-014

Foreign Direct Investment, Firm-Level Capabilities and Human Capital Development: Evidence from Kenyan Manufacturing Industry

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March 2006

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Abstract

This paper uses firm-level survey data of Kenyan manufacturing industry to examine the significance of FDI and firm-level capabilities in human capital development. It undertakes a detailed descriptive comparison of human capital and other firm-level capabilities generated by both foreign and locally owned firms. The analysis shows that foreign firms generally enjoyed high human capital development and firm-level capabilities than locally owned firms. Empirical evaluation of human capital determinants revealed a statistically significant role played by FDI in determining human capital development in all the firms. Other factors which demonstrated an equally significant role included specific firm level capabilities; process, product, marketing and export performance. Interestingly, basic infrastructure, systemic embeddedness, firm size, labour market conditions and the role of government were not statistically significant, implying their weak role in human capital stimulation. The choice of Kenyan manufacturing industry presents an ideal case to evaluate FDI, firm-level capabilities and human capital development for two main reasons. First, the Kenyan economy has continued to witness low levels of economic growth despite having literally lifted most industrial controls and protections since introduction of structural adjustment programme from mid 1980s. Second, although Kenya has low levels of FDI in general terms it has high levels of foreign presence in selected industries. The Kenyan case is therefore expected to offer important policy ramifications for other countries in the sub Saharan region.

Keywords: FDI, human capital development, firm-level capabilities, systemic embeddedness, basic infrastructure and Kenya.
JEL codes: C24, F21, F23, L6, O3.

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1.   INTRODUCTION

The role of human capital in economic growth and development has long been debated (Schultz, 1961, 1963; Arrow, 1962; Becker, 1962, 1964). The proponents of endogenous growth literature posit explicitly that human capital serves as a major driving force of technical progress and as an engine of economic growth (Romer, 1986, 1990; Lucas, 1988; Rebelo, 1991, Aghion and Howitt, 1990, 1998). Endogenous growth theory acknowledges the endogenous role of human capital accumulation in economic growth and distinguishes between labour and human capital. Although the precise impact of human capital may be difficult to determine, existing empirical literature recognises human capital created through investments in education and the development of skill as one of the most significant determinants of economic growth (Schultz, 1963; Barro, 1991, 1996; Barro and Sala-i-Martin, 1995). Given the importance of human capital in economic growth, it forms an important part of national development objectives and policies.

Over the past few decades the Newly Industrialised Countries (NICs) in East Asia were able to transform their economies from agriculture-dominant traditional economies to industry-dominant modern economies by making tremendous progress in technological capability development (Kim, 1997, 1999; Westphal, 1990; Amsden, 1989, 1994; Lall, 1992, 1996; Ernest et al., 1998). Since human capital is the driving force behind technical progress, skill development and productivity in an industry, their success was largely attributed to its promotion and development in earnest. The government in the NICs played a significant facilitating role in human capital development (Fransman, 1988; Nelson and Pack, 1997; Chang, 1994, 2003; Amsden, 1991, 1994). It is argued that conscious accumulation of human capital has enabled these countries to acquire the necessary capability and innovative capacity, which has greatly enhanced their value added manufacturing activities enabling them to participate competitively in the international export markets. Multiple examples can be cited ranging from automobile, shipbuilding, electronics, textiles to semiconductors industries (Gerrefi, 1994; Rasiah, 1995; Kim, 1997; Ernest et al., 1998). Proponents of firm and industrial competitiveness argue profoundly that participation in international market requires tremendous investment in human capital in order to survive global competition (Porter, 1990, 1998; Best, 1990, 2001; Mytelka, 1999, 2000; Lall, 2001).

Human capital can be conceptualised as skills, experience, knowledge and values, which are vested in people in an economy. The notion of human capital was pioneered by Schultz (1961) who while talking about "moral issue of education as an investment in man" suggested that its outcome and consequences ought to be treated as a form of capital. In addition to serving as the driving force in production, human capital is required for generating and maintaining technical progress and for technology absorption in the form of knowledge externalities (Nelson and Phelps, 1966; Abramovitz, 1986; Cohen and Levinthal, 1990; Dahlman and Nelson, 1995).

Although multiple ways might exist through which human capital can be developed, two modes are the most commonly documented. The first one takes place through investment in formal education - regarded in most countries to be the main approach of human capital development. Countries therefore set aside substantial amount of resources in their national budgets in support of formal education, which often includes primary school, secondary and tertiary level education. However, at the tertiary level there is usually an overlap of different institutions, including universities, and a wide array of other academic institutions that provide technical, industrial and vocational training. The second method takes place in work places through different training, learning mechanisms and other forms of human resource enrichment programmes. Note here that training in the work places can involve sending workers for skill enhancement to some of the tertiary institutions.

Specific differences however exist between the two approaches. First, unlike in formal education where participants are likely to be people in their youthful and formative years, training in the work place involve mature career adults who are interested in strengthening their experiential and tacit knowledge. These adults will have received general and formative education in their youth. Second, while formal education continues to receive enormous attention in most countries with regard to policy discussions, less attention is paid to training in the work place. The irony of this it is that this is happening at a time when human capital development in the work place has continued to increase in importance.

Following this reasoning, it can be argued that despite the increased importance of human capital development for the purpose of making technical progress, innovation and productivity in firms, the observed ignorance results in relatively little being known about how it occurs in most countries. This leaves a gap in the literature on technological change and skill development, especially so in technically backward countries in sub-Saharan Africa.

Several pertinent questions therefore need to be examined at the firm level: What is the current and exact position of human capital at firm level in these countries' manufacturing industry? How is it accumulated and/or developed? How much effort is required and what are

the exact processes or mechanisms through which it is developed? How does human capital accumulation at the firm level interplay with that of formal education? Do any forms of active collaboration, formal or informal interactions exist? What factors favour or hinder human capital development in these countries? How does human capital and its development mechanisms in these countries compare to more advanced countries, particularly the NICs? Another important question that begs urgent attention is how human capital affects learning, technological change and innovation in these countries given the importance of these factors in international competitiveness.

The outlined questions clearly indicate that there is a daunting task ahead of us if we are to make any fundamental contribution in the relevant literature on this subject with regard to poor and technically backward countries. This is particularly so with regard to sub Sahara context where virtually everything seems to lag behind. This paper unfortunately does not intend to address all the questions outlined above. The scope will be limited to the examination of the extent of human capital development and its determinants taking Kenya as the case study country. Further, the analysis will be narrowed down to human capital development only in the firms located in selected manufacturing industries[2]. In general, understanding of how human capital is developed is a fundamental task that could lead to a more informed decision making with regard to efficient investment of scarce resources in formal education and human resource training in the industry as part of an overall strategy for industrialization, sustainable economic growth and poverty eradication. This is in line with the current global theme under Millennium Development Goals (MDGs)[3]. The analysis will be done following a conceptual framework designed below which extracts and incorporates fundamental elements of technological change, innovation and skill development such as firm-level learning and capability building, systemic embeddedness, supportive infrastructure and institutions, role of government policy and external/international influence through MNCs.

This paper is organised as follows. Section 2 discusses briefly the Kenyan context with regard to human capital development. Section 3 presents the analytical framework and outlines hypotheses formulated for examination. Section 4 presents the methodological setting of the paper. Section 5 presents the scope and sample characteristics of the survey data used for this analysis. Section 6 presents the empirical findings and discussion while section 7 presents conclusions and policy implications. Suggestions for future further research are also provided in this section.

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[2] Due to resource constraints and the fact FDI is not equally distributed in all the manufacturing industries, this analysis could not be extended to cover all the industries.
[3] See the UNDP (2005) for more details.

2. THE KENYAN CONTEXT

Kenya recognizes the importance of strong human capital for a sustainable economic growth, creation of wealth and poverty eradication. This is articulated in a recent development plan which stated that "…. experience has shown that before a country can move into a higher growth path of rapid industrialization, it has to achieve certain critical masses in human and infrastructural conditions as well as sound institutional capacity and an appropriate framework (GoK, 1997a)". The Kenyan government acknowledges that as far as skilled workers are concerned the level of education and nature of education system of the country is of critical importance to ensure a mass supply of manpower required by the economy (GoK, 1997b). The country, therefore, has attempted to come up with a blend of policies intended to support human capital development that include formal and non-formal education. Government policies pertaining to formal education promotion are primarily formulated and implemented by the Ministry of Education, Science and Technology (MOES&T) done alongside several other line ministries. As will be argued below, formulation and implementation of education policies by different ministerial organs can be criticised in that this has a likelihood of posing unique and inherent problems to the entire system which can affect overall co-ordination and effective implementation of education policies. Formal education can be classified into general education system and manpower or skill training system. Formal school education in Kenya is commonly referred to as 8-4-4 system of education, which was started in Kenya in 1988. The 8-4-4 system of education refers to 8 years of primary education, 4 years of secondary and 4 years of university education at the tertiary level. Note however that the last phase of education system need not be 4 years at the university. This can vary since not all students qualify for university education as most of them end up joining other tertiary institutions such as teacher training, local polytechnics, technical institutes, institutes of technology and so on.

Enrolment in formal public primary schools grew from 891,533 pupils in 1963 to 7.2 million pupils in 2004, while enrolment at secondary level grew from 30,000 students in 1963 to 862,908 students in 2003. Total enrolment in public universities increased from 3,443 students in 1970 to 58,017 students in 2003/4 while total enrolment in private universities for the same period was 9,541 students. The country has about 19 universities: 6 public universities and 13 private universities. An estimated 5,123 Kenyan students were enrolled in foreign universities. While these figures indicate a substantial progress at primary enrolment

and secondary school enrolment that of the university has remained substantially low with the transition rate from secondary to university averaging at 12 %. One of the reasons for the high figure witnessed at the primary level in the recent years was due to the introduction of free primary education (FPE) in the country in January 2003. This resulted in an increased enrolment of children from 5.9 million in 2002 to 7.2 million in formal public schools alone in 2004 representing an increase of 18 % (GoK, 2004). Enrolment at university has remained low due to the escalating cost of university education coupled with guaranteed lack of employment afterwards. Payment for university education was introduced in the country as part of the user fees prescribed under the structural adjustments programmes (SAPs) envisioned to reduce government-expanded expenditure.

Despite this seemingly satisfactory performance in school enrolment, a brief comparison with school enrolment in some selected second tier East Asian countries[4] reveals interesting findings that tend to suggest otherwise. Table 1 shows that although Kenya was a laggard with regard to primary school enrolment in 1970s, by 1990 the enrolment was approaching that of the East Asian countries and was actually at par with that of Malaysia. With regard to secondary and tertiary education, there was substantial difference with NICs taking a definitive lead. Interestingly, while NICs have recorded substantial growth in both levels of education, in general terms, Kenya appears to lie far below enrolment figures recorded by the NICs in 1970. This finding is disheartening but nevertheless consistent with other findings such as UNDP analysis, which places Kenya in the lowest cluster according to its human development index[5]. All the NICs countries being compared with Kenya were placed either in medium or in high human development status. As indicated above, note that this was already happening at a time when cost of education was increasing accompanied by low level of employment opportunities.

Another difference was on the proportion of tertiary students enrolled in science, math and engineering. Using figures available for a particular year in the period 1998 – 2003, Kenya had 29 % enrolment in these three areas, which again fell far below levels recorded by all NICs countries that often posted almost twice this figure (UNDP 2005). This observation

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[4] The countries included are "second tier" countries except South Korea, which is a "first tier" country perceived to have done exceptionally well in its human capital development.
[5] Human Development Index (HDI) is a composite index that measures the average achievements in a country in three basic levels: A long and healthy life, as measured by life expectancy at birth; knowledge, as measured by the adult literacy rate and the combined gross enrollment ratio for primary, secondary and tertiary schools; and a decent standard of living, as measured by GDP per capita in Purchasing Power Parity (PPP) US dollars (UNDP 2005). A Country with an index greater than 0.800 is classified as having high human development, between 0.500 and 0.799 as having medium human development and below 0.500 as having low human development.

strengthens the empirical fact noted earlier purporting that translation levels from secondary to higher levels of education (tertiary level) were quite low, culminating in appalling enrollment levels at the university level. The comparison has revealed that Kenya still lags behind in virtually all the education levels. This observation tends to articulate that enough effort and priority has not yet been placed on the development of human capital through education and training by promoting sciences, engineering and information technology and perhaps this was also the case with technical and vocational training which we examine in a moment. It is not surprising therefore that insufficient allocation of resources or even policies towards science, technology and innovation are not yet put in place. The reader is reminded to bear in mind that the comparison just undertaken does not include the quality of education and thus more work done incorporating quality dynamics in education would undoubtedly result in an interesting analysis with intriguing findings. What is more worrying from an economic standpoint is the fact that secondary and tertiary levels of education are particularly critical for industrialization as they provide knowledge and skills necessary for learning, capability development, innovation and absorption of external knowledge and spillovers from other firms including MNCs present. The preliminary implication of this discussion is that if the country is expected to record industrialization and economic growth levels similar to those witnessed in the NICs, then it has to improve drastically its formal education several folds commensurate with NICs. There is no doubt about this any more as countries with high levels of human capital tend to converge in terms of economic development with high living standards as exemplified by high levels of GDP per capita.

Table 1: A Comparison of Age Group Enrollment in Education, 1970-2002

Country	Primary			Secondary			Tertiary		
	1970	1990	2002	1970	1990	2002	1970	1990	2002
Kenya	58	94	92	9	24	33	1	2	3
South Korea	103	105	104	42	90	90	16	39	85
Malaysia	87	94	93	34	56	70	4	7	29
Indonesia	80	114	112	16	45	61	4	9	16
Thailand	83	98	96	17	31	81	13	16	38
Philippines	-	109	112	-	71	84	-	28	30

Note: Figures are presented in percentages. Figures obtained from World Development Indicators.

We now turn to the second form of formal education, commonly referred to as manpower training or just skill training. In Kenya, this can be considered to include technical, industrial,

vocational and entrepreneurship training (TIVET). The country operates 21 technical institutes, 17 institutes of technology, 4 national polytechnics and 1 technical teachers' college. There are over 600 youth polytechnics distributed in different parts of the country. Approximately 1,000 colleges are operated commercially by private sector operators who offer courses in a variety of training ranging from computers to non-technical areas of training (Gok, 2004). According to the statistics available, total enrolment in public TIVET institutions had increased to over 79,000 in 2003 (Gok, 2004). Students can enroll in these institutions directly from secondary school or from firms in the industry that are willing to impart skill training in any of the TIVET institutions. Although some of the institutes offering TIVET training fall under the auspices of (MES&T), other line ministries operate and manage some of the institutions of which some provide technical training. Interestingly, the management of TIVET institutions is spread across over more than 10 government ministries. For instance, the Ministry of Labour and Human Resource Development (MOL&HRD) which was initially involved in dealing with labour issues was expanded in 2003 to include in its docket adult education, human resource development, human resource management and employment, industrial and vocational training among others issues.

This is precisely where the problem lies with regard to TIVET or more generally administration of tertiary level education in Kenya; yet this is the level at which effective and well organised skill training needed in the industry is expected to take place. Involvement of many stakeholders in its management and administration makes supervision, co-ordination of activities and maintenance of training standards extremely difficult. This is more so particularly when individual ministries and private sector lack the necessary and appropriate capacity to ensure quality and high standard of training. The implication of this would be existence of disparities in the training standards and mismanagement of scarce resources. As noted in the country's Sessional Paper of 2004, mismanagement of scarce resources arises due to unnecessary duplication of efforts, under-utilisation of available training facilities, wasteful and unnecessary competition, and costly and irrelevant training programmes. To a large extent, development of a sound TIVET curriculum has remained a stalled and unharmonised process; operated in a haphazard manner with little flexibility. Although less research work has been done addressing this phenomenon, there is no doubt that this particular mode of operation in Kenya leaves both quantity and quality of technical, vocational and industrial training inadequate to firms' and to a large extent the industrial needs.

Turning to the non-formal mode of education (NFE), we come across yet another sub sector of human capital development that is not well understood in the scholarly circles as much

focus tended to be on formal education erroneously perceived to be the only main mode of human capital development. NFE can be defined as organised learning that is usually upgraded, non-sequential and/or part-time, such as on-the-job training and professional development (Ernst et al., 1998). It is mainly provided and managed by firms, communities and non-government organisations (NGOs). In a recent study by Gachino (2005), alternative ways of offering NFE training were discovered. Interviews in Kenya's manufacturing industry showed that firms offered training in four main ways: In the first case, staff benefited from training while on-the-job through learning by doing, by demonstration, learning by performing and so on. Secondly, the training were offered in-house but in a formalized pattern through a training department. Third, the training were offered externally; either in an external training department, sometimes regional or in a local training institute. Training could also emanate from transfer of technological knowledge, operational and managerial practices through collaborative arrangements between MNC subsidiaries and locally owned firms. Finally, training involved external training done outside the country (abroad and/or overseas). This was common with MNCs that offered training with their foreign headquarters or existing training affiliates overseas. Problems facing NFE sub sector include inadequate teaching and inappropriate learning resources and support systems. The NFE sub sector is characterized by underdeveloped, inefficient support systems, often blamed on lack of strong government support and facilitation. It also suffers from a lack of formalised linkages with formal education system and with the broader national system of innovation (NSI). As expected, the result of this is less ingrained with reduced interactive atmosphere which then lowers NFE and subsequently human capital development in general.

NFE irrespective of how it occurs is of substantial importance than perhaps formal learning particularly to the firms in an industry. As a result, NFE analysis forms the focus of this paper as opposed to formal education learning which received much emphasis in the earlier literature on appropriate technology and technology transfer. Analysis of NFE will be overlapped with another form of human capital development, which has also received much recognition particularly in the technological change and skill development literature. This is informal learning (INL), defined as a long life process by which firm workers learn informally through internal or external interactions. As an example, INL to local employees can occur by acquiring values, attitudes and briefs embedded in the organisational culture of MNCs through daily experience, observation and exposure to indoctrination (Ernst, et al., 1998). INL mode of human capital development at the firm level has also become increasingly important. However, similar to NFE, information on the extent and adequate knowledge of how informal learning was actually taking place was conspicuously lacking. Thus for both kinds of learning little was understood, yet learning at the firm and industry

level was supposed to be fundamental in complementing formal education in a given country's process of human capital development. The implication for this is that the role played by firms in human capital development process fails to be appreciated and thus becomes naively ignored even in policy circles. This paper aims to contribute and ignite a plausible debate in human capital development at firm and industry level. The determinants of human capital development need a thorough examination to enable informed industrial policies for the country's industrial take off, sustained economic growth, poverty reduction and subsequently eradication.

Several factors about Kenya's manufacturing industry make examination of human capital development at the firm level particularly interesting. First, Kenya has a wide range of factors that are reminiscent of a typical poor and technically backward economy. The country has weak infrastructure, weak technological capabilities, lack of vibrant technology and innovation culture, lack of sound institutions and coordination with and among them, macro-economic imbalances. As a result of these factors in the last one and half decade, the Kenyan economy literally underwent stagnation[6].

Second, the poor economic performance alongside poor inconsistent policies translated into low levels of FDI and private domestic investment in the country. Third, the country is still committed to the path of Structural Adjustment Programmes (SAPs) and stabilisation measures started in mid 1980s, followed with more reforms and commitment in early 1990s. Fourth, Kenya has enacted industrial policies bent towards industrialising the country by the year 2020. Kenya now belongs to expanded Common Market for East and South Africa (COMESA) tariff free trading block and has been accredited to the African Growth Opportunity Act (AGOA) export programme, which has helped dynamise specific manufacturing activities such as boosting the textile and garment industries in the Kenyan export processing zone (EPZ). This has revived the textile industry, which had collapsed following the ban of Kenyan textile and apparel to the USA market in 1994 due to the trans-shipment from other regions mainly Asian countries such as China and India. In the guise of existing levels of economic performance ensuing liberalisation, recent industrialisation policies and foreign investment, albeit, in selected industries; this creates an interesting scenario to examine human capital development perceived necessary to support learning,

technological change and innovation which will in turn dynamise and propel competitiveness in the Kenyan manufacturing industry.

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[6] There is however a recent glimmer of hope with the current political dispensation which has shown, albeit slowly, some positive initiatives towards economic growth, wealth creation for poverty eradication.

3. ANALYTICAL FRAMEWORK AND HYPOTHESES

This section presents an analytical framework and proposes a number of hypotheses for analysis. In this paper we argue that an appropriate examination of human capital development in manufacturing industry must be done within the theoretical framework of technological change, skill development and innovation. The reason for this is simple, in that technological change, innovation and skill development all play a complementary role to each other. The process of undertaking technological change and innovation in firms presents learning and capability building opportunities which resonates well with human capital development. Technical changes in the production process or changes in products result in acquisition of new knowledge and ideas. Similarly, changes in management, organisation and marketing are always associated with accumulation of new values, ideas, skills and knowledge. In all these cases experiential and tacit knowledge are accumulated which are all forms of human capital development.

According to the endogenous growth literature, human capital provides the manpower and skills that are required for effecting technological change, maintaining a steady technical progress necessary for eventual economic growth. Phrased differently, endogenous literature recognises an ever increasing endogenous role of human capital accumulation in economic growth. While contributing to the endogenous literature Romer (1986, 1990); Lucas (1988) and Aghion and Howitt (1990, 1998) have made fundamental contributions to this subject, recognising the endogenous role played by technical change, R&D and distinguishing between labour and human capital in contrast to the neo-classical economists who had overlooked skills attributes of labour. Their work was based on earlier works by Arrow (1962), Uzawa (1965), Kaldor (1957) and Schumpeter (1935, 1952). At the heart of endogenous growth theory is the increasing returns argument to economic growth, which as they argue, is possible due to endogenous technical change and presence of human capital. They argue that although growth may be mainly driven by accumulated stock of human capital, the effects of human capital is perhaps more important in undertaking technological change than perhaps is in the actual output production under a given technology. Supporting the role of technology and human capital development the early work by Nelson and Phelps (1966)[7] purported that stock of human capital and ability to generate and maintain technical progress were the sole reasons behind the observed differences in economic growth across

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[7] Well educated mangers, engineers and workers have a comparative advantage in seeing new opportunities and effective learning of new things.

countries. So, revisiting complementary argument we note that, while human capital can quicken acquisition and adaptation of technological change which in turn induces economic growth, on the opposite, dynamism in technological change and economic growth stimulates in turn human capital.

Following seminal work by Nelson and Winter (1977, 1982) technological change have been conceptualised in terms of evolutionary perspectives; one that involves dynamic heterogeneous actors interacting among themselves for socio-economic gains within an economy. This is what has come later to be referred to as national system of innovation. Hence, national system of innovation can be conceptualized as an evolutionary system that puts particular emphasis on the way in which technology, different social-economic agents, organisations, institutions and policies interact with each other for the purpose of fostering knowledge, learning, capability building and innovation. It is thus characterised by agents engaged in formal government and education institutions, network of physical, scientific, economic and technology infrastructure. The flow of technological information, knowledge and skills within the NSI is regarded as the most important thing for the purpose of technological learning and capability building in the local, national and global context. We therefore argue that the process of human capital development at the firm level can be better understood assuming evolutionary and institutionalist view, which views firms not as isolated, static and pure economic organisations, but rather as members of changing economic and social-institutional networks. Adopting this framework enables an expanded framework that enables examination of human capital taking into consideration the role of firm-level capabilities, systemic embeddedness, supportive infrastructure and institutions, role of government policy and international influence which takes place through FDI presence in the country. We examine each of these at a time including proposed hypotheses.

Foreign presence as a Stimulant for Human Capital Development
The role played by foreign presence in a host country particularly developing economies has been a subject of intense discussion (Lall and Streeten, 1977; Rasiah, 1995, 2004; Blomstrom and Kokko, 1997; Pack and Saggi 1997, Gachino, 2005). Nonetheless, this discussion has largely remained inconclusive with some arguing that foreign presence in a host country results in externalities or spillover benefits, which are required for economic growth and development. The spillovers would be generated as MNCs transfer technology or undertake R&D in a host country. The MNCs also participate in exports, creates employment opportunities with advanced human resource opportunities. On the other hand, opponents of foreign presence argue that FDI is likely to crowd out local investment and stifle a host country's industrialization effort. This, they argue, would increase dependency of such

countries and, hence, vulnerability of recipient countries on the FDI – exporting developed countries on account of the footloose nature of FDI. However, despite this divergence in opinion, lack of clear-cut consensus, for many technically backward countries that are still wallowing in abject poverty, FDI is still viewed as the appropriate means through which economic growth can be achieved. This is justified by the fact that these countries do not have the necessary resources required to initialise and maintain a steady economic growth process. Countries in the sub Sahara region are characterised by low national savings and thus low investment levels hence low economic growth. The economies in this region are very fragile, with extremely small markets dominated by weak firms that are capital poor and still 'locked into' low levels of traditional skills and non-competitive techniques. The institutions and infrastructure are weaker than in many other developing countries.

Although FDI levels in the region are not high, Kenya's manufacturing industry is claimed to enjoy a sizeable amount of foreign presence (Kaplinksy, 1978; Gachino, 2005; Rasiah & Gachino, 2005). Taking this country as a case study, it becomes interesting to find out what role FDI has played in technological learning, capability building and in the current analysis human capital development. This happens when MNCs provide access to new technology, managerial and marketing know-how. This can take place in the MNCs when they offer training to the locals to enable them operate machinery and technology. Training can take place through vertically linked firms and can include a wide array of issues; efficiency, achievement and conformity to international standards (such as ISO), marketing, organisation and management, labour market conditions. Training can take place indirectly as a result of MNC presence. When MNCs introduce competition, it forces local firms as well to introduce technological changes thus triggering local firms to learn and innovate if they are to improve their competitiveness. Skill development can also arise as a result of demonstration effects. This takes place simply when firms just observe how MNCs undertake their operations such as production and then imitate them.

However, as noted in the spillover literature, most of the spillover benefits have been observed in the context of developed or advanced developing countries. Little about such benefits is actually known about FDI in context of underdeveloped countries where MNC subsidiaries exist. Actually there are MNC subsidiaries already existing in such countries either because of existing niche markets (windows of opportunities), raw materials, cheap labour or sometimes to tap on an existing pool of knowledge and skills. In Kenya, for instance, there are many MNC subsidiaries which came into country in the early years of independence. Kenya served as an excellent regional manufacturing base to serve an existing regional market in the whole of Eastern Africa, part of Central and Great Lakes region in

Africa. Availability of raw materials, mainly agricultural and readily available cheap labour served as additional factors towards attracting subsidiaries to Kenya (Swainson, 1980).

Since MNCs often exploit state-of-the-art technologies requiring skill levels that are higher than those used by locally owned firms, they are more generally likely to offer training to their staff than indigenous firms. This amounts to human capital development whose results could further translate to *human capital spillovers* in future. Comparing MNCs and local firms, MNCs have been shown to attach much priority to human capital development (Patibandla and Patersen 2002). At the same time local employees in a MNC may acquire skills, tacit knowledge, attitudes and ideas just by doing routine work in a firm that conforms to international production standards – this however does not always follow. *Human capital spillovers* occur due to the mobility of workers or labour turnover from MNC affiliates to domestic firms hence diffusing knowledge and skills. This channel of technology transfer is quite unique from the others in that it involves technology embodied in the workers as they move between firms; in this case from foreign firms to the locally owned firms or when employees of MNCs leave their jobs to form their own firms. This kind of spillover is influenced to a great extent by the level of absorptive capacity in the firms. A study by Gerschenberg (1987) on labour turnover examined MNC subsidiaries and the training and spread of managerial skills in Kenya. His survey included 72 Kenyan managers, where 28 were employed in MNC subsidiaries, 19 were from joint ventures, 16 from indigenous firms and the remaining from publicly owned firms. He observed that MNC subsidiaries offered more training of various sorts to their managers than private locally owned firms do (Gerschenberg, 1987: 934). About 16 % of managers in about 91 jobs considered covered in the study had moved from MNCs to locally owned firms thus contributing to the diffusion of know-how.

Hypothesis 1: Presence of foreign firms is likely to stimulate human capital development in the Kenyan manufacturing industry

Firm Technological Capability and Human capital Development
Technological capability is conceptualized as the ability to generate and maintain technical change and innovation (Bell and Pavitt, 1992). It requires time, effort and enormous resources such as knowledge, skills and experience acquired over time through learning by doing, interacting performing and so forth. It also includes institutional structures and linkages in firms, between firms and outside firms. The literature on learning and technological capability mainly classifies capabilities into: investment capability, production capability, innovative capability and linkage capabilities (Lall, 1992; Ernst et al., 1998; Westphal et al., 1985; Kim,

1997, 1999; Wangwe, 1995; Wignaraja, 2000). A firm that endeavours to improve its technological capability through learning, training and other means of knowledge accumulation such as R&D enhances its human capital development. The literature on technological capability accumulation has offered substantial insight on various learning aspects as well as stylised facts on a national systemic learning economy where changes, internal transformations and restructuring are important for the success of firms and industries. Whenever technological changes such as process, product, marketing, organisation and management take places there is always new acquisition of knowledge, ideas and information all of which add to accumulation of experiential tacit knowledge. Technological changes and capability building effort through learning, R&D and so forth increases human capital as well as absorptive capacity (Lucas, 1988; Cohen and Levinthal, 1989, 1990; Basant and Fikkert, 1996).

Hypothesis 2: Firms that have accumulated technological capabilities (for example: production; process and marketing) are more likely to result in human capital development than firms with weak technological capabilities.

Export Performance

Participation in exports is widely regarded as one of the means through which human capital development could occur. This takes place directly or indirectly through demonstration effects from other exporting firms in the industry. The first case occurs when a firm participating in international export market is stimulated to observe a dynamic learning process at the firm level which stimulates human capital development. As an example, a firm which re-orients its market operations to participate in export market begins by looking for and studying the appropriate export markets. This involves establishing international distribution linkages and networks as well as establishing overseas transport infrastructure. It also involves mastering of the global regulatory framework, tastes and preferences, and efficiency levels required. Due to these requirements, participation in export market forces firms to increase their learning effort in order to master techniques required in achieving and maintaining international competitiveness at the global export market. With continuous learning, firms therefore accumulate technological capability including human capital development.

In the indirect approach, firms learn from others operating in the same industry. This represents a case where a firm improves its human capital as a result of external or exogenous factors. Consider for instance, a case of a locally owned firm benefiting from export information through linkage activities established with a MNC firm operating in a country.

Usually the exporting firm, in this case the MNC, will have obtained international ISO standard accreditation, say in production of which one of the requirements is human resource development primarily through continuous training in the firms. This is expected to have trickle down effect to all the local firms supplying to such a MNC, since the suppliers are supposed to comply by supplying goods and services that are acceptable and in line with the ISO standard specifications. The locally owned firm supplying to the MNC are therefore forced to provide human resource training. Demonstration effect is another way through which firms can be forced to provide human resource training. Take for instance, a firm intending to participate in a certain niche export market internationally. An obvious thing such a firm would be expected to do first is to observe and learn how other firms exporting to this particular market conduct their business. This is learning through demonstration effect where the firm intending to start exporting can imitate marketing techniques marketing, existing networks, managerial or organisational forms from exporting firms. The role of exports in human capital development is supported by the proponents of the assimilation literature with reference to the successful cases of East Asian countries. Participation in exports provided tremendous contribution to technology capability building and human capital development as a result of international spillovers occurring from interactions with MNCs as well as sophisticated foreign clients abroad (Dahlman and Westphal, 1982; Westphal et al., 1985: 137-150; Westphal, 1990; Lall, 1990; Aitken et al., 1997; Rasiah, 1995, 2004).

Hypothesis 3: A firm which participates in exports is more likely to result in human capital development than a firm that does not

Systemic Embeddedness: Importance of Interactions in Human Capital Formation

Human capital developed at the firm level and in an industry arises as a result of various learning and skill acquisition processes. Learning is regarded as an extremely interactive and dynamic process largely embedded and influenced by socio-economic factors, which includes prevailing policies. All these factors operate in a systemic manner, which then requires a strong systemic and network cohesion conducive for knowledge generation, exploitation and diffusion. This has been supported by the literature on network dynamics and NSI which emphasizes the importance of dynamic interactions through established formal and informal networks or otherwise among economic agents (Freeman, 1991, 1995; Lundvall, 1992, 2000; Nelson and Rosenberg, 1993; Mytelka, 2000, 2004). Through these interactions, interactive learning can take place while technology, skills, ideas and information can be exploited jointly or exchanged for the purpose of value added activities in production. In light of this discussion, we hypothesise that a firm embedded in a systemic atmosphere characterized by

interactions among firms, institutions, and government and business associations is likely to benefit exploitation of interactive learning, demonstration effects and thus enhance its human capital development.

Hypothesis 4: Systemic embeddedness of firms in the manufacturing industry is likely to promote human capital development in a positive direction

Firm Size–Scale Factor

The role of size on human capital development can be traced to the existing debate in industrial organisation on importance of scale on firms' competitiveness. On one side it is claimed that minimum efficiency scale (MES) is all that matters if a firm has to be competitive. Minimum efficiency scale represents the lowest level of output where the minimum average cost (MAC) is required to exhaust scale economies in manufacturing (Scherer, 1973; Pratten, 1971). Nonetheless, MES varies with the type of industries. For large and heavy industries such as automobiles and shipbuilding, high scale economies is expected since such cases require high MES unit production if low unit costs have to be maintained. On the other side, not all industries require high MSE unit production. In industries such as small-batch machine tools, it is scope that matters but not the scale (Piore and Sabel, 1984). This would be more now than ever before since information and communication technology (ICT) has played a significant contributory role in making small size very efficient. This happens when ICT enables increased decomposition and dispersal of production activities almost in real time. This alternative argument has been supported by voluminous empirical work against significance of scale in efficiency and innovative activities (Audretsch and Zoltan, 1991; Audretsh, 2002).

Although this debate may be valid, small and large firms in the Kenyan context have always shown a wide diversity with regard to performance. Small firms are usually characterised by low performance levels, which would make it impossible for them to recover costs that would possibly be incurred in human capital development. On the contrary, large firms, due to their scale of operation, are often endowed with resources which could be used to spread over human resource development. Quite often, large firms are in a better position to mobilise external resources and services than small firms. In the Kenyan context, market dynamics favour large firms in that only firms above a certain size are able to have access to certain skills, information and credit facilities needed to be competitive. When it comes to financing for capability development, capital market imperfections confer an advantage on large firms in securing finance for technological activities. Availability of capital means more resources to engage in systemic research, labour training and a greater need for structured information

gathering. This enables such firms to maintain inter-firm buyer supplier networks and with institutions that provide training, technical information and technical services, which are important inputs in the human capital development. Although firms in the Kenyan context were observed to be different from the above discussion, we opt to propose a neutral influence of firm scale in human capital development.

Hypothesis 5: Human capital development may or may not be influenced by firm size; human capital development may be high in small firms as well

Systemic Infrastructural and Institutional Support Structure
The role played by systemic infrastructure and institutional support structure in human capital development need not be emphasised. We argued above that human capital development is a complex process that can be influenced by a host of factors, both internal and exogenous to the firms. It was emphasized that firm's systemic embeddedness was important in the process of knowledge generation, exploitation in production, utilisation for learning and innovation, and diffusion to other firms. Systemic interactions via networks and linkages created through sub-contracting relations or buyer-supplier linkages stimulate learning and innovation[8].

If firms have to effectively develop their capabilities, basic infrastructural and institutional support structures must be present. For instance, sound human capital development institutions must be put in place. Technology promotion centers such industrial research and development organisation and productivity centers must also be present. Investment promotion councils with strong capacity to promote investment and advice on technology transfer. Similarly, institutions such as those providing financing play a very active role towards facilitation of learning, innovation and human capital development. Such institutions and the intermediary organisations role of coordinating demand-supply relations between firms, government, and institutions have been well articulated in the literature (Rasiah, 2001; Doner, 2001; Aoki, 2001). They play an important role in strengthening network cohesion. From a systemic point of view, infrastructural and institutional capacity to function effectively depends on systemic relationships established over time. To a large extent, if infrastructural and institutional structures play an effective role, then the risk of government failure is minimal. We will therefore argue by analogy that where support structure is present, it would be more likely that firms would be able to develop their required human capital. Testing a proposition based on existence of support structure is extremely difficult since no

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[8] These attributes of involving all actors dynamically and interactively for the sole purpose of social benefit to a wide economic standpoint, led to the formation of NSI built upon works of Freeman (1987, 1995), Lundvall (1988, 1992, 2000) and Nelson and Rosenberg (1993).

appropriate data exists for that. A proxy can however be developed based on collected firm level data. From these data, infrastructural and institutional structures will be taken as present if a firm claims to have received support of some kind (such as technical, financial and so forth) from the existing technical and financial institutions in the Kenyan manufacturing industry.

Hypothesis 6: *The presence of strong basic infrastructure and supportive institutions in an industry including financing for technology development and innovation is anticipated to promote human capital development*

The Role of Government Policy

The government is often supposed to play a facilitating role in human capital development. The government ought to operate a broad-based policy since formal education and training need to be complemented by learning within firms. In countries that are still in their early years of development; with private sector and labour market only partially developed, learning and training at firm level and national level can only be achieved through a proactive role by the government to facilitate and whenever possible provide human resource development programmes. If left to the weak system, there is likelihood of market failure in provision of learning and hence, the government needs to intervene without having to rely on market mechanisms. The government must actively determine the quality and scope of human capital development programmes. It must create an incentive system conducive to formal and informal learning. The facilitation role could be through incentives, to encourage the firms to learning. It should help in development of an appropriate curriculum with relevant academic programmes required in the industry. It should also come up with institutions, which directly support promotion of human capital needed in the industry. Examples exist in the NICs where enormous human capital and indeed technological capability has been built as a result of conscious and continuous facilitation role by the state (Fransman, 1988; Nelson and Pack, 1997; Chang, 2003).

Hypothesis 7: *The government role through relevant policies is expected to enhance human capital development in the country*

Age of the Firm

With regard to firm age, we hypothesise that firms with longer experience are considered to enjoy greater experiential and tacit knowledge and thus the older a firm is, the more it will have developed its human capital. Linking the size and age of a firm, Jovanovic (1982) argued that firms increase in size as a result of a selection process, in which efficient firms grow and survive, while inefficient firms stagnate or exit the industry. He noted that since the

process takes time, larger firms are therefore expected to be older. This would then mean that there exists a positive age, human capital relationship. This would be expected based on a firm's accumulated stock of knowledge and experience over time, emanating from various kinds of learning processes undertaken in the firms as they imitate their competitors and MNCs, as they do R&D and search for information or simply as they conduct basic adoptions and incremental innovations. The accumulated stock of knowledge and experience over time amounts to absorptive capacity that is necessary if a firm is expected to recognise external knowledge in form of knowledge spillovers, absorb it and utilise it for productive purposes. To most firms in the Kenyan industry, the process of knowledge accumulation is slow; hence time becomes a crucial factor leading us to formulate the proposition that human capital development increases with the age of a firm.

Hypothesis 8: Human capital development increases with firm age; human capital development tends to be more in old firms, or in other words, human capital development is a function of years of experience

Labour Market Conditions

Labour market conditions often influence knowledge acquisition and thus learning, capability, innovation and human capital development. Examples of labour market conditions that influence firms' incentives on learning and training provision include regulations on basic or minimum wages, restrictions on dismissals, and existing social security/insurance programs. Related studies examining the role of labour market conditions indicate that good labour conditions can positively contribute to industrialisation by stimulating competitiveness (Sabel, 1989; Sabel and Piore, 1984; Zeitlin, 1989; Sengenberger and Zeitlin, 1991; Wilkinson and You, 1995). The same studies have shown the converse to be also true involving reduced industrialisation when poor labour market conditions are the norm. In the current context, we argue that when a firm observes good labour market conditions, it is bound to pay high salaries and wages, offer fridge benefits, and provide staff with human resources training opportunities including enrichment programmes and the like.

Hypothesis 9: Good labour market conditions promote human capital development in Kenya's manufacturing.

Industrial Specificity

Industrial specificity has a strong bearing on human capital development. We argue that existing differences in industries is likely to influence human capital development differently. Differences in industries often arise due to the nature and sophistication of technology in use

thus requiring specialised skill training. It also arises due to the level of value added which is in turn determined by the nature of technology in use. Sometimes presence of MNCs may have a contribution due to their ownership characteristics, which includes state of their state-of-the-art machinery and technology. There is a wide array of literature in support of this fact. Take for instance the garments and automobile industries. According to Gerrefi (1999: 2002) framework of producer-buyer driven value chains, garments are categorised in terms of buyer-driven chains, while automobiles are characterised by producer-driven chains. However, in both industries there is increased use of technology and tacit knowledge. While garments have become high technology users, the auto-part has equally become more knowledge intensive. The auto parts industry is closely related to machinery and engineering industries and electronics assembly. This is a tremendous transformation from being labour intensive to knowledge intensive since 1980s (Ernst, 2000; Rasiah, 2003; Kraemer and Diedrick, 2003). From this discussion, this paper proposes a hypothesis intended to test the role of industry specificity in human capital development.

Hypothesis 10: The industrial specificities in Kenya have a strong correlation on human capital development in Kenya.

4. METHODOLOGICAL SETTING

This section presents variable definitions and their operationalisation based on the above hypotheses. This is done by generating measurement proxies for each of these variables. On the basis of variables defined an econometric model, Tobit model, is specified for our analysis.

Definition of Variables and Operationalisation

Human Capital Development – Dependent Variable

Human capital development (HMCD) was computed as a composite index based on three related proxies; training expenditure (TEXP), training mode (TRMOD) and human development resource practices (HDPRC). HMCD was thus estimated as follows:

HMCD Index = Normalised composite average (TEXP, TRMOD, HDPRC)

TEXP was proxied by the training expenses as a share of total payroll in the firm. TRMOD was measured as a categorical variable taking a value of 0 when no formal training was undertaken, 1 when only external staff are used to train employees, 2 when staff with training responsibilities were on payroll, 3 when a separate training department was used, 4 when a separate training center was used. In order to understand how the firms considered specific human development resource practices (HDPRC), all the firms were asked if they had policies in place to encourage team-working, small group activities to improve company performance, multi-skilling, interactions with marketing, customer service and R&D department, life long learning and upward mobility. For each of these practices, a human resource practice was measured by a score value of one, which was then summed and divided by the total number of practices to obtain the average. All the figures were brought to comparable levels using a normalising formula as follows:

$$Index = \left[\frac{ObservedValue; X_{ij} - MinimumObservedValue; X_j}{MaximumObservedValue; X_j - MinimumObservedValue; X_j} \right]$$

The normalisation procedure simply involves establishment of a fixed minimum and maximum for each of the variables in order to normalise them to a comparable range between 0 and 1. X_{ij} is the actual value for category i in sector j, $X_{j,min}$ is the minimum value in sector j and $X_{j,max}$ is the maximum value in sector j. This procedure could as well be used to make the composite indices range from 0 to 10 or 0 to 100 depending on the desired level to draw comparisons between the categories of firms, industries or countries considered for cross country comparisons.

Explanatory Variables

The explanatory variables were defined as follows:

FDI – Foreign Presence

Foreign presence (FDI) was measured as foreign equity participation averaged over all plants in the sector, weighted by each plant's share in sectoral employment[9]. This proxy was adopted in this study since the survey captured only a few foreign firms.

Export Performance

Export performance EXPT was estimated by an export dummy defined as follows:

EXPT = 1 if a firm exports; EXPT = 0 if a firm does not export.

Process Technology Capability

Process technology capability (PRTC) was also computed as a composite index based on three related proxies; quality control instruments (QCI), investment in machinery and equipment including ICT components (IME) and quality of production machinery (QPM). PRTC was thus estimated as follows:

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[9] This is similar to the method used by Aitken and Harrison (1999).

PRTC Index = Normalised composite average (QCI, IME, QPM)

QCI was measured as a binary variable; QCI = 1 if relatively advanced quality control methods were used, QCI = 0 otherwise. IME was measured by a score of one for each of the following investments (brought new capital equipment; set up new production line; put in new production system and put in new ICT components). An average was obtained by dividing with the total number of investments. QPM was measured as a categorical variable with a score of 5 when a firm rated its average quality of its production machinery as world class, 4 when rated as highly advanced, 3 when rated as just advanced, 2 when rated as not very advanced, 1 when rated as dated and 0 otherwise. Normalisation was done using the formula presented above.

Product Technology Capability

Product technology capability (PDTC) was again computed as a composite index based also on three related proxies; new product development (NPDEV), scope of the new product developed (NPDEVSC) and resources firms advance to undertake R&D (R&D). Thus PDTC was estimated as follows:

PDTC = Normalised composite average (NPDEV, NPDEVSC, R&D)

NPDEV was a categorical variable equal to 3 if a firm has been involved in the development of over 10 new products, 2 if involved in the development of between 4 and 10 products, 1 if involved in the development of between 1 and 3 products, and 0 otherwise. Similarly, NPDEVSC was defined as a categorical variable equal to 4 if the new products were new to the global market, 3 if they were new to the regional market, 2 if they were new to the local market, 1 if they were only new to the firm and finally 0 otherwise. R&D was based on the resources firms' advance for the purpose of conducting R&D activities and was determined on the basis of three R&D proxies as follows:

R&D = Normalised composite average (RDU, RDE, RDN)

The first proxy related to whether firms undertake in-house process R&D and was measured as a simple binary variable as follows:

RDU = 1 if a firm undertakes in-house R&D, RDU = 0 if otherwise.

The second proxy dealt with R&D expenditure incurred by firms to undertake R&D. However, 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 as follows:

RDE = R&D expenditure as a percentage of total sales.

The third proxy was based on the nature of R&D activity and was defined as follows: RDN was measured by a score of 1 for each of the following R&D activities; quality control, reverse engineering, original design, original brand, adaptive engineering, others and divided by the total number of the R&D activities. The formula explained above was used to normalize the proxies before computing the average.

Marketing Performance

Marketing performance (MKTP) was equally computed on the basis of three proxies following the above approach. The proxies considered were marketing expenditure as a percentage of total firm sales (MKTEXP), marketing mode (MKTMOD) and marketing support (MKTSUP).

MKTP = Normalised composite average (MKTEXP, MKTMOD, MKTSUP)

MKTEXP was measured as a percentage of total sales in each firm. MKTMOD was measured as a categorical variable taking a value of 1 when a firm uses external marketing support, 2 when a firm has staff with marketing duties, 3 when a firm has a separate marketing department, 4 when a firm has a separate marketing centre and 0 when no marketing is undertaken. MKTSUP from institutions was measured by a score of 1 for each of the institutions (such as industry associations, government support programmes, purchase reputation, external private marketing agents and so forth) and divided by the total number of investments. Normalisation was done using the equation above.

Firm Size – Scale of Operation

In this paper, firm size (SIZE) was proxied by employment level of the firms. Although other proxies exist for determining firm size such as firm's output performance, there is no specified rule of thumb *per-se* as to which is more appropriate than the other. For this analysis, firm size was defined as a binary variable using employment size as follows:

SIZE = 0 if a firm employment was = < 100; SIZE = 1 if employment was = > 100

Firm Age

Firm age was simply taken as the number of years in absolute numbers since firm's establishment.

Basic Institutions and Infrastructure

The basic institutions and infrastructure was estimated as a composite index (BSCII) using information systematically captured from the firms during the survey. The composite index included thirteen institutional and infrastructural variables and was computed as follows:

BSCII = Normalised composite average (TS, PS, WS, TCI, HF, GI, FS, BE, TE, UE, RDSE, RDA, RDI)

Where TS, PS, WS, TCI, HF, GI, FS, BE, TE, UE, RDSE, RDA, RDI refer to transport services, power supply, water supply, telecommunication infrastructure, health facilities, coordination from basic government institutions, financial services, basic education, technical training education, university education, R&D scientists and engineers, incentives for R&D activities and R&D institutions respectively. All the firms were asked to make an objective assessment of the existing institution and infrastructure with regard to their role in enabling manufacturing operations. The value for each of the variables was measured using a Likert scale ranging from 1-5 (weakest to strongest). This score served as the institutional rating for each firm. The value for each variable was normalised using the formula presented earlier.

Role of Government

The role of government (GOV) was computed on the basis of three related proxies following the above procedure as follows:

GOV = Normalised composite average (G_{INST}, G_{EDTC}, G_{RLN})

G_{INST} was related to usefulness of government institutions. All firms were asked to rate how government institutions benefited their ability to compete. The government institutions included science and technology support institutions; testing and quality evaluation facilities; marketing research and intelligence; overseas market promotion; export credit programs; financial incentives; SMI support and inter-firm collaboration schemes. G_{EDTC} was related to services of government regulatory bodies. Firms were asked to rate the services of government regulatory bodies in supporting their effort to develop technology and compete. The services included custom procedures, licensing arrangements, local duties and levies, access to land, municipal regulations, official corruption, regulation on hiring foreign workers and so forth. G_{RLN} was related to the value of relationships. Firms were therefore asked to rate value of their relationship with intermediary none and semi-government agencies. Such agencies included R&D organisations; financial service institutions; distributors; suppliers of material & components; customers; technical service providers; business service providers; relationship between firms and industry associations; strength of strategic alliances and so forth. For the three variables, (G_{INST}, G_{EDTC}, G_{RLN}), likert scale scores ranging from 1-5 were used and averaged with the number of proxies used. Normalisation was done using the formula presented above.

Systemic Embeddedness

Systemic embeddedness (SYEMB) was computed as a composite index based on four proxies as follows:

SYEMB = Normalised composite average [BSCII, G_{EDTC}, G_{RLN}, SN]

All firms were asked to rate the strength of their connections and coordination with basic infrastructure institutions, related government organizations and between each other. Likert scale scores ranging from 1-5 were used and averaged with the number of proxies used.

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Where BSCII, G_{EDTC} and G_{RLN} were as explained above. SN referred to inter-firm buyer supplier firms. Normalisation was done using the above formula.

Labour Market Conditions

The proxy for labour market conditions was determined using a dummy variable based on a simple question which required firms to state if their workers were unionised or not. Firm wages can also be considered as an alternative proxy variable for labour market conditions. This can be derived from a firm's annual gross salary figures normalised by firm's employment size. Unfortunately, supply of salary figures by the firms was patchy as most of them did not want to divulge salary and wages figures. Hence, for this analysis a dummy proxy was opted for and expressed as follows:

Union = 1 if workers were unionised; Union=0 if workers were not unionised.

Industrial Specificity

Industrial specificities were estimated using industry dummies.

Determinants of Human Capital Development: An Empirical Tobit Model

On the basis of variables formulated above, our hypotheses pertaining to human capital development can be empirically tested using Tobit model analysis. Tobit model is suggested since HMCD was estimated as an index limited within a specified range, in this case between 0 and 1. This meant that HMCD was censored above 1 and below 0 [$0 \leq HMCD \geq 1$]. The empirical model was therefore set as follows:

$$HMCD = \beta_0 + \beta_1 FDI + \beta_2 PRTC + \beta_3 PDTC + \beta_4 EXPT \, \beta_5 MKTP + \beta_6 BSCII + \beta_7 SIZE$$
$$+ \beta_8 GOV + \beta_9 SYEMB + \beta_{10} Union + \beta_{11} INDMMY + \alpha$$

5:   SCOPE AND SAMPLE CHARACTERISTICS

The data used in this paper comes from a survey covering only three manufacturing industries in Kenya; metal engineering, textile, and food processing and beverages. Since the objective of this paper was to examine the role of FDI and firm-level capabilities in human capital development, the scope of this analysis is therefore limited to only a few industries characterised by high levels of FDI and performance capabilities – in terms of value added. The three industries are believed to have higher levels of FDI than other industries. Food processing and textile industries are classified under agro based industries and as in most developing countries, the agro based industry is the most dynamic in Kenya today with high FDI presence, linkage intensive, largest employer and a major contributor to the GDP. In addition to the survey, specific case studies of at least five firms for each industry was undertaken to help extract industry-type characteristics which would have positive and direct consequences on human capital development. So the survey and the selected case studies formed the basis for the results and analysis done in this paper.

The initial idea was to sample by weight each firm carries based on the sectoral output. However, this could not materialise due to the fact that most of them were missing in the frame in the country's Central Bureau of Statistics. Nevertheless, without using any systematic sampling technique, a purposive selection procedure was followed in selecting the firms in such a way that the main activities by ISIC would at least be represented in all the three industries. This spreading of the selection coverage was important to make sure that all firms selected did not come primarily from the same manufacturing activities. The list of firms was extracted from the most recent National Directory of Industries (NDI) prepared by the Ministry of Trade and Industry between 1998/1999. The list of firms was also drawn from firms that are included in the monthly survey of industrial production (MSIP); this is a survey that is conducted monthly by Central Bureau of Statistics (CBS) – a department of Ministry of Planning and National Development (MP&ND). This was also compared to the firms in the 'master file' still in CBS – the master file is the frame and contains the list of all institutions and firms operating in Kenya. Another useful source of firm listing was the directory of firms and industries held by Kenya Association of Manufacturers (KAM) – 2002 edition[10].

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[10] We are grateful to Central Bureau of Statistics (CBS), Department of company registration and Kenya Association of Manufacturers (KAM) for allowing us to have access to their firm directories.

From an initial selection of 150 firms, an estimate of about 127 firms in the manufacturing industry was successfully surveyed. After eliminating 12 firms with incomplete information, 105 firms remained for empirical analysis, which is about 80 % of the total firms surveyed. The breakdown is shown below in Table 2.

In the sample, there were only 37 foreign firms while all the rest were local firms. A firm was defined as foreign owned when foreign ownership of nominal capital was at least 10 % – this was the benchmark used by the Kenyan national authorities as well as OECD and UNCTAD[11]. There were more local firms in all the industries with the exception of textile industry where foreign firms out-numbered the local firms. Table 1 further classifies all the firms by size following the definition of size provided earlier. About 65 % of the firms in our survey were classified as small firms. This was as expected in the Kenyan context since most of the firms in poor developing countries are normally characterised by small and medium enterprises (SMEs) (see Lundvall and Battese, 2000; Soderbom, 2000, 2001; Mazumdar and Mazaheri, 2003). However, comparing local and foreign firms in terms of size, foreign firms in the sample seemed to be mostly large firms. While 75.7 % of foreign firms were classified as large firms, only 58.8 % of local firms were classified as large firms (see Table 2). This is not surprising given that foreign firms have the necessary capacity in terms of resources to set up huge production processes employing heavy capital machinery for large-scale production and at the same time employ huge labour force including many skilled workers.

Table 2: Ownership Structure of the Sample Firms

	Firm Orientation	Metal Engineering	Textile Industry	Food Processing Industry
Small	Local	12	6	10
	Foreign	4	1	4
Large	Local	12	5	23
	Foreign	7	11	10
Total		35	23	47

Source: Computed from author's survey (2002/3)

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[11] Examples of other benchmarks taken in other studies include Haddad and Harrison (1993) who regarded foreign firms as those with at least (5 %) equity owned by foreigners and Sjoholm (1997) who considered a benchmark (15 %) of equity owned by foreigners.

Turning to export performance, it was noted during the survey that since the introduction of SAPs in Kenya most of the firms had attempted to re-orient themselves towards exporting. It was also noted that even firms that were largely inward-oriented had tended to operate primarily as suppliers to exporting firms. A few of the companies interviewed confirmed to have had short term and in some cases long-term contractual arrangement to supply their final products to domestic exporting firms. The survey data showed that 12 %[12] of the firms had sales to domestic export companies. While some of the domestic exporting firms used these products as raw materials in their production, interviews conducted also confirmed that other domestic exporting firms served as marketing and exporting agencies for other companies[13].

Exporting firms formed about 51 % of the total sample (see Table 3). By ownership the proportion of local firms with export experience was 44 % while that of foreign firms with export experience was 65 %. There were more local firms without any export experience in food processing than in any other industry. In all the three industries, foreign firms with export experience out numbered firms without any export experience. The break down is provided in Table 3. This shows that foreign firms are likely to be more export oriented than the local firms in Kenyan manufacturing. In addition foreign firms seemed to dominate in export performance in the Kenyan manufacturing[14] – from the three industries examined foreign firms share of total exports was about 77 %. With the exception of food processing, foreign firms had higher export intensity than the local firms in all the other industries.

Table 3: Firms with Export Experience

| Firms	Exporting Status	Food Processing	Textile	Metal Engineering	Total
Local firms	Exporting	11	6	13	30
	Non-exporting	22	5	11	38
Foreign firms	Exporting	8	9	7	24
	Non-exporting	6	3	4	13
Total		46	23	35	105

Source: Computed from author's survey (2002/3).

Foreign firms generally enjoyed higher firm-level capabilities than locally owned firms in all the three industries studied. Given industrial differences in technologies, firm-level

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[12] Computed from the data obtained from the author's survey in Kenya (2002/3).
[13] Interviews conducted by the author in Kenya 2002/3.

capabilities were examined for each industry separately and then for all industries combined. We discuss each of the firm-level capabilities at a time starting with human capital development. Foreign firms enjoyed tremendous advantage in HMCD over locally owned firms in all the three industries, Figure 1. There was a wide variation between foreign and local firms on the basis of HMCD index computed for all the three industries combined. The results of T-Test analysis presented in Appendix 1 showed the difference to be statistically significant at least for metal engineering and food processing and beverages. This was expected since foreign firms usually undertake more human resource development activities than locally owned firms[15] generally meant to drive production in a foreign country and to compete in international export markets. Human capital is critical to operate and maintain the machinery and equipment and undertake organisational changes.

Firgure 1: Human Capital Development by Firm Ownership
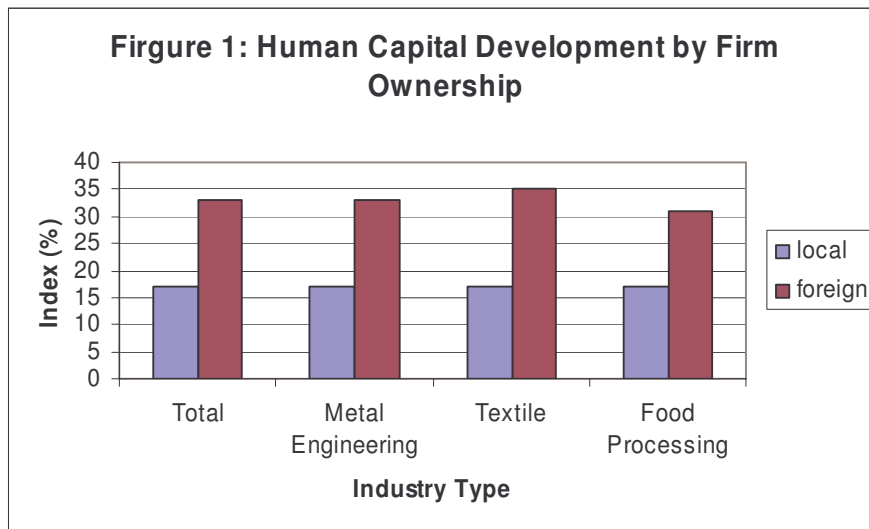
Source: Computed from author's survey (2002/3).

The results of PRTC were slightly different from those of HMCD discussed above. Foreign firms enjoyed higher PRTC than locally owned firms in food processing and in metal engineering industry, Figure 2. However, the difference was significant at 10 % only in

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[14] This seemed to support the argument by Helleiner (1973, 1992) that MNCs manufacturing in a host country were likely to play a major role in the future development of that country's manufactured exports.

[15] This was observed to be the case in most of the MNCs companies interviewed by the author (2002). MNCs seemed to be more keen on human resource development; most of them had training centres, better training schemes and engineering departments; something that most of their local counterparts did not have.

machine engineering, Appendix 1. The T-test result also showed that when all the industries were considered jointly, foreign firms generated more PRTC than locally owned firms and the difference was statistically significant. These results were as expected since foreign firms would normally be more endowed with more advanced, sophisticated production processes in comparison to locally owned firms.

**Figure 2: Process Technology Capability by Firm Ownership**
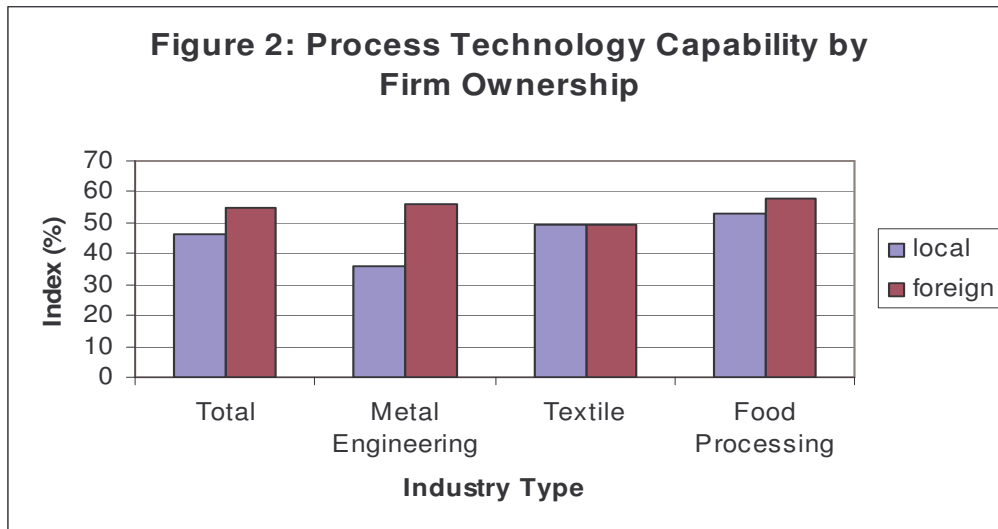
Source: Computed from author's survey (2002/3).

As indicated elsewhere, foreign firms' share of the overall R&D index (RD) was higher than that of the local firms for all the three industries. It is interesting to note that while foreign firms enjoyed significantly different levels of product technology capability in the three industries, local firms seemed to have a comparable average of product technology capability in all the three industries with the highest in metal engineering and lowest in food processing and beverages. This is clearly demonstrated in Figure 3. Results of T-Test analysis presented in Appendix showed the difference to be statistically significant in metal engineering and food processing at 5 and 10 % respectively. Hence, overall, despite their preference for carrying out much of their R&D activities overseas, foreign firms still generally enjoyed higher capabilities than local firms. However, in addition to R&D being little developed only a few firms performed it – only 25 % of the firms surveyed reported to be doing some kind of R&D with MNCs dominating.

Figure 3: Product Technology Capability by Firm Ownership
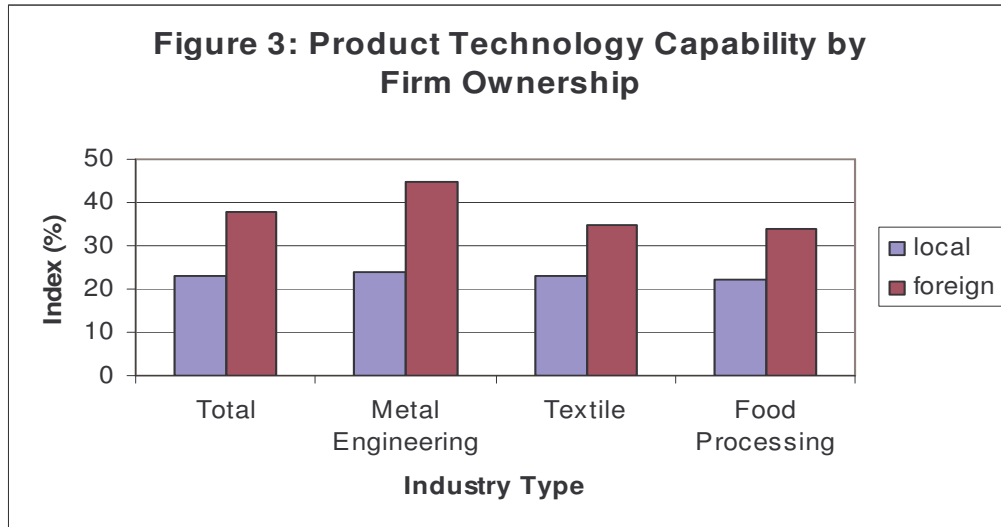
Source: Computed from author's survey (2002/3).

The preliminary analysis done showed also that foreign firms enjoyed more MKTP than locally owned firms, Figure 4. Results of T-Test analysis presented in Appendix 1 showed the difference between foreign and local firms to be significant in machine engineering and food processing at 10 and 5 % respectively. The difference for all the industries combined was also significant at 5 %. These results are not surprising given the fact MNCs usually have high level marketing prowess. In addition these firms dedicate enormous resources to constant stimulation of marketing performance.

Figure 4: Marketing Performace by Firm Ownership
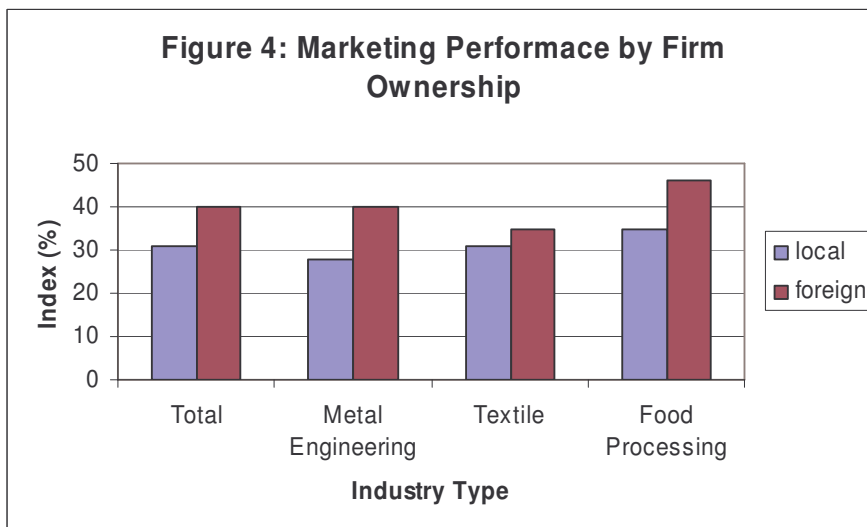
Source: Computed from author's survey (2002/3).

While capabilities differ with industrial specificity and the type of technology, important conclusions can be summed up from this section. First, although over 50 % of the firms in the sample enjoyed export experience and thus were exposed to international trade and competition, foreign firms dominated in exports. Second, specific firm-level technological capabilities between foreign and local firms varied significantly in the industries examined. Foreign firms enjoyed relatively higher levels of HMCD than the local firms. On other technological capabilities, foreign firms enjoyed higher PRTC, PDTC and MKTP than the local firms in all the three industries combined. It can therefore be argued that foreign firms dominated in all the firm-level technological capabilities than the local firms. The implication for this is that, although it is hard to determine the spillovers, there is a possibility that some of the capabilities generated by the MNCs could be absorbed in the Kenyan manufacturing. These would further contribute to the development of human capital.

6.   EMPIRICAL FINDINGS AND DISCUSSION

This paper attempted to examine the role of FDI presence and firm-level capabilities in human capital development controlling for a number of firm-level variables. The paper hypothesized that FDI and firm-level capabilities among other determinants played significant role in human capital development in the Kenyan manufacturing industry. These hypotheses were investigating empirically employing Tobit estimation technique[16] – since the independent variable was "left censored" and "right censored". Most of the results estimated based on Tobit estimation technique were statistically significant as shown in Table 4. Two sets of estimates are estimated – with and without the inclusion of systemic embeddedness variable – each case estimated with and without industry dummies. The Tobit estimation technique produced statistically significant results between human capital development and FDI, EXPT, PRTC, PDTC and MKTP (see Table 4). SIZE, BSCII, GOVN, SYEMB and UNION were not significant. We will present results of determinants that were significant. Estimated results of variable correlation showed that none of the variables had any serious correlation (See appendix 2). The variables were also free from heteroscedasticity[17].

The results obtained with FDI, though as expected, did not generate coefficients of high magnitude. Results obtained without systemic embeddedness produced FDI coefficients that were positive and significant at 10 and 5 % with and without industrial dummies included respectively. Results estimated with systemic embeddedness included seemed to improve in significance as the coefficients became significant at 5 and 1 % with and without dummies included. According to the results obtained a high positive correlation between FDI and human capital development exits – HMCD. Foreign firms are characterised by ownership advantages such as high technology, knowledge, managerial skills and marketing know-how. In a host country when foreign firms employ local workers, they train them to acquire certain skills required in order to operate effectively in foreign firms – foreign firms employ more experienced workers and possess better training schemes. Having learnt, acquired experiential and tacit knowledge from the foreign firms, such workers might leave foreign firms and join local firms or start their own enterprises (Gershernberg, 1987). Linkages established between local supplying firms to foreign firms have acted as an avenue through which organised

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[16] For details see Maddala (1989); Gujarati (1995); Green (2000) and Stata (2003).
[17] Results of Heteroscedasticity were not presented in this paper but can be availed on request.

programmes are arranged to train workers from local supplying firms[18]. Through these links local firms get exposed to international export markets which in turn act as new source of learning and knowledge acquisition to the local firms and hence development of human resources capability (Lall, 1982, 1992; Rasiah, 1995, 2004; Bell and Pavitt, 1992).

EXPT enjoyed a positive correlation with human capital development with and without systemic embeddedness included. The coefficient obtained for EXPT was positive and significant at 5 % but at 10 % when systemic embeddedness and industry dummies were included. This implies that the process of exporting in the Kenyan manufacturing exposes firms to a pool of international knowledge, information and cutting edge techniques from global markets. Accumulation of knowledge and techniques from established networks overseas culminates in a process of constant learning in the firms resulting in HMCD. In the long run this results enhanced ability to innovate and compete in the international market.

The results obtained with PRTC were as expected. The coefficients obtained were positive and statistically significant at 5 % in all cases – with and without systemic embeddedness and industry dummies. These results indicated high correlation between PRTC and HMCD. Process capabilities range from basic skills such as quality control, operation and maintenance, to more advanced ones such as adaptation, improvement or equipment 'stretching and to the most demanding ones such as process research, design, and innovation. Stated differently, PRTC includes planning, scheduling and work procedures, execution of orders: ability to oversee, control and improve the operation of the facilities and processes. Equipment stretching, processing adaptation and cost saving, licensing new technology, in-house process innovation (see Westphal et al., 1985; Lall, 1992; Ernst et al., 1998). Learning and performance are also viewed as a function of processing experience. Undertaking these activities, amounts to acquiring experience both experiential and tacit learning knowledge all of which result in accumulation of human capital development (Romijn, 1997, 1998).

Similarly, Tobit estimates for PDTC had the expected results – relatively robust coefficients which were positive and statistically significant at 5 % with and without systemic embeddedness or industrial dummies. The results supported existence of a high positive correlation between human capital development and PDTC. This is not unexpected since PDTC ranges from raw material control, assimilation of product design, minor adaptation to

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[18] During the survey conducted by the author (2002/3), a few local firms reported having benefited from such training arrangements, a few foreign firms also reported having offered specific training mainly in production techniques and in quality control. It was also reported that foreign firms and local firms occasionally undertook joint training organised by industry association in Kenya.

market needs, product quality improvement, licensing and assimilating new imported product technology to in-house basic research and product innovation (Westphal et al., 1985; Lall, 1992; Ernst et al., 1998). As in the case of PRTC, undertaking these activities in firms amounts to acquiring experience both experiential and tacit learning knowledge all of which result in accumulation of human resources capability.

MKTP had the expected results. The estimated coefficients with systemic embeddedness were robust and highly significant at 1 % with and without industry dummies. With systemic embeddedness the coefficients obtained were significant at 10 % without industry dummies and at 5 % with industry dummies. These results provided statistical evidence of positive correlation between human capital development and MKTP. This would be expected since strong marketing capability requires a firm to possess knowledge and skills required for collecting marketing intelligence, development of new markets, and establishment of distribution channels and provision of customer services (Ernst et al., 1998). All these are supposed to be fed into the firm to be translated into successful goods and services. This feedback aspect to the firm serves to provide new source of learning and innovation, which further translates into accumulation of human capital development.

Although the results obtained for AGE were as expected, they were however not robust. The Tobit coefficients obtained were weak but significant at 10 % in all the cases. Nonetheless, these results supported a positive correlation between human capital development and firm's AGE. The interpretation of this would be that an old firm has accumulated tacit experience over time through learning by doing and by operation performance.

Table 4: Determinants of Human Capital Development: Tobit Estimates

Determinant	Without Systemic Embeddedness		With Systemic Embeddedness	
FDI	0.063**	0.059*	0.069***	0.064**
	(0.028)	(0.030)	(0.026)	(0.027)
EXPT	0.160**	0.146**	0.136**	0.120*
	(0.069)	(0.073)	(0.066)	(0.069)
PRTC	0.442**	0.462**	0.435**	0.463**
	(0.184)	(0.188)	(0.182)	(0.186)
PDTC	0.352**	0.329**	0.305**	0.276**
	(0.143)	(0.149)	(0.140)	(0.144)
MKTP	0.411*	0.440**	0.504***	0.532***
	(0.207)	(0.213)	(0.193)	(0.198)
SIZE	-0.009	0.004	-0.018	-0.001
	(0.073)	(0.076)	(0.072)	(0.075)
AGE	0.004*	0.003*	0.004*	0.004*
	(0.002)	(0.002)	(0.002)	(0.002)
BSCII	0.015	0.017		
	(0.048)	(0.049)		
GOV	-0.027	-0.041		
	(0.320)	(0.322)		
SYEMB			0.140	0.119
			(0.216)	(0.219)
UNION	-0.049	-0.054	-0.053	-0.060
	(0.071)	(0.071)	(0.065)	(0.066)
Constant	-0.535***	-0.533***	-0.553***	-0.536***
	(0.180)	(0.184)	(-0.136)	(0.138)
Industry Dummies	*No*	*Yes*	*No*	*Yes*
LR-test	74.68***	75.02***	77.64***	78.22***
Log Likelihood	-28.012	-27.839	-29.059	-28.766
Pseudo R Squared	0.5714	0.5740	0.5719	0.5762
No. of observations	101	101	104	104

Note: The figures in parenthesis represent standard errors.

*, **, *** represent 10 %, 5 % and 1 % levels of significance respectively.

Source: Computed from data compiled from author's survey in Kenya (2002/3).

7. CONCLUSIONS AND POLICY IMPLICATIONS

The purpose of this paper was to examine the role of foreign presence, FDI, and firm-level capabilities in human capital development. Survey data collected from three manufacturing industries in Kenya, enabled testing of several hypothesis based on FDI and technological capabilities literature. Results of descriptive statistics indicated that foreign firms were large in size and generated higher human capital development than locally owned firms. Human capital development was different for each manufacturing industry. Overall, firms with export experience clearly outnumbered those that just sold in the domestic markets. Foreign firms enjoyed greater export-orientation than locally owned firms. The comparisons done employing T-Test analysis showed, on firm-level capabilities, foreign firms generally enjoyed higher process and product technology capability, and marketing performance than locally owned firms in all the industries combined. Although R&D activities were extremely low in all the three industries, foreign firms were once again more endowed with R&D capabilities than the locally owned firms. It can be concluded that foreign firms in countries which are typically at the same level of development with Kenya tend to be more involved in technology development than locally owned firms.

The empirical analysis produced statistically significant correlations between human capital development, FDI and firm-level capabilities (PRTC, PDTC, MKTP) including export performance. Several lessons can be drawn from this analysis. First, the analysis provided strong empirical evidence that foreign presence and firm-level capabilities stimulated human capital development in Kenya. Second, that firm export performance also mattered in determining human capital development. Third, that HMCD increased with firm Age. Fourth, that all the countries which are technically backward like Kenya are likely to have FDI play a positive and significant role in human capital development. Fifth, industry specificity appeared to have influence on human capital development which tended to differ with variables included. On the policy side we argue that policies that allow increased activities of FDI should therefore be encouraged alongside firm-level development of technological capabilities.

Partly due to government failure involving provision of basic infrastructure, creation of stable macro-economic climate, creation of special industrial zones and functional support institutions the costs of production has remained high contributing to loss of competitiveness in Kenya's exports. Indeed Kenya has found it hard to compete with imports from advanced developing countries brought into the country via other countries within the COMESA

trading block. Systemic embeddedness had positive relationship with PRTC and MKTP. This helps firms spread its production and marketing activities with reduced transaction costs.

Given that foreign firms had high levels of export intensity and generated more HMCD, PRTC, PDTC and MKTP capabilities than the local firms, it can be discerned that FDI has at least resulted in some technological spillovers absorbed by domestic firms in Kenyan manufacturing. Participation by foreign firms and their high levels of HMCD, PRTC, PDTC and MKTP capabilities generated is likely to transform the local environment, develop industrial technological capabilities and facilitate export manufacturing. The government must therefore continue to play participatorier role as a facilitator – mainly of public goods. The government must also increase its coordination role among institutions. It must focus especially on improving the institutions and systemic coordination to encourage collective learning, capability building and innovation process in firms. In addition, the country must formulate and embrace broad-based technology policies necessary to stimulate learning and innovation culture if industrialization has to be anticipated by 2020 as envisioned in the current industrial policies. Only then, the country will be in a position to accelerate human capital development and thus enhance competitiveness in production with high levels of value added.

REFERENCES

Abramovitz, M.A. (1986) Catching Up, Forging Ahead, and Falling Behind. *Journal of Economic History* **66**, pp. 385-406

Aitken, B.G., Hanson, H. and Harrison, A.E. (1997) Spillovers, Foreign Investment and Export Behaviour. *Journal of International Economics,* **43**, pp. 103-132.

Aitken, B.J. and Harrison, A.E. (1999) Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela. *The American Economic Review* **89**(3), pp. 605-618.

Aghion, P. and Howitt, P. (1992) Endogenous Growth Through Creative Destruction. *Econometrica*, **60**(2), pp. 323-351.

Aghion, P. and Howitt, P. (1998) *Endogenous Growth Theory* (Cambridge MA: MIT Press,).

Amsden, A.H. (1989) *South Korea and Late Industrialisation* (New York: Oxford University Press).

Amsden, A.H. (1994) Why Isn't the whole World Experimenting with the East Asia Model to Develop? Review of the East Asian Miracle. *World Development* **22**(4), pp. 627-634.

Amsden, A.H. (1991) The Diffusion of Development: The Late-Industrialising model and Greater East Asia. *American Economic Review* **81**(2).

Aoki, M. (2001) *Towards a Comparative Institutional Analysis* (Cambridge: MIT Press).

Arrow, K.J. (1962) The Economic Implications of Learning by Doing. *Review of Economic Studies* **XiX**.

Audretsch, D. (2002) The Dynamic Role of Small Firms: Evidence from US. *Small Business Economics* **1**(3), pp. 13-40.

Audretsch, D. and Zoltan, A. (1991) *Innovation and Technological Change: An International Comparison.* (Ann Arbor: University of Michigan Press).

Barro, R. (1991) Economic Growth in a Cross Section of Countries. *Quarterly Journal of Economics* **106**(2), pp. 407-443

Barro, R. (1996) Determinants of Economic Growth: A cross-Country Empirical Study. NBER Working paper Series, No. 5698

Barro, R.J. and Salai-i-Martin (1995) *Economic Growth* (New York: McGraw Hill)

Becker, G.S. (1962) Investment in Human Capital: A Theoretical Analysis. *Journal of Political Economy* **70**(1), pp. 1-49

Becker, G. S. (1964) *Human Capital* (Chicago: The University of Chicago press).

Bell, M. and Pavitt, K. (1992) Accumulating Technological Capability in Developing Countries. *Proceedings of the World Bank Annual Conference on Development Economics.*

Best, M. (1990) *The New Competition* (Cambridge, MA: Harvard University Press).

Best, M. (2001) *The New Competitive Advantage* (Oxford: Oxford University Press).

Blomstrom, M. and Kokko, A. (1997) How Foreign Investment Affects Host Countries. *A Policy Research Working paper No. 1745. The World Bank International Economics Department, International Trade Division.*

Chang, H.–J. (1994) *The Political Economy of Industrial Policy* (Basingstoke: Macmillan).

Chang, H.–J. (2003) *Globalisation, Economic Development and the Role of the State* (London, Zed Books; Third World Network)

Cohen, W. M. and Levinthal, D.A. (1990) Absorptive Capacity: A new Perspective on Learning and Innovation. *Administrative Science Quarterly* **35**, pp. 128-152.

Dahlman, C. and Westphal, L. (1982) Technological Effort in Industrial Development: An Interpretative Survey of Recent Research, in: F. Stewart and J. James. London (eds) *The Economics of New Technology in Developing Countries, (*London: Frances Pinter Publishers)

Dahlman, C. and Nelson, R. (1995) Social Absorptive Capability, National Innovation Systems and Economic Development, in: B. Koo and D. Perkins (eds) *Social Capability and Long Term Economic Growth.* (London: Macmillan), pp. 82-122.

Doner, R. (2001). Institutions and the Tasks of Economic Upgrading. *Paper Prepared for Delivery at the 2001 Annual Meeting of the American Political Science Association, San Francisco.*

Enos, J.L. (1995) *In pursuit of Science and Technology in Sub-Saharan Africa: The Impact of Structural Adjustment Programme* (London and New York: Routledge).

Ernst, D. (2000) Inter-organisational Knowledge Outsourcing: What Permits Small Taiwanese Firms to Compete in the Computer Industry? *Asia Pacific Journal of Management* **17**(2): 223-55.

Ernst, D. Ganiatsos, T. and Mytelka, L. (eds) (1998). *Technological Capabilities in the Context of Export-Led Growth: A conceptual Framework. Technological Capabilities and Export Success in Asia* (London: Routledge Publishers).

Fransman, M. (1985) International Competitiveness, Technical Change and the State: The Machine Tool Industries in Taiwan and Japan. *World Development* **14**(12): 1375-1396.

Freeman, C. (1991) Networks of Innovators: A Synthesis of Research Issues. *Research Policy* **20**: 499-514.

Freeman, C. (1995) The National System of Innovation in Historical Perspective. *Cambridge Journal of Economics* **19**(1).

Gachino, G. (2005) Foreign Direct Investment, Spillovers and Innovation: The Case of Kenyan Manufacturing Industry. Unpublished PhD Thesis 2005

Gachino G. and Rasiah, R. (2003) Labour Productivity, Exports and Skills Formation: Comparing Foreign and Local Firms in Kenyan Manufacturing. *Paper presented at the International Workshop FDI-Assisted Development*, Oslo 22-24 May 2003.

Gereffi, G. (1994) The Organisation of Buyer-Driven Global Commodity Chains: How U.S. Retailers Shape Overseas Production Networks, in: G. Gereffi and M. Korzeniewicz (eds) *Commodity Chains and Global Capitalism.* Westport, Connecticut, London: Praeger.

Gereffi, G. (2002) Intenational Competitiveness in the Global Apparel Commodity Chain. *International Journal of Business and Society* **3**(1): 1-23.

Gershenberg, I. (1987) The Training and Spread of Managerial Know-How, A Comparative Analysis of Multinational and Other Firms in Kenya. *World Development* **15**(7): 931-939.

GoK, (1997(a)) *The Government of Kenya Sessional Paper No.2 on Industrial Transformation to the Year 2020* (Kenya Nairobi: Government Publishers).

GoK, (1997(b)) *The Government of Kenya 8th National Development Plan for the period 1997-2001* (Kenya Nairobi: Government Publishers).

GoK, (2004) *The Government of Kenya Sessional paper on "A Policy Framework for Education, Training and Research. Meeting the Challenges of Education, Training and Research in Kenya in the 21st Century* (Kenya Nairobi: Government Publishers).

Green, W. H. (2000) *Econometric Analysis* (London: Prentice-Hall International).

Gujarati, D. N. (1995) *Basic Econometrics* (McGraw-Hill, Inc.).

Haddad, M. and Harrison, A. (1993) Are There Spillovers from Direct Foreign Investment? Evidence from Panel Data for Morroco. *Journal of Development Economics* **42**(1): 51-74.

Jovanovic, B. (1982) Selection and the Evolution of Industries. *Econometrica* **50**(3): 649-70.

Kaldor, N. (1957) A model of Economic Growth. *Economic Journal* **67**: 591-624.

KAM (2002) *The Manufacturers Directory* (Nairobi: Kenya Association of Manufacturers).

Kaplinsky, R., Ed. (1978) *Readings on the Multinational Corporations in Kenya* (Nairobi: Heineman).

Kim, L. (1997) *Imitation to Innovation: The Dynamics of Korea's Technological Learning.* (Boston Massachusetts: Harvard Business School Press).

Kim, L. (1999). *Learning and Innovation in Economic Development* (Massachusetts, Cheltenham: Edward Elgar Publishing, Inc).

Kraemer, K.L. and Dedrick, J. (2003) The Information Technology Sector and International Competitiveness. *International Journal of Business and Society* **4**(2): 111-134.

Lall, S. (1982) *Developing Countries as Exporters of Technology: A First Look at the Indian Experience* (London: Macmillan Press).

Lall, S. (1992) Technological Capabilities and Industrialisation. *World Development* **20**(2): 165-186.

Lall, S. (1996) *Learning from the Asian Tigers: Studies in Technology and Industrial Policy* (London & New York: Macmillan Press Ltd & St. Martin's Inc.).

Lall, S. (2001) *Competitiveness, Technology and Skills* (London: Edward Elgar Publishing).

Lall, S. and Streeten, P. (1977) *Foreign Investment, Transnational and Developing Countries* (Basingstoke: Macmilan).

Lucas, R. E. J. (1988) On the Mechanics of Economic Development. *Journal of Monetary Economics* **22**(1): 3-42.

Lundvall, B.A. (1992) *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning* (London: Francis Pinter).

Lundvall, B.A. (2000) Promoting Innovation Systems as a Response to the Globalising Learning Economy (Aalborg: Aalborg University).

Lundvall, K. and Battese, G.E. (2000) Firm Size, Age and Efficiency: Evidence from Kenyan Manufacturing Firms. *The Journal of Development Studies* **36**(3): 146-163.

Maddala, G.S. (1989) *Introduction to Econometrics* (New York: Macmillan Publishing Company).

Mazumdar, D. and Mazaheri, A. (2003) *The African Manufacturing Firm: An Analysis Based on Firm Survey's in Seven Countries in Sub-Saharan Africa* (London: New York, Routledge).

Mytelka, L.K., Ed. (1999) *Competition, Innovation and Competitiveness in Developing Countries* (Paris: OECD).

Mytelka, L.K. (2000) Local Systems of Innovation in a Globalised World Economy. *Industry and Innovation* **7**(1): 15-32.

Mytelka, L.K. (2004) The Dynamics of Catching Up: The Relevance of an Innovation System Approach in Africa, in: M. Muchie, P. Gammeltoft and B. Lundvall (eds.) *Putting Africa First: The Making of African Innovation Systems,* (Aalborg: Aalborg University Press).

Nelson, R.R. and Phelps E. (1966) Investment in Humans, Technological Diffusion, and Economic Growth. *American Economic Review* **56**: 67-75.

Nelson R.R. and Pack, H. (1997) The Asian Miracle and Modern Growth Theory. *World Bank Research Paper*

Nelson, R. R. and Rosenberg, N. (1993) Technical Innovation and National Systems, in: R. R. Nelson (ed.) *National Innovation Systems: A Comparative Analysis.* Oxford, (UK: Oxford University Press).

Nelson, R. and Winter, S.G. (1977) In Search of a Useful Theory of Innovation. *Research Policy* **6**(1): pp. 36-76

Nelson, R. and Winter, S.G. (1982) *An Evolutionary Theory of Economic Chang*e (Cambridge: Harvard University Press).

Pack, H. and Saggi, K. (1997) Inflows of Foreign Technology and Indigenous Technological Development. *Review of Development Economics* **1**(1): pp. 81-98.

Patibandla, M. and Petersen, B. (2002) Role of Transnational Corporations in the Evolution of a High-Tech Industry: The Case of India's Software Industry. *World Development* **30**(9):1561-1577.

Piore, M. J. and Sabel, C.F. (1984) *The Second Industrial Divide: Possibilities for Prosperity* (New York: Basic Books).

Porter, (1990) *The Competitive Advantage of Nations* (New York: Free Press9)

Porter, (1998) *On Competition* (Cambridge, MA: Harvard Business)

Pratten, C. (1971) *Economies of Scale in Manufacturing Industry* (Cambridge: Cambridge University Press).

Rasiah, R. (1995) *Foreign Capital and Industrialisation in Malaysia* (Basingstoke: Macmillan).

Rasiah, R. (2001) Market, Government and Malaysia's New Economic Policy. *Cambridge Journal of Economics* **25**(1).

Rasiah, R. (2003) Systemic Coordination and the Knowledge Economy: Human Capital Development in MNC-driven Electronics Clusters in Malaysia. *Transnational Corporations* **11**(3).

Rasiah, R. (2004) *Foreign Firms, Technological Capabilities and Economic Performance: Evidence from Africa, Asia and Latin America* (Cheltenham, UK and Northampton, MA, USA: Edward Elgar).

Rasiah, R. and Gachino, G. (2005) Are Foreign Firms more Productive, and Export and Technology Intensive than Local Firms in Kenyan Manufacturing? *Oxford Development Studies* **33**(2): 211-228.

Rebelo, S. (1991) Long–Run Policy Analysis and Long–Run Growth. *Journal of Political Economy* **99**(3).

Romer, P.M. (1986) Increasing Returns and Long Run Growth. *Journal of Political Economy* **94**: 1002-1037.

Romer, P. M. (1990) Endogenous Technological Change. *Journal of Political Economy* **98**: S71-102.

Romijn, H. (1997) Acquisition of Technological Capability in Development: A Quantitative Case Study of Pakistan's Capital Goods Sector. *World Development* **25**(3): 359-377.

Romijn, H. (1998) Technology Support for Small Industries in Developing Countries: from 'Supply-Push' to 'Eightfold-C'." *QEH Working Paper Series-QEHWPS21*.

Sabel, C. (1989) Flexible Specialisation and the Re-emergence of Regional Economies, in: P. Hirst and J. Zeitlin (eds.) *Reversing Industrial Declines? Industrial Structure and Policy in Britain and Her Competitors,* (Oxford: Berg Publishers).

Scherer, F. (1973) The Determinants of Industry Plant Sizes in Six nations. *Review of Economics and Statistics* **55**(2): 135-175.

Schultz, T.W. (1961) Investment in Human Capital. *American Economic Review*, **52**(1): 1-17

Schultz, T.W. (1963) *The Economic value of Education.* (Columbia: Columbia University press).

Schumpeter, J.A. (1934) The Theory of Economic Development (Oxford: Oxford University Press).

Schumpter, J.A. (1952) *Capitalism, Socialism, and Democracy* (London: Unwin).

Sengenberger, W. and F. Pyke (1991) Small Firms, Industrial Districts and Local Economic Regeneration. *Labour and Society* **16**(1): 1-24.

Sjoholm, F. (1997) Technology Gap, Competition and Spillovers from Direct Foreign Investment: Evidence from Established Data. *Journal of Development Studies* **36**: 1.

Soderbom, M. (2000) What Drives Manufacturing Exports in Africa? Evidence from Ghana, Kenya and Zimbabwe. *CSAE-UNIDO Working Paper No. 2.*

Soderbom, M. (2001) Constraints and Opportunities in Kenyan Manufacturing. *Report on the Kenyan Manufacturing Enterprise Survey 2000 UNIDO and CSAE.*

Stata (2003) *Stata Reference Manual* (Stata: Stata Press).

Swainson, N. (1980) *The Development of Corporate Capitalism in Kenya, 1918-1977,* (Nairobi: Heinemann).

UNDP (2005) Innovation: Applying Knowledge in Development. (United Nations Development Programme: UNDP).

Uzawa, H.A. (1965) Optimum Technical Change in an Aggregative Model of Economic Growth. *International Economic Review*. **6**(1): 18-31

Wangwe, S.M., Ed. (1995*) Exporting Africa: Technology, Trade and Industrialisation in Sub-Saharan Africa*. (London and New York: Routledge).

Westphal, L.E. (1990) Industrial Policy in an Export-Propelled Economy: Lessons from South Korea's Experience. *Journal of Economic Perspective* **4**(3): 41-59.

Westphal, L.E., Kim, L. and Dahlman, C.J. (1985). Reflections on Korea's Acquisition of Technological Capability in:N. Rosenberg and C. Frischtak (eds) *International Technology Transfer: Concepts, Measures and Comparisons,* (New York: Pergamon Press).

Wignaraja, G. (2000) Firm Size, Technological Capabilities and Market-Oriented Polices in Mauritius. *Working paper presented at UNU/INTECH.*

Wilkinson, F. and You, J.I. (1995) Competition and Cooperation: Towards an Understanding of the Industrial District. *Review of Political Economy* **6**: 259-78.

Appendix 1: Two-Tailed t Test Results Comparing Foreign and Local Kenyan Firms

	Local	Std. Dev.	Foreign	Std. Dev.	Mean Difference	T-Values	Sig. (2-tailed)
Human Capital Development							
Metal engineering	0.168	0.230	0.334	0.242	-0.165	-1.945	0.060*
Textile and garment	0.167	0.176	0.353	0.335	-0.186	-1.644	0.115
Food and beverage	0.166	0.209	0.313	0.327	-0.147	-1.847	0.071*
All Firms	0.167	0.209	0.332	0.299	-0.165	-3.309	0.001***
Process Technology Capability							
Metal engineering	0.355	0.230	0.562	0.163	-0.207	-2.680	0.011**
Textile and garment	0.493	0.260	0493	0.277	-0.001	-0.005	0.996
Food and beverage	0.525	0.176	0.577	0.287	-0.052	-0.757	0.453
All Firms	0.46	0.222	0.545	0.249	0.085	-1.805	0.074*
Product Technology Capability							
Metal engineering	0.242	0.240	0.455	0.251	-0.212	-2.396	0.022**
Textile and garment	0.23	0.228	0.349	0.267	-0.119	-1.145	0.265
Food and beverage	0.219	0.196	0.336	0.215	-0.117	-1.826	0.075*
All Firms	0.229	0.215	0.376	0.242	-0.147	-3.197	0.002***
Market Performance							
Metal engineering	0.278	0.160	0.397	0.224	-0.120	-1.808	0.080*
Textile and garment	0.307	0.161	0.345	0.219	-0.038	-0.467	0.645
Food and beverage	0.352	0.148	0.456	0.183	-0.104	-2.055	0.046**
All Firms	0.318	0.156	0.402	0.207	-0.084	-2.346	0.021**

Note: *, ** and *** - Significant at 1%, 5% and 10% levels respectively. Source: Computed from UNU-INTECH Survey (2002/3)

	HMCD	EXPTDMY	PRTC	PDTC	MKTP	BSCII	FDI	UNION	GOVN	SIZE	AGE	SYEMB
HMCD	1.000											
EXPTDMY	0.493	1.000										
PRTC	0.554	0.361	1.000									
PDTC	0.513	0.327	0.558	1.000								
MKTP	0.540	0.443	0.539	0.426	1.000							
BSCII	0.123	0.000	0.154	0.095	0.239	1.000						
FDI	0.416	0.330	0.279	0.180	0.165	-0.001	1.000					
UNION	-0.184	-0.049	-0.350	-0.131	-0.174	-0.289	-0.109	1.000				
GOVN	0.325	0.340	0.387	0.323	0.410	0.236	0.186	0.092	1.000			
SIZE	0.376	0.372	0.387	0.267	0.326	-0.067	0.501	-0.007	0.221	1.000		
AGE	0.062	0.019	-0.208	-0.044	-0.039	-0.023	-0.180	0.354	-0.069	-0.055	1.000	
SYEMB	0.277	0.190	0.348	0.326	0.297	0.494	0.115	-0.077	0.779	0.133	-0.067	1.000

Appendix 2: Correlation Matrix of All the Variables used in the Analysis

Source: Computed from UNU-INTECH Survey (2002/3)

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